Chabot-Las Positas Community College District

Bid No. B19/20 - 12

MPOE REPLACEMENT – BLDG 300,
LEARNING SKILLS TESTING RELOCATION – BLDG 100

Bids Due:

March 4, 2020 at 4:00 P.M.

Return Bids To:

Chabot-Las Positas Community College District
Business Services-Facilities and Bond Program

7600 Dublin Boulevard., 3rd Floor
Dublin, California 94568

Phone: (925) 485-5277
Fax: (925) 485-5294

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NOTICE TO CONTRACTORS CALLING FOR BIDS

DISTRICT	**CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT**
PROJECT DESCRIPTION	**MPOE Replacement – Bldg 300, and Learning Skills Testing Relocation – Bldg 100** New MPOE room within existing building on Chabot College campus. The new MPOE will require new electrical and telecommunications service connections. Construction shall consist of utility installation and surface restoration.
LATEST TIME / DATE FOR SUBMISSION OF BID PROPOSALS	**March 4, 2020 @ 4:00 P.M.**
LOCATION FOR SUBMISSION OF BID PROPOSALS	**CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT OFFICE** **7600 Dublin Boulevard., 3rd Floor** **Dublin, California 94568**
LOCATION FOR OBTAINING BID AND CONTRACT DOCUMENTS	**Chabot-Las Positas Community College Website** http://www.clpccd.org/business/BusinessServicesPurchasing.php **Builders' Exchange of Santa Clara County** http://www.bxscco.com/online-plans/ **Bay Area Builder's Exchange** https://bayareabx.com/

NOTICE IS HEREBY GIVEN that the above-named California Community College District, acting by and through its Board of Trustees, hereinafter "the District" will receive up to, but not later than the above-stated date and time, sealed Bid Proposals for the Contract for the Work of the Project generally described as: **BID #B19/20-12: MPOE Replacement – Bldg 300, and Learning Skills Testing Relocation – Bldg 100.**

1. **Submittal of Bid Proposals.** All Bid Proposals shall be submitted on forms furnished by the District. Bid Proposals must conform with, and be responsive to, the Bid and Contract Documents, copies of which may be obtained from the District as set forth above. Only Bid Proposals submitted to the District at or prior to the date and time set forth above for the public opening and reading of Bid Proposals shall be considered.

2. **Bid and Contract Documents.** The Bid and Contract Documents are available at the location stated above

3. Documents Accompanying Bid Proposal. Each Bid Proposal shall be accompanied by: (a) the required Bid Security; (b) Subcontractors List; (c) Non-Collusion Affidavit; (d) Certification of Pre-Bid Site Visit; and (e) Statement of Bidder's Qualifications. All information or responses of a Bidder in its Bid Proposal and other documents accompanying the Bid Proposal shall be complete, accurate and true; incomplete, inaccurate or untrue responses or information provided therein by a Bidder shall be grounds for the District to reject such Bidder's Bid Proposal for non-responsiveness.

4. Prevailing Wage Rates. Pursuant to California Labor Code §1773, the Director of the Department of Industrial Relations of the State of California has determined the generally prevailing rates of wages in the locality in which the Work is to be performed. Copies of these determinations, entitled "PREVAILING WAGE SCALE" are maintained at the District's Administrative Offices located at 7600 Dublin Boulevard, 3rd Floor, Dublin, CA 94568, and are available to any interested party upon request. Alternatively, prevailing wage rate classifications and determinations may be viewed and obtained by accessing the Division of Labor Standards Enforcement databases at http://www.dir.ca.gov/dirdatabases.html. The Contractor awarded the Contract for the Work shall post a copy of all applicable prevailing wage rates for the Work at conspicuous locations at the Site of the Work. The Contractor and all Subcontractors performing any portion of the Work shall pay not less than the applicable prevailing wage rate for the classification of labor provide by their respective workers in prosecution and execution of the Work.

5. Contractors License Classification. In accordance with the provisions of California Public Contract Code §3300, the District requires that Bidders possess the following classification(s) of California Contractors License **B.** Any Bidder not so duly and properly licensed shall be subject to all penalties imposed by law. No payment shall be made for work, labor, materials or services provided under the Contract for the Work unless and until the Registrar of Contractors verifies to the District that the Bidder awarded the Contract is properly and duly licensed to perform the Work.

6. Contract Time. The date(s) for completion of portions of the Work, if applicable, and for achieving Substantial Completion of the Work shall be achieved as set forth in the Special Conditions. Failure to complete designated portions of the Work within the time(s) established in the Special Conditions and/or failure to achieve Substantial Completion of the Work within the Contract Time established in the Special Conditions shall subject the Contractor to assessment of Liquidated Damages as set forth in the Special Conditions.

7. Labor Compliance Program (AB 1506). The District has established a Labor Compliance Program ("LCP") pursuant to Labor Code §1771.5. The Contractor awarded the Contract for the Work shall comply with the LCP and provisions of the Contract Documents relating to implementation, compliance with, and enforcement of the LCP.

8. Bid Security. Each Bid Proposal shall be accompanied by Bid Security in an amount not less than **ten percent (10%)** of the maximum amount of the Bid Proposal, inclusive of any additive Alternate Bid Item(s). Failure of any Bid Proposal to be accompanied by Bid Security in the form and in the amount required shall render such Bid Proposal to be non-responsive and rejected by the District.

9. No Withdrawal of Bid Proposals. Bid Proposals shall not be withdrawn by any Bidder for a period of **sixty (60)** days after the opening of Bid Proposals. During this time, all Bidders shall guarantee prices quoted in their respective Bid Proposals.

10. Job-Walk. The District will conduct a **Mandatory Job Walk on February 12, 2020, beginning at 10:00 A.M. Bidder's attendance at the Job Walk is mandatory**. Bidders are to meet at **Chabot College, 25555 Hesperian Boulevard, Facilities Management Office (Across from Building 3000),**

Hayward, California 94545 to participate in the Job Walk. Campus maps are available at www.chabotcollege.edu. If the Job Walk is mandatory, the Bid Proposal submitted by a Bidder whose representative(s) did not attend the entirety of the Mandatory Job Walk will be rejected by the District as being non-responsive. Each Bidder Attendee will be given a signed Certification of Pre-Bid Site Visit form at the conclusion of the Job-Walk.

11. Substitute Security. In accordance with the provisions of California Public Contract Code §22300, substitution of eligible and equivalent securities for any monies withheld by the District to ensure the Contractor's performance under the Contract will be permitted at the request and expense of the Contractor and in conformity with California Public Contract Code §22300. The foregoing notwithstanding, the Bidder to whom the Contract is awarded shall submit its written request to the District to permit the substitution of securities for retention under California Public Contract Code §22300 prior to the submission of its first Application for Progress Payment. The failure of such Bidder to make such written request to the District prior to submission of its first Application for Progress Payment shall be deemed a waiver of the Bidder's rights under California Public Contract Code §22300.

12. Waiver of Irregularities. The District reserves the right to reject any or all Bid Proposals or to waive any irregularities or informalities in any Bid Proposal or in the bidding.

13. Award of Contract. The Contract for the Work, if awarded, will be by action of the District's Board of Trustees to the responsible Bidder submitting the lowest priced responsive Bid Proposal. If Alternate Bid Items are included in the bidding, the lowest priced Bid Proposal will be determined on the basis of the Base Bid Proposal and the combination of Alternate Bid Items selected in accordance with the applicable provisions of the Instructions for Bidders.

14. Construction Cost Estimate Range for Total Bid: $1,500,000.00

15. Last Date / Time For:

Bidder's Request for Information	February 19, 2020 @ 4:00pm
Last Day to Issue Addenda	February 26, 2020 @ 4:00pm
Bids Due	March 4, 2020 @ 4:00pm

Publication Dates:
January 31, 2020
February 7, 2020

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INSTRUCTIONS FOR BIDDERS

1. Preparation and Submittal of Bid Proposal.

1.1 Bid Proposal Preparation. All information required by the bid forms must be completely and accurately provided. Numbers shall be stated in both words and figures where so indicated in the bid forms; conflicts between a number stated in words and in figures are governed by the words. Partially completed Bid Proposals or Bid Proposals submitted on other than the bid forms included herein are non-responsive and will be rejected. Bid Proposals not conforming to these Instructions for Bidders and the Notice to Contractors Calling for Bids ("Call for Bids") may be deemed non-responsive and rejected.

1.2 Bid Proposal Submittal. Bid Proposals shall be submitted at the place designated in the Call for Bids in sealed envelopes bearing on the outside the Bidder's name and address along with an identification of the Work for which the Bid Proposal is submitted. Bidders are solely responsible for timely submission of Bid Proposals to the District at the place designated in the Call for Bids.

1.3 Date and Time of Bid Proposal Submittal. The District will place a clock ("the District Clock") in a conspicuous location at the place designated for submittal of Bid Proposals. For purposes of determining the time that a Bid Proposal is submitted, the District Clock shall be controlling. The foregoing notwithstanding, whether or not Bid Proposals are opened exactly at the time fixed in the Call for Bids, no Bid Proposals shall be received or considered by the District after it has commenced the public opening and reading of Bid Proposals; Bid Proposals submitted after such time are non-responsive and will be returned to the Bidder unopened.

2. Bid Security. Each Bid Proposal shall be accompanied by Bid Security in the form of: (a) cash, (b) a certified or cashier's check made payable to the District or (c) a Bid Bond, in the form and content attached hereto, in favor of the District executed by the Bidder as a principal and a Surety as surety (the "Bid Security") in an amount not less than the percentage of the maximum amount of the Bid Proposal. Any Bid Proposal submitted without the required Bid Security is non-responsive and will be rejected. If the Bid Security is in the form of a Bid Bond, the Bidder's Bid Proposal shall be deemed responsive only if the Bid Bond is in the form and content included herein and the Surety is an Admitted Surety Insurer under Code of Civil Procedure §995.120.

3. Documents Accompanying Bid Proposal; Signatures. The Bid Proposal must be submitted with: Bid Security, Subcontractors List, Statement of Qualifications, Certification of Pre-Bid Site Visit and the Non-Collusion Affidavit. The Bid Proposal, Statement of Qualifications and the Non-Collusion Affidavit shall be executed by an individual duly authorized to execute the same on behalf of the Bidder.

4. Modifications. Changes to the bid forms which are not specifically called for or permitted may result in the District's rejection of the Bid Proposal as being non-responsive. No oral or telephonic modification of any submitted Bid Proposal will be considered. A written modification may be considered only if actually received by the District prior to the scheduled closing time for receipt of Bid Proposals and the public opening thereof.

5. Erasures; Inconsistent or Illegible Bid Proposals. Bid Proposals must not contain any erasures, interlineations or other corrections unless the same are suitably authenticated by affixing in the margin immediately opposite such erasure, interlineation or correction the surname(s) of the person(s) signing the Bid Proposal. Any Bid Proposal not conforming with the foregoing may be

deemed by the District to be non-responsive. If any Bid Proposal or portions thereof, is determined

by the District to be illegible, ambiguous or inconsistent, whether by virtue of any erasures, interlineations, corrections or otherwise, the District may reject such a Bid Proposal as being non-responsive.

6. **Examination of Site and Contract Documents.** Each Bidder shall, at its sole cost and expense, inspect the Site and to become fully acquainted with the Contract Documents and conditions affecting the Work. The failure of a Bidder to receive or examine any of the Contract Documents or to inspect the Site shall not relieve such Bidder from any obligation with respect to the Bid Proposal, or the Work required under the Contract Documents. The District assumes no responsibility or liability to any Bidder for, nor shall the District be bound by, any understandings, representations or agreements of the District's agents, employees or officers concerning the Contract Documents or the Work made prior to execution of the Contract which are not in the form of Bid Addenda duly issued by the District. The submission of a Bid Proposal shall be deemed prima facie evidence of the Bidder's full compliance with the requirements of this section.

7. **Withdrawal of Bid Proposal**. Any Bidder may withdraw its Bid Proposal by of written request actually received by the District prior to the scheduled closing time for the receipt of Bid Proposals and the District's public opening and reading of Bid Proposals. A written notice of withdrawal of a submitted Bid Proposal received after the scheduled closing time for receipt of Bid Proposals or the District's public opening and reading of Bid Proposals shall not be considered by the District, nor effective to withdraw such Bid Proposal.

8. **Agreement and Bonds.** The Agreement which the successful Bidder, as Contractor, will be required to execute along with the forms and amounts of the Labor and Material Payment Bond, Performance Bond and other documents and instruments which will be required to be furnished are included in the Contract Documents and shall be carefully examined by the Bidder. The required number of executed copies of the Agreement and the form and content of the Performance Bond and the Labor and Material Payment Bond and other documents or instruments required at the time of execution of the Agreement are specified in the Contract Documents.

9. **Interpretation of Drawings, Specifications or Contract Documents.** Any Bidder in doubt as to the true meaning of any part of the Contract Documents; finds discrepancies, errors or omissions therein; or finds variances in any of the Contract Documents with applicable rules, regulations, ordinances and/or laws, a written request for an interpretation or correction thereof may be submitted to the District. It is the sole and exclusive responsibility of the Bidder to submit such request not less than **Seven (7) calendar days** prior to the scheduled closing date for the receipt of Bid Proposals. Questions received less than Seven (7) calendar days prior to the date for opening Bids may not be answered. Interpretations or corrections of the Contract Documents will be by written addendum issued by the District or the Architect. A copy of any such addendum will be mailed, faxed, emailed or delivered to each Bidder receiving a set of the Contract Documents. No person is authorized to render an oral interpretation or correction of any portion of the Contract Documents to any Bidder, and no Bidder is authorized to rely on any such oral interpretation or correction. Failure to request interpretation or clarification of any portion of the Contract Documents pursuant to the foregoing is a waiver of any discrepancy, defect or conflict therein.

10. **District's Right to Modify Contract Documents.** Before the public opening and reading of Bid Proposals, the District may modify the Work, the Contract Documents, or any portion(s) thereof by the issuance of written addenda disseminated to all Bidders who have obtained a copy of the Specifications, Drawings and Contract Documents pursuant to the Call for Bids. If the District issues any addenda during the bidding, the failure of any Bidder to acknowledge such addenda in its Bid

Proposal will render the Bid Proposal non-responsive and rejected.

11. Bidders Interested in More Than One Bid Proposal; Non-Collusion Affidavit. No person, firm, corporation or other entity shall submit or be interested in more than one Bid Proposal for the same Work; provided, however, that a person, firm or corporation that has submitted a sub-proposal Bidder or who has quoted prices for materials to a Bidder is not thereby disqualified from submitting a sub-proposal, quoting prices to other Bidders or submitting a Bid Proposal for the proposed Work to the District. The form of Non-Collusion Affidavit included in the Contract Documents must be completed and duly executed on behalf of the Bidder; failure of a Bidder to submit a completed and executed Non-Collusion Affidavit with its Bid Proposal will render the Bid Proposal non-responsive.

12. Award of Contract.

12.1 Waiver of Irregularities or Informalities. The District reserves the right to reject any and all Bid Proposals or to waive any irregularities or informalities in any Bid Proposal or in the bidding.

12.2 Award to Lowest Responsive Responsible Bidder. The award of the Contract, if made by the District through action of its Board of Trustees, will be to the responsible Bidder submitting the lowest priced responsive Bid Proposal on the basis of the Base Bid Proposal or the Base Bid Proposal and Alternate Bid Items, if any, selected in accordance with these Instructions for Bidders.

12.3 Selection of Alternate Bid Items. The selection of Alternate Bid Items for inclusion in the scope of the Work of the Contract to be awarded and for determination of the lowest Bid Proposal based upon the Base Bid Proposal and the combination of Alternate Bid Items selected for inclusion in the Contract to be awarded will be by a “blind-bidder” process. After opening timely submitted Bid Proposals and before the public reading of Bid Proposals, District clerical staff (“Clerical Staff”) who will not be engaged in the selection of Alternate Bid Items for inclusion in the Contract to be awarded will assign each Bidder an alphabetical letter for identification purposes. The Clerical Staff will mask all portions of the Bid Proposal and other documents submitted with Bid Proposals so that the identity of each Bidder is not revealed. The Clerical Staff will maintain a list (“the Bidders List”) which identifies by name and the alphabetical letter assigned by the Clerical Staff to each Bidder. After completing the Bidders List, the Clerical Staff will publicly read the Bid Proposals amounts of each Bidder for the Base Bid as well as each Alternate Bid Item. In this public reading of Bid Proposals, Bidders will not be identified by name; Bidders will be identified only by alphabetical letter assigned to each Bidder by the Clerical Staff. After the public reading of Bid Proposals, the Clerical Staff will provide the Architect and the District's staff responsible for selection of Alternate Bid Items for inclusion in the Contract to be awarded (“District Project Staff”) copies of Bid Proposals with the identities of Bidders masked; Bid Proposals reviewed by the Architect and District Project Staff will identify Bidders only by alphabetical letters. At such time as the Architect and the District Project Staff have completed review of Bid Proposals and made a determination of which Bidder (by the alphabetical letter assigned by Clerical Staff) has submitted the lowest Bid Proposal on the basis of the Base Bid Proposal and any combination of Alternate Bid Items as determined by the Architect and the District Project Staff, the Clerical Staff will make available to the Project Staff the Bidders List so that the identity of the Bidder to be awarded the Contract can be identified. Until such time as the District Project Staff have completed review of Bid Proposals and determination of which Bidder has submitted the lowest Bid Proposal, there will be no communication between the Clerical Staff and the Architect or the District Project Staff regarding the identities of Bidders

or disclosure of any portion of the Bidders List.

12.4 Alternate Bid Items Not Included in Award of Contract. Bidders are referred to the provisions of the Contract Documents permitting the District, during performance of the Work, add or delete from the scope of the Work any or all of the Alternate Bid Items with the cost or credit of the same being the amount(s) set forth by in **Attachment A** the Alternate Bid Items Proposal.

12.5 Responsive Bid Proposal. A responsive Bid Proposal shall mean a Bid Proposal which conforms, in all material respects, with the Bid and Contract Documents.

12.6 Responsible Bidder. A responsible Bidder is a Bidder who has the capability in all respects, to perform fully the requirements of the Contract Documents and the moral and business integrity and reliability which will assure good faith performance. In determining responsibility, the following criteria will be considered: (i) the ability, capacity and skill of the Bidder to perform the Work of the Contract Documents; (ii) whether the Bidder can perform the Work promptly and within the time specified, without delay or interference; (iii) the character, integrity, reputation, judgement, experience and efficiency of the Bidder; (iv) the quality of performance of the Bidder on previous contracts, by way of example only, the following information will be considered: (a) the administrative, consultant or other cost overruns incurred by the District on previous contracts with the Bidder; (b) the Bidder's compliance record with contract general conditions on other projects; (c) the submittal by the Bidder of excessive and/or unsubstantiated extra cost proposals and claims on other projects; (d) the Bidder's record for completion of work within the contract time and the Bidder's compliance with the scheduling and coordination requirements on other projects; (e) the Bidder's demonstrated cooperation with the District and other contractors on previous contracts; (f) whether the work performed and materials furnished on previous contracts was in accordance with the Contract Documents; (v) the previous and existing compliance by the Bidder with laws and ordinances relating to contracts; (vi) the sufficiency of the financial resources and ability of the Bidder to perform the work of the Contract Documents; (vii) the quality, availability and adaptability of the goods or services to the particular use required; (viii) the ability of the Bidder to provide future maintenance and service for the warranty period of the Contract; (ix) whether the Bidder is in arrears on debt or contract or is a defaulter on any surety bond; (x) such other information as may be secured by the District having a bearing on the decision to award the Contract, to include without limitation the ability, experience and commitment of the Bidder to properly and reasonably plan, schedule, coordinate and execute the Work of the Contract Documents and whether the Bidder has ever been debarred from bidding or found ineligible for bidding on any other projects. The ability of a Bidder to provide the required bonds will not of itself demonstrate responsibility of the Bidder.

13. Subcontractors.

13.1 Designation of Subcontractors; Subcontractors List. Each Bidder shall submit a list of its proposed Subcontractors for the proposed Work as required by the Subletting and Subcontracting Fair Practices Act (California Public Contract Code §§4100 et seq.) on the form furnished. The failure of any Bid Proposal to include all information required by the Subcontractors List will result in rejection of the Bid Proposal for non-responsiveness.

13.2 Work of Subcontractors. All Bidders are referred to the Contract Documents and the notation therein that all Contract Documents are intended to be complimentary and that the organization or arrangements of the Specifications and Drawings shall not limit the extent of the Work of the Contract Documents. Accordingly, all Bidders are encouraged to disseminate

all of the Specifications, Drawings and other Contract Documents to all persons or entities submitting sub-bids to the Bidder. The omission of any portion or item of Work from the Bid Proposal or from the sub-bidders' sub-bids which is/are necessary to produce the intended results and/or which are reasonably inferable from the Contract Documents is not a basis for adjustment of the Contract Price or the Contract Time. Dissemination of the Contract Documents to sub-bidders and dissemination of addenda issued during the bidding process is solely the responsibility of each Bidder.

13.3 Subcontractor Bonds. In accordance with California Public Contract Code §4108, if a Bidder requires a bond or bonds of its Subcontractor(s), whether the expense of procuring

such bond or bonds are to be borne by the Bidder or the Subcontractor(s), such requirements shall be specified in the Bidder's written or published request for sub-bids. Failure of the Bidder to comply with these requirements shall preclude the Bidder from imposing bonding requirements upon its Subcontractor(s) or rejection of a Subcontractor's bid under California Public Contract Code §4108(b).

14. Workers' Compensation Insurance. Pursuant to California Labor Code §3700, the successful Bidder shall secure Workers' Compensation Insurance for its employees engaged in the Work of the Contract. The successful bidder shall sign and deliver to the District the following certificate prior to performing any of the Work under the Contract:

> "I am aware of the provisions of §3700 of the California Labor Code which require every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that Code and I will comply with such provisions before commencing the performance of the Work of the Contract."

The form of such Certificate is included as part of the Contract Documents.

15. Bid Security Return. The Bid Security of three or more low Bidders, the number being solely at the discretion of the District, will be held by the District for ten (10) days after the period for which Bid Proposals must be held open (which is set forth in the Call for Bids) or until posting by the successful Bidder(s) of the bonds, certificates of insurance required and return of executed copies of the Agreement, whichever first occurs, at which time the Bid Security of such other Bidders will be returned to them.

16. Forfeiture of Bid Security. If the Bidder awarded the Contract fails or refuses to execute the Agreement within fifteen (15) calendar days from the date of receiving notification that it is the Bidder to whom the Contract has been awarded, the District may declare the Bidder's Bid Security forfeited as damages caused by the failure of the Bidder to enter into the Contract and may thereupon award the Contract for the Work to the responsible Bidder submitting the next lowest Bid Proposal or may call for new bids, in its sole and exclusive discretion.

17. Contractor's License. No Bid Proposal will be considered from a Bidder who, at the time Bid Proposals are opened, is not licensed to perform the Work, in accordance with the Contractors License Law, California Business & Professions Code §§7000 et seq. This requirement is not a mere formality and will not be waived by the District or its Board of Trustees. The required California Contractor's License classification(s) for the Work is/are set forth in the Call for Bids.

18. Anti-Discrimination. It is the policy of the District that there be no discrimination against any prospective or active employee engaged in the Work because of race, color, ancestry, national origin,

religious creed, sex, age or marital status. All Bidders agree to comply with the District's anti-discrimination policy and all applicable Federal and California anti-discrimination laws including but not limited to the California Fair Employment & Housing Act beginning with California Government Code §§12940 et seq. and California Labor Code §1735. In addition, all Bidders agree to require like compliance by any Subcontractor employed by them on the Work of the Contract.

19. Bidder's Qualifications. Each Bidder shall submit with its Bid Proposal the form of Statement of Bidder's Qualifications, which is included within the Contract Documents. All information required by Statement of Bidder's Qualifications shall be completely and fully provided. Any Bid Proposal not accompanied by the Statement of Bidder's Qualifications completed with all information required and bearing the signature of the Bidder's duly authorized representative under penalty of perjury will render the Bid Proposal non-responsive and rejected. If the District determines that any information provided by a Bidder in the Statement of Bidder's Qualifications is false or misleading or is incomplete so as to be false or misleading, the District may reject the Bid Proposal submitted by such Bidder as being non-responsive.

20. Job-Walk. The District will conduct a Job-Walk at the time(s) and place(s) designated in the Call for Bids. The District may, in its sole and exclusive discretion, elect to conduct one or more Job-Walk(s) in addition to that set forth in the Call for Bids, in which event the District shall notify all Bidders who have theretofore obtained the Contract Documents pursuant to the Call for Bids of any such additional Job-Walk. If the District elects to conduct any Job-Walk in addition to that set forth in the Call for Bids, the District shall, in its notice of any such additional Job-Walk(s), indicate whether Bidders' attendance at such additional Job-Walk(s) is/are mandatory. If attendance at the Job Walk is indicated in the Call for Bids as being mandatory, the failure of any Bidder to have its authorized representative present at the entirety of the Job-Walk will render the Bid Proposal of such Bidder to be non-responsive. Where the Job-Walk is mandatory, a Bidder may have more than one authorized representative and/or representatives of its Subcontractors present at the Job-Walk; provided, however that attendance by representatives of the Bidder's Subcontractors without attendance by a representative of the Bidder shall not be sufficient to meet the Bidder's obligations hereunder and will render the Bid Proposal of such Bidder to be non-responsive. The District will reject the Bid Proposal of a Bidder who obtains the Bid and Contract Documents after the date of the Mandatory Job-Walks set forth in the Call for Bids unless a Job-Walk is requested by such Bidder and a Job-Walk is conducted by the District in accordance with the following provisions. The District may, in its sole and exclusive discretion, conduct such requested Job-Walk taking into consideration factors such as the time remaining prior to the scheduled opening of Bid Proposals. Any such requested Job Walk will be conducted only upon the requesting Bidder's agreement to reimburse the District for the actual and/or reasonable costs for the District's staff and its agents and representatives in arranging for and conducting such additional Job-Walk.

21. Public Records. Bid Proposals and other documents responding to the Call for Bids become the exclusive property of the District upon submittal to the District. At such time as the District issues he Notice of Intent to award the Contract pursuant to these Instructions for Bidders, all Bid Proposals and other documents submitted in response to the Call for Bids become a matter of public record and shall be thereupon be considered public records, except for information contained in such Bid Proposals deemed to be Trade Secrets (as defined in California Civil Code §3426.1) and information provided in response to the Statement of Qualifications. A Bidder that indiscriminately marks all or most of its Bid Proposal as exempt from disclosure as a public record, whether by the notations of “Trade Secret,” “Confidential,” “Proprietary,” or otherwise, may result render the Bid Proposal non-responsive and rejected. The District is not liable or responsible for the disclosure of such records, including those exempt from disclosure if disclosure is deemed required by law, by an order of Court, or which occurs through inadvertence, mistake or negligence on the part of the District or its officers, employees or agents. At such time as Bid Proposals are deemed a matter of public record, pursuant

to the above, any Bidder or other party shall be afforded access for inspection and/or copying of such Bid Proposals, by request made to the District in conformity with the California Access to Public Records Act, California Government Code §§6250, et. seq. If the District is required to defend or otherwise respond to any action or proceeding wherein request is made for the disclosure of the contents of any portion of a Bid Proposal deemed exempt from disclosure hereunder, the Bidder submitting the materials sought by such action or proceeding agrees to defend, indemnify and hold harmless the District in any action or proceeding from and against any liability, including without limitation attorneys' fees arising therefrom. The party submitting materials sought by any other party shall be solely responsible for the cost and defense in any action or proceeding seeking to compel disclosure of such materials; the District's sole involvement in any such action shall be that of a stakeholder, retaining the requested materials until otherwise ordered by a court of competent jurisdiction.

22. Drug Free Workplace Certificate. In accordance with California Government Code §§8350 et seq., the Drug Free Workplace Act of 1990, the successful Bidder will be required to execute a Drug Free Workplace Certificate concurrently with execution of the Agreement. The successful Bidder will be required to implement and take the affirmative measures outlined in the Drug Free Workplace Certificate and in California Government Code §§8350 et seq. Failure of the successful Bidder to comply with the measures outlined in the Drug Free Workplace Certificate and in California Government Code §§8350 et seq. may result in penalties, including without limitation, the termination of the Agreement, the suspension of any payment of the Contract Price otherwise due under the Contract Documents and/or debarment of the successful Bidder.

23. Compliance with Immigration Reform and Control Act of 1986. The Bidder is solely and exclusively responsible for employment of individuals for the Work of the Contract in conformity with the Immigration Reform and Control Act of 1986, 8 USC §§1101 et seq. (the "IRCA"); the successful Bidder shall also require that any person or entity employing labor in connection with any of the Work of the Contract shall so similarly comply with the IRCA.

24. Notice of Intent to Award Contract. Following the public opening and reading of Bid Proposals, the District will issue a Notice of Intent to Award the Contract, identifying the Bidder to whom the District intends to award the Contract and the date/time/place of the District's Board of Trustees meeting at which award of the Contract will be considered.

25. Bid Protest. Any Bidder submitting a Bid Proposal to the District may file a protest of the District's intent to award the Contract provided that each and all of the following are complied with:

(i) The bid protest is in writing;

(ii) The bid protest is filed and received by the District's Vice Chancellor, Administrative Services not more than five (5) calendar days following the date of issuance of the District's Notice of Intent to Award the Contract; and

(iii) The written bid protest sets forth, in detail, all grounds for the bid protest, including without limitation all facts, supporting documentation, legal authorities and argument in support of the grounds for the bid protest; any matters not set forth in the written bid protest shall be deemed waived. All factual contentions must be supported by competent, admissible and creditable evidence.

Any bid protest not conforming with the foregoing shall be rejected by the District as invalid. Provided that a bid protest is filed in strict conformity with the foregoing, the District's Vice Chancellor, Administrative Services or such individual(s) as may be designated by him/her, shall review and

evaluate the basis of the bid protest. Either the District's Vice Chancellor, Administrative Services or other individual designated by him/her shall provide the bidder submitting the bid protest with a written statement concurring with or denying the bid protest. The District's Board of Trustees will render a final determination and disposition of a bid protest by taking action to adopt, modify or reject the disposition of a bid protest as reflected in the written statement of the District's Vice Chancellor, Administrative Services or his/her designee. Action by the District's Board of Trustees relative to a bid protest shall be final and not subject to appeal or reconsideration by the District's Vice Chancellor, Administrative Services any other employee or officer of the District or the District's Board of Trustees. The rendition of a written statement by the District's Vice Chancellor, Administrative Services (or his/her designee) and action by the District's Board of Trustees to adopt, modify or reject the disposition of the bid protest reflected in such written statement shall be express conditions precedent to the institution of any legal or equitable proceedings relative to the bidding process, the District's intent to award the Contract, the District's disposition of any bid protest or the District's decision to reject all Bid Proposals. In the event that any such legal or equitable proceedings are instituted and the District is named as a party thereto, the prevailing party(ies) shall recover from the other party(ies), as costs, all attorneys' fees and costs incurred in connection with any such proceeding, including any appeal arising therefrom.

END SECTION

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SUBCONTRACTORS LIST

Bidder: _____

Address: Telephone: _____

Telecopier: _____

Bidder's Authorized Representative(s): _____

PROJECT: MPOE Replacement Bldg 300, Learning Skills Testing Relocation Bldg 100

NAME OF SUBCONTRACTOR	BUSINESS LOCATION/ ADDRESS OF SUBCONTRACTOR	TRADE OR PORTION OF THE WORK

PHOTOCOPY THIS PAGE AS NECESSARY TO LIST ADDITIONAL SUBCONTRACTORS

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NON-COLLUSION AFFIDAVIT

STATE OF CALIFORNIA)
COUNTY OF_____)

PROJECT: **MPOE Replacement – Bldg 300, Learning Skills Testing Relocation – Bldg 100**

I,_____, being first duly sworn, deposes and says that I am
(Typed or Printed Name)
the_____ of_____, the party submitting
(Title) (Bidder Name)
the foregoing Bid Proposal ("the Bidder"). In connection with the foregoing Bid Proposal, the undersigned declares, states and certifies that:

1. The Bid Proposal is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization or corporation.
2. The Bid Proposal is genuine and not collusive or sham.
3. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any other bidder or anyone else to put in sham bid, or to refrain from bidding.
4. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price, or that of any other bidder, or to fix any overhead, profit or cost element of the bid price or that of any other bidder, or to secure any advantage against the public body awarding the contract or of anyone interested in the proposed contract.
5. All statements contained in the Bid Proposal and related documents are true.
6. The bidder has not, directly or indirectly, submitted the bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any person, corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

Executed this____ day of_____, 20 at_____.
(City, County and State)

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

_____
Signature

_____
Name Printed or Typed

(Address)

(City, County and State)

(_____)_____
(Area Code and Telephone Number)

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STATEMENT OF BIDDER'S QUALIFICATIONS

1. Bidder's Organization

1.1 Form of entity of Bidder, i.e., corporation, partnership, etc. _____

1.1.1 If a corporation, state the following:
State of incorporation: _____

Date of incorporation: _____

President/Chief Executive Officer: _____

Secretary: _____

Treasurer/Chief Financial Officer: _____

1.1.2 If a partnership, state the following:
Type of partnership, i.e., general partnership, limited partnership: _____

_____

Names of all general partners, if any of the general partners are not natural persons, provide the information for each such general partner requested by Paragraphs 1.1.1, 1.1.2 and 1.1.4 as appropriate: _____

_____

_____

1.1.3 If a proprietorship, state the names of all proprietors: _____

_____

_____

_____

_____

1.1.4 If a joint venture, state the following

Date of organization: _____

Names of all joint venture members. For each member of the joint venture, provide the information requested by Paragraphs 1.1.1, 1.1.2 and 1.1.3 for each joint venture member, as applicable: _____

_____

_____

_____

_____

1.2 Number of years your organization has been in business as a contractor: _____

1.3 Number of years your organization has conducted business under its present name: _____

1.4 If your organization has conducted business under a name or name style different than your organization's present name, identify all prior name(s) or name style(s):

_____

_____

1.5 Your organization's Federal Tax Identification Number: _____

2. Licensing

2.1 California Contractors License: Number: _____
Expiration Date: _____
Responsible Managing Employee/Officer: _____
License Classification(s): _____

2.2 Has a claim or other demand ever been made against your organization's California Contractors License Bond? _____Yes _____No
If yes, on a separate attachment, state the following: (i) the name, address and telephone number of each person or entity making claim or demand; (ii) the date of each claim or demand; (iii) the circumstances giving rise to each such claim or demand; and (iv) the disposition of each such claim or demand.

2.3 Has a complaint ever been filed against your organization's California Contractors License with the California Contractors State License Board?_____Yes_____No
If yes, on a separate attachment, state the following for each complaint: (i) the name, address and telephone number of each person or entity making the complaint; (ii) the date of each complaint; (iii) the circumstances giving rise to each such complaint; and (iv) the disposition of each such complaint, including without limitation, any disciplinary or other action imposed or taken by the California Contractors State License Board as a result of any such complaint.

3. Experience

3.1 Categories of work (other than management/supervision) your organization typically performs with your own forces _____
_____
_____
_____

3.2 On a separate attachment, list all construction project completed by your organization in the past two (2) years and for each project identified, state: (i) a general description of the work performed by your organization on the project; (ii) the dollar value of the work performed or to be performed by your organization; (iii) the project owner's name, name of the project owner's representative and the address and telephone number of the owner and the project owner's representative; and (iv) the project architect's name, address, telephone number and contact person.

3.3 On a separate attachment, list all construction project your organization has in progress and for each project listed, state: (i) a general description of the work performed by your organization on the project; (ii) the dollar value of the work performed or to be performed by your organization; (iii) the project owner's name, name of the project owner's representative and the address and telephone number of the project owner and the project owner's representative; (iv) the project architect's name, address, telephone number and contact person; (v) percent presently complete; and (vi) the current scheduled completion date.

4. Performance History

4.1 Claims and lawsuits (if you answer yes to any of the following, you must attach details).

4.1.1 Have any lawsuits or other administrative, legal, arbitration or other proceedings, ever been brought or commenced against your organization or any of its principals, officers or equity owners in connection with any construction contract or construction project? Yes No
If so, describe the circumstances, the amount demanded or other relief demand and the disposition of each such lawsuit or other proceeding.

4.1.2 Has your organization ever filed a lawsuit or commenced other administrative, legal or other proceedings in connection with any construction contract or construction project? Yes No
If so, describe the circumstances, the amount demanded or other relief demand and the disposition of each such lawsuit or other proceeding.

4.1.3 Are there any judgements, orders, decrees or arbitration awards pending, outstanding against your organization or any of the officers, directors, employees or principals of your organization? Yes No
If so, describe each such judgement, order, decree or arbitration award and the present status of the satisfaction or discharge thereof.

4.2 Has your organization ever refused to sign a construction contract awarded to it?
__ Yes No
If so, on a separate attachment, state the following: (i) describe each such contract; (ii) the owner's name, address, telephone number and contact person; and (iii) the circumstances of your refusal to sign such contract.

4.3 Has your organization ever failed to complete a construction contract? Yes No
If so, on a separate attachment, state the following: (i) describe each such contract; (ii) the owner's name, address, telephone number and contact person; and (iii) the circumstances of your failure to complete such contract.

4.4 Has your organization ever been declared in default of a construction contract?
_____ Yes ____No
If so, on a separate attachment, state the following: (i) describe each such contract; (ii) the owner's name, address, telephone number and contact person; and (iii) the circumstances of each such declaration of default.

4.5 Has any construction contract to which your organization is a party been terminated for the convenience of the project owner?____Yes____No
If so, identify the project and project owner along with a description of the circumstances under which the convenience termination occurred.

4.6 Has a claim or other demand ever been asserted against any Bid Bond, Performance Bond, or Payment Bond posted by your organization in connection with any construction contract or your submittal of a bid proposal for a construction contract?
_____ Yes_____No
If so, on a separate attachment, state the following: (i) the name, address, telephone number and contact person for each claimant; (ii) the date upon which

each such demand or claim was made; and (iii) the disposition of each such demand or claim.

4.7 Has your organization or any predecessor to your organization been charged with a violation of the California False Claims Act or similar federal statute within the past ten (10) years?

_____ Yes ____No

If yes, on a separate attachment, provide the following: (i) a detailed description of the circumstances upon which charges were based; (ii) the public agency involved, including name, address, telephone and email address of contact person(s) at such public agency; and (iii) disposition of such charges.

4.8 Has any individual or entity who owns ten percent (10%) or more of the equity interest of your organization been an equity owner of ten percent (10%) or more of the equity interest of any other entity or organization, within the past ten (10) years, which has been charged with a violation of the California False Claims Act or similar federal statute within the past ten (10) years?

_____ Yes ____No

If yes, on a separate attachment, provide the following: (i) the name(s) of each such other entity or organization; (ii) a detailed description of the circumstances upon which charges were based; (iii) the public agency involved, including name, address, telephone and email address of contact person(s) at such public agency; and (iv) disposition of such charges.

4.9 Has any individual or entity who owns ten percent (10%) or more of the equity interest of your organization been charged with a violation of the California False Claims Act or similar federal statute within the past ten (10) years?

_____ Yes ____No

If yes, on a separate attachment, provide the following: (i) the name of such individual(s) or entity(ies); (ii) a detailed description of the circumstances upon which charges were based; (iii) the public agency involved, including name, address, telephone and email address of contact person(s) at such public agency; and (iv) disposition of such charges.

5. References (Include name, contact person, telephone/telecopier and address for each reference provided):

5.1 Trade References (three (3) minimum)

_____

_____

_____

5.2 Bank References

_____

_____

_____

5.3 Public Works Inspectors of Record (K-12 or community college project)

_____

_____

_____

_____

5.4 Owner references (three (3) minimum, preferably California K-12 school districts and/or California community college districts)

_____

_____

_____

_____

_____

_____

_____

6. Accuracy and Authority

The undersigned is duly authorized to execute this Statement of Bidders Qualifications under penalty of perjury on behalf of the Bidder. The undersigned warrants and represents that he/she has personal knowledge of each of the responses to this Statement of Bidder's Qualifications and/or that he/she has conducted all necessary and appropriate inquiries to determine the truth, completeness and accuracy of responses to this Statement of Bidder's Qualifications.

The undersigned declares and certifies that the responses to this Statement of Bidder's Qualifications are complete and accurate; there are no omissions of material fact or information that render any response to be false or misleading and there are no misstatements of fact in any of the responses.

Executed this day of _____ 20 at _____
(City and State)

I declare under penalty of perjury under California law that the foregoing is true and correct.

_____
(Signature)

_____
(Typed or written name)

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BID BOND

KNOW ALL MEN BY THESE PRESENTS that we,_____, as Surety and_____, as Principal, are jointly and severally, along with their respective heirs, executors, administrators, successors and assigns, held and firmly bound unto **CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT**, hereinafter "the Obligee," for payment of the penal sum hereof in lawful money of the United States, as more particularly set forth herein.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

WHEREAS, the Principal has submitted the accompanying Bid Proposal to the Obligee for the Work commonly described as the **MPOE Replacement Bldg 300, Learning Skills Testing Relocation Bldg 100**

WHEREAS, subject to the terms of this Bond, the Surety is firmly bound unto the Obligee in the penal sum of **ten percent (10%)** of the maximum amount of the Bid Proposal submitted by the Principal to the Obligee, as set forth above.

NOW THEREFORE, if the Principal shall not withdraw said Bid Proposal within the period specified therein after the opening of the same, or, if no period be specified, for sixty (60) days after opening of said Bid Proposal; and if the Principal is awarded the Contract, and shall within the period specified therefor, or if no period be specified, within five (5) days after the prescribed forms are presented to him for signature, enter into a written contract with the Obligee, in accordance with the Bid Proposal as accepted and give such bond(s) with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such Contract and for the payment for labor and materials used for the performance of the Contract, or in the event of the withdrawal of said Bid Proposal within the period specified for the holding open of the Bid Proposal or the failure of the Principal to enter into such Contract and give such bonds within the time specified, if the Principal shall pay the Obligee the difference between the amount specified in said Bid Proposal and the amount for which the Obligee may procure the required Work and/or supplies, if the latter amount be in excess of the former, together with all costs incurred by the Obligee in again calling for Bids, then the above obligation shall be void and of no effect, otherwise to remain in full force and effect.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or the Call for Bids, the Work to be performed thereunder, the Drawings or the Specifications accompanying the same, or any other portion of the Contract Documents shall in no way affect its obligations under this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of said Contract, the Call for Bids, the Work, the Drawings or the Specifications, or any other portion of the Contract Documents.

In the event suit or other proceeding is brought upon this Bond by the Obligee, the Surety shall pay to the Obligee all costs, expenses and fees incurred by the Obligee in connection therewith, including without limitation, attorneys fees.

IN WITNESS WHEREOF, the Principal and Surety have executed this instrument this _____ day of_____, 20 by their duly authorized agents or representatives.

(Principal's Corporate Seal)

_____
(Principal Name)

By:_____

_____
(Typed or Printed Name)

Title: _____

(Surety's Corporate Seal)

_____
(Surety Name)

By:_____
(Signature of Surety)

(Attach Attorney-in-Fact Certificate)

_____
(Typed or Printed Name)

( ) _____
(Area Code and Telephone Number of Attorney-in-Fact for Surety)

Contact name, address, telephone number and email address for notices to the Surety

_____
(Contact Name)

_____
(Address)

_____
(Telephone)

_____
(Email address)

CERTIFICATION OF PRE-BID SITE VISIT

The Honorable Board of Trustees
Chabot-Las Positas Community College District
5020 Franklin Drive
Pleasanton, California 94588

RE: **BID NO. B19/20-12: MPOE Replacement Bldg 300, Learning Skills Testing Relocation Bldg 100**

Ladies and Gentlemen:

In connection with submitting a Bid Proposal for the Work described as **MPOE Replacement Bldg 300, Learning Skills Testing Relocation Bldg 100**, I visited the Site of the Work on ,__/ _____on behalf of
Date A.M. P.M.

_____
Bidder Name

to inspect the Site of the proposed work, which will be turned over to the Bidder, if awarded the Contract, in its present condition, with a representative of the Chabot-Las Positas Community College, in order to acquaint the Bidder with the proposed Work so that the Bidder fully understands the facilities, difficulties, and restrictions attendant to execution and completion of the Work. I have also reviewed on behalf of the Bidder, the as-built drawings and/or previous Contract Documents, site conditions and Bid Documents with:_____,_____College.

I certify all conditions provided for my review and their effect on the Work as called for in the Contract Documents are included and accounted for in the Bid Proposal amounts submitted to the District.

I understand that a Bidder who fails to submit this Certification of Pre-Bid Site Visit, fully executed, with the Bidder's Bid Proposal form, will result in rejection of the Bid Proposal for non-responsiveness..

_____
Name of Bidder

_____
Authorized Signatory

_____
Address

_____

_____

_____
Phone Number

_____
Date

[END OF SECTION]

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BID PROPOSAL

TO: **CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT**, a California Community College District, acting by and through its Board of Trustees ("the District").

FROM: _____
(Name of Bidder)

_____
(Address)

_____
(City, State, Zip Code)

_____
(Telephone/Telecopier)

_____
(E-Mail Address of Bidder's Representative(s))

_____
(Name(s) of Bidder's Authorized Representative(s))

1. Bid Proposal

1.1 Bid Proposal Amount. The undersigned Bidder proposes and agrees to perform the Contract including, without limitation, providing and furnishing any and all of the labor, materials, tools, equipment and services necessary to complete in a workmanlike manner all of the Work and other obligations required by the Contract Documents for the sum of _____ Dollars ($_____). The Bidder confirms that it has checked all of the above figures and understands that neither the District nor any of its agents, employees or representatives shall be responsible for any errors or omissions on the part of the undersigned Bidder in preparing and submitting this Bid Prop/osal.

1.2 Acknowledgment of Bid Addenda. The Bidder confirms that this Bid Proposal incorporates and is inclusive of, all items or other matters contained in Bid Addenda issued by or on behalf of the District.

_____ **Addenda Nos.**_____received, acknowledged
(initial) and incorporated into this Bid Proposal.

1.3 Alternate Bid Items. The Bidder's price proposal(s) for Alternate Bid Items is set forth in the form of Attachment A Alternate Bid Item Proposal included herewith. Price proposal(s) for Alternate Bid Item(s) will not form the basis for the District's award of the Contract for the above-identified Bid Package unless an Alternate Bid Item is incorporated into the scope of Work of the Contract.

2. Documents Accompanying Bid. The Bidder has submitted with this Bid Proposal the following: (a) Bid Security; (b) Subcontractors List; (c) Statement of Qualifications; (d) Certification of Pre-Bid Site Visit; and (e) Non-Collusion Affidavit. The Bidder acknowledges that if this Bid Proposal and the foregoing documents are not fully in compliance with applicable requirements set forth in the

Call for Bids, the Instructions for Bidders and in each of the foregoing documents, the Bid Proposal may be rejected as non-responsive.

3. **Award of Contract.** If the Bidder submitting this Bid Proposal is awarded the Contract, the undersigned will execute and deliver to the District the Contract in the form attached hereto within five (5) days after notification of award of the Contract. Concurrently with delivery of the executed Agreement to the District, the Bidder awarded the Contract shall deliver to the District: (a) Certificates of Insurance evidencing all insurance coverages required under the Contract Documents; (b) the Performance Bond; (c) the Labor and Material Payment Bond; (d) the Certificate of Workers' Compensation Insurance; and (e) the Drug-Free Workplace Certificate. Failure of the Bidder awarded the Contract to strictly comply with the preceding may result in the District's rescission of the award of the Contract and/or forfeiture of the Bidder's Bid Security. In such event, the District may, in its sole and exclusive discretion elect to award the Contract to the responsible Bidder submitting the next lowest Bid Proposal, or to reject all Bid Proposals.

4. **Contractor's License.** The undersigned Bidder is currently and duly licensed in accordance with the California Contractors License Law, California Business & Professions Code §§7000 et seq., under the following classification(s) bearing License Number(s)_____, with expiration date(s) of_____. The Bidder certifies that: (a) it is duly licensed, in the necessary class(es), for performing the Work of the Contract Documents; (b) that such license shall be in full force and effect throughout the duration of the performance of the Work under the Contract Documents; and (c) that all Subcontractors providing or performing any portion of the Work shall be so properly licensed to perform or provide such portion of the Work.

5. **Acknowledgment and Confirmation.** The undersigned Bidder acknowledges its receipt, review and understanding of the Drawings, the Specifications and other Contract Documents pertaining to the proposed Work. The undersigned Bidder certifies that the Contract Documents are, in its opinion, adequate, feasible and complete for providing, performing and constructing the Work in a sound and suitable manner for the use specified and intended by the Contract Documents. The undersigned Bidder certifies that it has, or has available, all necessary equipment, personnel, materials, facilities and technical and financial ability to complete the Work for the amount bid herein within the Contract Time and in accordance with the Contract Documents.

By: _____
(Signature)

(Corporate Seal)

_____
(Typed or Printed Name)

Title: _____

ATTACHMENT A
ALTERNATE BID ITEM PROPOSAL

Bidders must provide a proposal price for each Additive Bid Items, set forth herein; failure to do so will result in rejection of the Bid Proposal for non-responsiveness.

ADDITIVE BID ITEM NO.

ITEM	ADDITIVE ALTERNATES	$ VALUE
Additive Bid Item No.1		

[END OF SECTION]

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AGREEMENT

THIS AGREEMENT is made this day of_____, 20 , in the City of Pleasanton, County of Alameda, State of California, by and between **CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT**, a California Community College District hereinafter "District" and _____ ("Contractor").

WITNESSETH, that the District and the Contractor in consideration of the mutual covenants contained herein agree as follows:

1. **The Work.** Within the Contract Time and for the Contract Price, subject to adjustments thereto pursuant to the Contract Documents, the Contractor shall perform and provide all necessary labor, materials, tools, equipment, utilities, services and transportation to complete in a workmanlike manner all of the Work required in connection with the work of improvement commonly referred to as **MPOE Replacement Bldg 300, Learning Skills Testing Relocation Bldg 100**. Contractor shall complete all Work covered by the Contract Documents, including without limitation, the Drawings and Specifications prepared by the Architect, and other Contract Documents enumerated in Article 5 below, along with all modifications and addenda thereto issued in accordance with the Contract Documents.

2. **Contract Time.** The Work shall be commenced on the date stated in the District's Notice to Proceed; the Contractor shall achieve Substantial Completion of the Work within the Contract Time set forth in the Contract Documents.

3. **Contract Price.** The District shall pay the Contractor as full consideration for the Contractor's full, complete and faithful performance of the Contractor's obligations under the Contract Documents, subject to adjustments of the Contract Price in accordance with the Contract Documents, the Contract Price of _____ Dollars **($_____)**. The Contract Price is based upon the Contractor's Base Bid Proposal and the following Alternate Bid Items, if any:

The District's payment of the Contract Price shall be in accordance with the Contract Documents.

4. **Liquidated Damages.** If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, including adjustments thereto authorized by the Contract Documents, the Contractor shall be subject to assessment of Liquidated Damages in accordance with the Contract Documents. Failure of the Contractor to complete Punchlist items noted upon Substantial Completion within the time established to complete the Punchlist items will result in the District's assessment of Liquidated Damages in accordance with the Contract Documents.

5. **The Contract Documents.** The documents forming a part of the Contract Documents consist of the following, all of which are component parts of the Contract Documents.

//

Notice to Contractors Calling For Bids	Bid Bond
Instructions For Bidders	Bid Addenda Nos. _____
Bid Proposal	Agreement
Subcontractors List	Performance Bond
Non-Collusion Affidavit	Labor and Materials Payment Bond
Statement of Bidder's Qualifications	Drug-Free Workplace Certification

Certificate of Workers Compensation Insurance
General Conditions
Special Conditions
Change Order Form
Asbestos and Other Hazardous Materials Certification
Debris Recycling Statement
Certification of Pre-Bid Site Visit
Guarantee
Specifications
Drawings

6. Authority to Execute. The individual(s) executing this Agreement on behalf of the Contractor is/are duly and fully authorized to execute this Agreement on behalf of Contractor and to bind the Contractor to each and every term, condition and covenant of the Contract Documents.

CONTRACTORS ARE REQUIRED BY LAW TO BE LICENSED AND REGULATED BY THE CONTRACTORS' STATE LICENSE BOARD. ANY QUESTIONS CONCERNING A CONTRACTOR MAY BE REFERRED TO THE REGISTRAR, CONTRACTORS' STATE LICENSE BOARD, P.O. BOX 2600, SACRAMENTO, CALIFORNIA 95826

IN WITNESS WHEREOF, this Agreement has been duly executed by the District and the Contractor as of the date set forth above.

"DISTRICT" **CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT**	**"CONTRACTOR"** **[CONTRACTOR NAME]**
By: _____	By: _____
Print Name: _____	Print Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS that we,_____, as Principal, and _____ as Surety, are held and firmly bound unto **CHABOT- LAS POSITAS COMMUNITY COLLEGE DISTRICT** hereinafter "the Obligee", in the penal sum of _____ Dollars ($_____) in lawful money of the United States, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

WHEREAS, the Obligee, by resolution of its Board of Trustees has awarded to the Principal a Contract for the Work described as **MPOE Replacement Bldg 300, Learning Skills Testing Relocation Bldg 100.**

WHEREAS, the Principal, has entered into an agreement with the Obligee for performance of the Work; the Agreement and all other Contract Documents set forth therein are incorporated herein and made a part hereof by this reference.

WHEREAS, by the terms of the Contract Documents, the Principal is required to furnish a bond ensuring the Principal's prompt, full and faithful performance of the Work of the Contract Documents.

NOW THEREFORE, if the Principal shall promptly, fully and faithfully perform each and all of the obligations and things to be done and performed by the Principal in strict accordance with the terms of the Contract Documents as they may be modified or amended from time to time; and if the Principal shall indemnify and save harmless the Obligee and all of its officers, agents and employees from any and all losses, liability and damages, claims, judgments, liens, costs, and fees of every description, which may be incurred by the Obligee by reason of the failure or default on the part of the Principal in the performance of any or all of the terms or the obligations of the Contract Documents, including all modifications, and amendments, thereto, and any warranties or guarantees required thereunder; then this obligation shall be void; otherwise, it shall be, and remain, in full force and effect.

The Surety, for value received, hereby stipulates and agrees that no change, adjustment of the Contract Time, adjustment of the Contract Price, alterations, deletions, additions, or any other modifications to the terms of the Contract Documents, the Work to be performed thereunder, or to the Specifications or the Drawings shall limit, restrict or otherwise impair Surety's obligations or Obligee's rights hereunder; Surety hereby waives notice from the Obligee of any such changes, adjustments of Contract Time, adjustments of Contract Price, alterations, deletions, additions or other modifications to the Contract Documents, the Work to be performed under the Contract Documents, or the Drawings or the Specifications.

In the event of the Obligee's termination of the Contract due to the Principal's breach or default of the Contract Documents, within twenty (20) days after written notice from the Obligee to the Surety of the Principal's breach or default of the Contract Documents and Obligee's termination of the Contract, the Surety shall notify Obligee in writing of Surety's assumption of obligations hereunder by its election to either remedy the default or breach of the Principal or to take charge of the Work of the Contract Documents and complete the Work at its own expense ("the Notice of Election"); provided, however, that the procedure by which the Surety undertakes to discharge its obligations under this Bond shall be subject to the advance written approval of the Obligee, which approval shall not be unreasonably withheld, limited or restricted. The insolvency of the Principal or the Principal's mere denial of a failure of

performance or default under the Contract Documents shall not by itself, without the Surety's prompt, diligent inquiry and investigation of such denial, be justification for Surety's failure to give the Notice of Election or for its failure to promptly remedy the failure of performance or default of the Principal or to complete the Work.

In the event the Surety shall fail to issue its Notice of Election to Obligee within the time provided for hereinabove, the Obligee may thereafter cause the cure or remedy of the Principal's failure of performance or default or to complete the Work. The Principal and the Surety shall be each jointly and severally liable to the Obligee for all damages and costs sustained by the Obligee as a result of the Principal's failure of performance under the Contract Documents or default in its performance of obligations thereunder, including without limitation the costs of cure or completion exceeding the then remaining balance of the Contract Price; provided that the Surety's liability hereunder for the costs of performance, damages and other costs sustained by the Obligee upon the Principal's failure of performance under or default under the Contract Documents shall be limited to the penal sum hereof, which shall be deemed to include the costs or value of any Changes to the Work which increases the Contract Price.

In the event suit or other proceeding is brought upon this Bond by the Obligee, the Surety shall pay to the Obligee all costs, expenses and fees incurred by the Obligee therewith, including without limitation, attorneys fees.

IN WITNESS WHEREOF, the Principal and Surety have executed this instrument this_____day of _____, 20 by their duly authorized agent or representative.

(Principal's Corporate Seal)

_____
(Principal Name)

By:_____

_____
(Typed or Printed Name)

Title: _____

(Surety's Corporate Seal)

_____
(Surety Name)

By:_____
(Signature of Attorney-in-Fact for Surety)

(Attach Attorney-in-Fact Certificate)

_____
(Typed or Printed Name)

( ) _____
(Area Code and Telephone Number of Attorney-in-Fact for Surety)

Contact name, address, telephone number and email address for notices to the Surety

_____
(Contact Name)

_____
(Address)

_____
(Telephone)

_____
(Email address)

[END OF SECTION]

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LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS that we, _____ as Principal, and _____ as Surety, are held and firmly bound unto **CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT** hereinafter "the Obligee", in the penal sum of _____ Dollars ($_____) in lawful money of the United States, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

WHEREAS, the Obligee, by resolution of its Board of Trustees has awarded to the Principal a Contract for the Work described as **MPOE Replacement Bldg 300, Learning Skills Testing Relocation Bldg 100.**

WHEREAS, the Principal, has entered into an Agreement with the Obligee for performance of the Work, the Agreement and all other Contract Documents set forth therein are incorporated herein by this reference and made a part hereof.

WHEREAS, by the terms of the Contract Documents, the Principal is required to furnish a bond for the prompt, full and faithful payment to any Claimant, as hereinafter defined, for all labor materials or services used, or reasonably required for use, in the performance of the Work.

NOW THEREFORE, if the Principal shall promptly, fully and faithfully make payment to any Claimant for all labor, materials or services used or reasonably required for use in the performance of the Work then this obligation shall be void; otherwise, it shall be, and remain, in full force and effect.

The term "Claimant" shall refer to any person, corporation, partnership, proprietorship or other entity including without limitation, all persons and entities described in California Civil Code §3181, providing or furnishing labor, materials or services used or reasonably required for use in the performance of the Work under the Contract Documents, without regard for whether such labor, materials or services were sold, leased or rented. This Bond shall inure to the benefit of all Claimants so as to give them, or their assigns and successors, a right of action upon this Bond.

In the event suit is brought on this Bond by any Claimant for amounts due such Claimant for labor, materials or services provided or furnished by such Claimant, the Surety shall pay for the same and reasonable attorneys fees pursuant to California Civil Code §3250.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, deletion, addition, or any other modification to the terms of the Contract Documents, the Work to be performed thereunder, the Specifications or the Drawings, or any other portion of the Contract Documents, shall in any way limit, restrict or otherwise affect its obligations under this Bond; the Surety hereby waives notice from the Obligee of any such change, extension of time, alteration, deletion, addition or other modification to the Contract Documents, the Work to be performed under the Contract Documents, the Drawings or the Specifications of any other portion of the Contract Documents.

IN WITNESS WHEREOF, the Principal and Surety have executed this instrument this _____ day of_____, 20 by their duly authorized agent or representative.

(Principal's Corporate Seal)

_____
(Principal Name)

By:_____
(Signature)

_____
(Type or Print Name)

Title: _____

(Surety's Corporate Seal)

_____
(Surety Name)

By:_____
(Signature of Attorney-in-Fact for Surety)

(Attach Attorney-in-Fact Certificate)

_____
(Type or Print Name of Attorney-in-Fact)

( )_____
(Area Code and Telephone Number of Attorney-in-Fact for Surety)

Contact name, address, telephone number and email address for notices to the Surety

_____
(Contact Name)

_____
(Address)

_____
(Telephone)

_____
(Email address)

CERTIFICATE OF WORKERS' COMPENSATION INSURANCE

PROJECT: MPOE Replacement Bldg 300, Learning Skills Testing Relocation Bldg 100

I,_____ the _____ of
(Name) (Title)
_____, declare, state and certify that:
(Contractor Name)

1. I am aware that California Labor Code §3700(a) and (b) provides:

   "Every employer except the state shall secure the payment of compensation in one or more of the following ways:

   (a) By being insured against liability to pay compensation in one or more insurers duly authorized to write compensation insurance in this state.

   (b) By securing from the Director of Industrial Relations a certificate of consent to self-insure either as an individual employer, or one employer in a group of employers, which may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to his or her employees."

2. I am aware that the provisions of California Labor Code §3700 require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of this Contract.

_____
(Contractor Name)

By:_____
(Signature)

_____
(Typed or printed name)

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DRUG-FREE WORKPLACE CERTIFICATION

I,_____, am the_____of
(Print Name) (Title)

_____. I declare, state and certify to all of the following:
(Contractor Name).

1. I am aware of the provisions and requirements of California Government Code §§8350 et seq., the Drug Free Workplace Act of 1990.

2. I am authorized to certify, and do certify, on behalf of Contractor that a drug free workplace will be provided by Contractor by doing all of the following:

   A. Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited in Contractor's workplace and specifying actions which will be taken against employees for violation of the prohibition;

   B. Establishing a drug-free awareness program to inform employees about all of the following:

      i. The dangers of drug abuse in the workplace;

      ii. Contractor's policy of maintaining a drug-free workplace;

      iii. The availability of drug counseling, rehabilitation and employee-assistance programs; and

      iv. The penalties that may be imposed upon employees for drug abuse violations;

   C. Requiring that each employee engaged in the performance of the Contract be given a copy of the statement required by subdivision (A), above, and that as a condition of employment by Contractor in connection with the Work of the Contract, the employee agrees to abide by the terms of the statement.

   D. Contractor agrees to fulfill and discharge all of Contractor's obligations under the terms and requirements of California Government Code §8355 by, inter alia, publishing a statement notifying employees concerning: (a) the prohibition of any controlled substance in the workplace, (b) establishing a drug-free awareness program, and (c) requiring that each employee engaged in the performance of the Work of the Contract be given a copy of the statement required by California Government Code §8355(a) and requiring that the employee agree to abide by the terms of that statement.

3. Contractor and I understand that if the District determines that Contractor has either: (a) made a false certification herein, or (b) violated this certification by failing to carry out and to implement the requirements of California Government Code §§8355, the Contract awarded herein is subject to termination, suspension of payments, or both. Contractor and I further understand that, should Contractor violate the terms of the Drug-Free Workplace Act of 1990, Contractor may be subject

to debarment in accordance with the provisions of California Government Code §§8350, et seq.

4. Contractor and I acknowledge that Contractor and I are aware of the provisions of California Government Code §§8350, et seq. and hereby certify that Contractor and I will adhere to, fulfill, satisfy and discharge all provisions of and obligations under the Drug-Free Workplace Act of 1990.

I declare under penalty of perjury under the laws of the State of California that all of the foregoing is true and correct.

Executed at _____ this _____ day of
(City and State)
_____, 20____.

_____
(Signature)

_____
(Handwritten or Typed Name)

GENERAL CONDITIONS

GENERAL CONDITIONS
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Payments.

8.3.2 Initial Progress Payment Meeting.

8.3.3 District's Review of Applications for Progress Payments.

GENERAL CONDITIONS

ARTICLE 1: DEFINITIONS; GENERAL

1.1 District. The "District" refers to **CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT** and unless otherwise stated, includes the District's authorized representatives, including the Construction Manager, if a Construction Manager is designated, the District's Board of Trustees and the District's officers, employees, agents and representatives.

1.2 Contractor. The Contractor is the person or entity identified as such in the Agreement; references to "Contractor" include the Contractor's authorized representative.

1.3 Architect. The Architect is the person or entity identified as such in the Agreement; references to the "Architect" includes the Architect's authorized representative.

1.4 The Work. The "Work" is the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment or services provided or to be provided by the Contractor to fulfill the Contractor's obligations under the Contract Documents. The Work may constitute the whole or a part of the Project.

1.5 The Project. The Project is the total construction of which the Work performed by the Contractor under the Contract Documents which may be the whole or a part of the Project and which may include construction by the District or by separate contractors.

1.6 Surety. The Surety is the person or entity that executes, as surety, the Contractor's Labor and Material Payment Bond and/or Performance Bond.

1.7 Subcontractors; Sub-Subcontractors. A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work. "Subcontractor" does not include a separate contractor to the District or subcontractors of any separate contractor. A Sub-Subcontractor is a person or entity of any tier, who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site.

1.8 Material Supplier. A Material Supplier is any person or entity who only furnishes materials, equipment or supplies for the Work without fabricating, installing or consuming them in the Work.

1.9 Drawings and Specifications. The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing generally, the design, location and dimensions of the Work and may include without limitation, plans, elevations, sections, details, schedules or diagrams. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards, criteria and workmanship for the Work and related services. The Drawings and Specifications are intended to delineate and describe the Work and its component parts so as to permit skilled and competent contractors to bid upon the Work and prosecute the same to completion. Large scale Drawings shall take precedence over smaller scale Drawings as to shape and details of construction. Figured dimensions on Drawings shall govern, but Work which is not dimensioned shall be as directed or required by field conditions. Specifications shall govern as to materials, workmanship and installation procedures.

1.10 Special Conditions; Supplemental Conditions. If made a part of the Contract Documents, Special Conditions and Supplemental Conditions are special or supplemental provisions, not otherwise provided for in the Agreement or the General Conditions.

1.11 Contract Documents. The Contract Documents consist of the Agreement between the District and the Contractor, Conditions of the Contract (whether General, Special, Supplemental or otherwise), Drawings, Specifications, including addenda thereto issued prior to execution of the Agreement and any other documents listed in the Agreement. The Contract Documents shall include modifications issued after execution of the Agreement. The Contract Documents form the Contract for Construction.

1.12 Intent and Correlation of Contract Documents.

1.12.1 Work of the Contract Documents. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable therefrom as being necessary to produce the intended results. Organization of the Specifications into divisions, sections or articles, and the arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. Where any portion of the Contract Documents is silent and information appears elsewhere in the Contract Documents, such other portions of the Contract Documents shall control.

1.12.2 Technical Terms. Unless otherwise stated in the Contract Documents, words or terms which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.12.3 Conflict in Contract Documents. Conflicts, inconsistencies or ambiguities in the Contract Documents shall be resolved by the Architect in accordance with Article 3.1.9 of the General Conditions; where conflicts or inconsistencies arise between the Drawings and the Specifications, in resolving such conflicts or inconsistencies, the Architect will be governed generally by the following standards: the Drawings are intended to describe matters relating to placement, type, quantity and the like; the Specifications are intended to describe matters relating to quality, materials, compositions, manufacturers and the like. If conflicts exist between portions of the Contract Documents regarding the quality of any item, product, equipment or materials, unless otherwise directed or authorized by the District, the Contractor shall provide the item, product, equipment or material of the highest or more stringent quality.

1.13 Shop Drawings; Samples; Product Data ("Submittals"). Shop Drawings are diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-Subcontractor, manufacturer, Material Supplier, or distributor to illustrate some portion of the Work. Samples are physical examples of materials, equipment or workmanship forming a part of, or to be incorporated into the Work. Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work. Shop Drawings, Samples and Product Data prepared or furnished by the Contractor or any of its Subcontractors or Material Suppliers are collectively referred to as "Submittals".

1.14 Division of State Architect ("DSA"). The DSA is the California Division of the State Architect including without limitation the DSA's Office of Construction Services, Office of Design Services and the Office of Regulatory Services; references to the DSA in the Contract Documents shall mean the DSA, its offices and its authorized employees and agents. The authority of the DSA over the Work and the performance thereof shall be as set forth in the Contract Documents and Title 24 of the California Code of Regulations.

1.15 Project Inspector. The Project Inspector is the individual designated and employed by the District in accordance with the requirements of Title 24 of the California Code of Regulations. The Project Inspector shall be authorized to act on behalf of the District as provided for in the Contract Documents and in Title 24 of the California Code of Regulations, as the same may be amended from time to time.

1.16 Contract Document Terms. The term "provide" means "provide complete in place" or to "furnish and install" such item. Unless otherwise provided in the Contract Documents, the terms "approved;" "directed;" "satisfactory;" "accepted;" "acceptable;" "proper;" "required;" "necessary" and "equal" shall mean as approved, directed, satisfactory, accepted, acceptable, proper, required, necessary and equal, in the opinion of the Architect. The term "typical" as used in the Drawings shall require the installation or furnishing of such item(s) of the Work designated as "typical" in all other areas similarly marked as "typical"; Work in such other areas shall conform to that shown as "typical" or as reasonably inferable therefrom.

1.17 Contractor's Superintendent. The Contractor's Superintendent is the individual employed by the Contractor whose principal responsibility shall be the supervision and coordination of the Work; the Contractor's Superintendent shall not perform routine construction labor.

1.18 Record Drawings. The Record Drawings are a set of the Drawings marked by the Contractor during the performance of the Work to indicate completely and accurately the actual as-built condition of the Work. The Record Drawings shall be sufficient for a capable and qualified draftsman to modify the Drawings to reflect and indicate the Work actually in place at Final Completion of the Work.

1.19 Construction Manager. The Construction Manager is an independent contractor retained by the District and is authorized and empowered to act on behalf of the District as set forth in the Contract Documents. The District reserves the right to remove or replace the Construction Manager prior to completion of the Work without adjustment of the Contract Price or the Contract Time or otherwise affect, limit or restrict Contractor's obligations hereunder. The Construction Manager for the Work is **Craig Fernandez**.

1.20 Construction Equipment. "Construction Equipment" is equipment utilized for the performance of any portion of the Work, but which is not incorporated into the Work.

1.21 Site. The Site is the physical area designated in the Contract Documents for Contractor's performance, construction and installation of the Work.

1.22 Field Clarifications. A written or graphic document consisting of supplementary details, instructions or information issued on behalf of the District which clarifies or supplements the Contract Documents and which becomes a part of the Contract Documents upon issuance. Field Clarifications do not constitute an adjustment of the Contract Time or the Contract Price, unless a Change Order relating to a Field Clarification is authorized and issued under the Contract Documents.

1.23 Defective or Non-Conforming Work. Defective or non-conforming Work is any Work which is unsatisfactory, faulty or deficient by: (a) not conforming to the requirements of the Contract Documents; (b) not conforming to the standards of workmanship of the applicable trade or industry; (c) not being in compliance with the requirements of any inspection, reference, standard, test, or approval required by the Contract Documents; or (d) damage occurring prior to Final Completion of all of the Work.

1.24 Delivery. The term "delivery" used in conjunction with any equipment, materials or other items to be incorporated into the Work shall mean the unloading and storage in a protected condition pending incorporation into the Work.

1.25 Notice to Proceed. The Notice to Proceed is the written notice issued by or on behalf of the District to the Contractor authorizing the Contractor to proceed with commencement of the Work and which establishes the date for commencement of the Contract Time.

1.26 Progress Reports; Verified Reports. Progress Reports, if required, are written reports prepared by the Contractor and periodically submitted to the District in the form and content as required by the Contract Documents. Verified Reports are periodic written reports prepared by the Contractor and submitted to the DSA; Verified Reports shall be in such form and content as required by the applicable provisions of Title 24 of the California Code of Regulations. A material obligation of the Contractor is the preparation of complete and accurate Progress Reports, if required, and Verified Reports as well as the timely submission of the same.

ARTICLE 2: DISTRICT

2.1 Information Required of District.

2.1.1 Surveys; Site Information. Information, if any, concerning physical characteristics of the Site, including without limitation, surveys, soils reports, and utility locations, to be provided by the District are set forth in the Contract Documents. Information not provided by the District or necessary information in addition to that provided by the District concerning physical characteristics of the Site which is required shall be obtained by Contractor without adjustment to the Contract Price or the Contract Time.

2.1.2 Permits; Fees. Except as otherwise provided in the Contract Documents, the District shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities which relate to the Work of the Contractor under the Contract Documents. If permits and fees are designated as the responsibility of the Contractor under the Contract Documents, the Contractor shall be solely responsible for obtaining the same; the cost of such permits or fees and any costs incurred by the Contractor in obtaining such permits shall be included within the Contract Price.

2.1.3 Drawings and Specifications. Except as otherwise provided for in the Contract Documents, the District shall furnish the Contractor, free of charge, the number of copies of the Drawings and the Specifications as set forth in the Special Conditions. All of the Drawings and the Specifications provided by the District to the Contractor remain the property of the District; the Contractor shall not use the Drawings or the Specifications in connection with any other work of improvement other than the Work of the Project.

2.1.4 Furnishing of Information. Information or services to be provided by the District under

the Contract Documents shall be furnished by the District with reasonable promptness to avoid delay in the orderly progress of the Work. Information about existing conditions furnished by the District under the Contract Documents is obtained from sources believed to be reliable, but the District neither guarantees or warrants that such information is complete and accurate. The Contractor shall verify all information provided by the District. To the extent that the Contract Documents depict existing conditions on or about the Site, or the Work involves the renovation, removal or remodeling of existing improvements, or the Work involves any tie-in or other connection with any existing improvements, the conditions and/or existing improvements depicted in the Contract Documents are as they are believed to exist. Contractor shall bear the risk of any variations between conditions or existing improvements depicted in the Contract Documents and those conditions or existing improvements actually encountered in the performance of the Work. Subject to the provisions of Article 4.2.3, the existence of any variations between conditions or existing improvements depicted in the Contract Documents and those actually encountered in the performance of the Work shall not result in any District liability therefor, nor shall any such variations result in an adjustment of the Contract Time or the Contract Price.

2.2 District's Right to Stop the Work. In addition to the District's right to suspend the Work or terminate the Contract pursuant to the Contract Documents, the District, may, by written order, direct the Contractor to stop the Work, or any portion thereof, until the cause for such stop work order has been eliminated if the Contractor: (i) fails to correct Work which is not in conformity and in accordance with the requirements of the Contract Documents, or (ii) otherwise fails to carry out the Work in conformity and accordance with the Contract Documents. The right of the District to stop the Work hereunder shall not be deemed a duty on the part of the District to exercise such right for the benefit of the Contractor or any other person or entity, nor shall the District's exercise of such right waive or limit the exercise of any other right or remedy of the District under the Contract Documents or at law.

2.3 Partial Occupancy or Use.

2.3.1 District's Right to Partial Occupancy. The District may occupy or use any completed or partially completed portion of the Work, provided that: (i) the District has obtained the consent of, or is otherwise authorized by, public authorities with jurisdiction thereof, to so occupy or use such portion of the Work and (ii) the District and the Contractor have accepted, in writing, the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, utilities, damage to the Work, insurance and the period for correction of the Work and commencement of warranties required by the Contract Documents for such portion of the Work partially used or occupied by the District. If the Contractor and the District are unable to agree upon the matters set forth in (ii) above, the District may nevertheless use or occupy any portion of the Work, with the responsibility for such matters subject to resolution in accordance with the Contract Documents. Immediately prior to such partial occupancy or use of the Work, or portions thereof, the District, the Project Inspector, the Contractor and the Architect shall jointly inspect the portions of the Work to be occupied or to be used to determine and record the condition of the Work. Repairs, replacements or other corrective action noted in such inspection shall be promptly performed and completed by the Contractor so that the portion of the Work to be occupied or used by the District is in conformity with the requirements of the Contract Documents and the District's occupancy or use thereof is not impaired. The District's use or occupancy of the Work or portions thereof pursuant to the preceding shall not be deemed "completion" of the Work as that term is used in Public Contract Code §7107.

2.3.2 No Acceptance of Defective or Nonconforming Work. Unless otherwise expressly agreed upon by the District and the Contractor, the District's partial occupancy or use of the Work or any portion thereof, shall not constitute the District's acceptance of the Work not complying with the requirements of the Contract Documents or which is otherwise defective.

2.4 The Project Inspector. In addition to the authority and rights of the Project Inspector as provided for elsewhere in the Contract Documents, all of the Work shall be performed under the observation of the Project Inspector. The performance of the duties of the Project Inspector under the Contract Documents shall not relieve or limit the Contractor's performance of its obligations under the Contract Documents.

2.4.1 Access to Work. The Contractor shall provide the Project Inspector with access to all parts of the Work at any time, wherever located and whether partially or completely fabricated, manufactured, furnished or installed. The Project Inspector shall have the authority to stop Work if the Work is not in conformity with the Contract Documents.

2.4.2 Limitations on Project Inspector. The Project Inspector does not have authority to interpret the Contract Documents or to modify the Work depicted in the Contract Documents. No Work inconsistent with the Contract Documents shall be performed solely on the basis of the direction of the Project Inspector, and the Contractor shall be liable to the District for the consequences of all Work performed on such basis.

ARTICLE 3: ARCHITECT; CONSTRUCTION MANAGER

3.1 Administration of the Contract.

3.1.1 Role of the Architect and Construction Manager. The Architect and the Construction Manager will provide administration of the Contract as described in the Contract Documents, and will be the District's representatives during construction until the time that Final Payment is due the Contractor under the Contract Documents. The Architect and Construction Manager will advise and consult with the District and the Project Inspector with respect to the administration of the Contract and the Work. The Architect is authorized to act on behalf of the District to the extent provided for in the Contract Documents; and shall have the responsibilities and powers established by law, including Title 24 of the California Code of Regulations. The Architect and Construction Manager are authorized to stop the Work whenever deemed necessary in the sole discretion of the Architect or the Construction Manager to insure that the Work is completed in accordance with the Contract Documents.

3.1.2 Architect's Periodic Site Inspections. The Architect will visit the Site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine, in general, if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. The Architect will not be required to make exhaustive or continuous Site inspections to check quality or quantity of the Work. On the basis of Site observations as an architect, the Architect will keep the District informed of the progress of the Work, and will endeavor to guard the District against defects and deficiencies in the Work.

3.1.3 Contractor Responsibility for Construction Means, Methods and Sequences. Neither the Architect or the Construction Manager will have control over or charge of and be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, these being solely the

Contractor's responsibility. Neither the Architect nor Construction Manager will have control over or charge of and be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons performing portions of the Work.

3.1.4 Review of Applications for Payment. In accordance with Article 8 hereof, the Architect and Construction Manager will review the Contractor's Applications for Progress Payments and for Final Payment, evaluate the extent of Work performed and the amount properly due the Contractor on such Application for Payment.

3.1.5 Rejection of Work. The Architect is authorized to reject Work which is defective or does not conform to the requirements of the Contract Documents. Whenever the Architect considers it necessary or advisable, for implementation of the intent of the Contract Documents, the Architect will have authority to require additional inspections or testing of the Work, whether or not such Work is fabricated, installed or completed. Neither this authority of the Architect nor a decision made in good faith by the Architect to exercise or not to exercise such authority shall give rise to a duty or responsibility to the Contractor, Subcontractors, Material Suppliers, their agents or employees, or other persons performing portions of the Work.

3.1.6 Submittals.

3.1.6.1 Processing of Submittals Through Construction Manager. Submittals required by the Contract Documents shall be prepared by or on behalf of the Contractor in accordance with the requirements of the Contract Documents. Submittals shall be transmitted by the Contractor to the Construction Manager for distribution by the Construction Manager to the Architect and the District. Upon completion of the Architect's review of a Submittal, the Construction Manager shall transmit the reviewed Submittal to the Contractor for the Contractor's distribution to its Subcontractor(s) and other affected parties.

3.1.6.2 Architect's Review. The Architect will review and approve or take other appropriate action upon the Contractor's Submittals, but only for the limited purpose of checking for general conformance with information given and the design concept expressed in the Contract Documents. Review of Submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's Submittals shall not relieve the Contractor of its obligations under the Contract Documents. The Architect's review of Submittals shall not constitute approval of safety measures, programs or precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item in a Submittal shall not indicate approval of an assembly of which the item is a component with the Submittal(s) required and relating to such assembly have been reviewed by the Architect.

3.1.6.3 Time for Architect's Review. The Architect's review of Submittals will be conducted promptly so as not to delay or hinder the progress of the Work or the activities of the Contractor, the District or the District's separate contractors while allowing sufficient time, in the Architect's reasonable professional judgment, to permit

adequate review of Submittals. The foregoing notwithstanding, the Architect's review and return of Submittals will conform with the time limits and other conditions, if any, set forth in the Specifications or the Submittal Schedule if the Submittal Schedule is required by other provisions of the Contract Documents.

3.1.7 Changes to the Work; Change Orders. The Architect and Construction Manager will prepare Change Orders, and with the written approval of the District, may authorize minor Changes in the Work which do not result in adjustment of the Contract Time or the Contract Price.

3.1.8 Completion. The Architect will conduct observations to determine the date(s) of Substantial Completion and the date(s) of Final Completion, will receive and forward to the District, for the District's review and records, written warranties and related documents required by the Contract Documents and assembled by the Contractor, and will verify that the Contractor has complied with all requirements of the Contract Documents and is entitled to receipt of Final Payment.

3.1.9 Interpretation of Contract Documents; Architect as Initial Arbiter of Disputes. The Architect will interpret and decide matters concerning the requirements of the Contract Documents on written request of either the District or the Contractor. The Architect's response to such requests will be made with reasonable promptness and within the time limits agreed upon, if any. If no agreement is reached establishing the time for the Architect's review and response to requests under this Article 3.1.9, the Architect shall be afforded a fifteen (15) day period after receipt of such request to review and respond thereto. Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both the District and the Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith. The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents. If there is any disagreement, dispute or other matter in controversy between the District and the Contractor, in addition to other requirements established by the Contract Documents or by law, the submission of the same to the Architect for its decision shall be a condition precedent to initiation of dispute resolution procedures.

3.1.10 Request for Information. If the Contractor encounters any condition which the Contractor believes, in good faith and with reasonable basis, is the result of an ambiguity, conflict, error or omission in the Contract Documents (collectively "the Conditions"), it shall be affirmative obligation of the Contractor to timely notify the Architect, in writing, of the Conditions encountered and to request information from the Architect necessary to address and resolve any such Conditions before proceeding with any portion of the Work affected or which may be affected by such Conditions. If the Contractor fails to timely notify the Architect in writing of any Conditions encountered and the Contractor proceeds to perform any portion of the Work containing or affected by such Conditions the Contractor shall bear all costs associated with or required to correct, remove, or otherwise remedy any portion of the Work affected thereby without adjustment of the Contract Time or the Contract Price. In requesting information of the Architect to address and resolve any Conditions the Contractor shall act with promptness in submitting any such written request so as to allow the Architect a reasonable period of time to review, evaluate and respond to any such request, taking into account the then current status of the progress and completion of the Work and the actual

or potential impact of any such Conditions upon the completion of the Work within the Contract Time. The Contract Time shall not be subject to adjustment in the event that the Contractor shall fail to timely request information from the Architect. The Architect's responses to any such Contractor request for information shall conform with the standards and time frame set forth in Article 3.1.9 of these General Conditions. The foregoing provisions notwithstanding, in the event that the Architect reasonably determines that any of Contractor's request(s) for information: (i) does not reflect adequate or competent supervision or coordination by the Contractor or any Subcontractor; or (ii) does not reflect the Contractor's adequate or competent knowledge of the requirements of the Work or the Contract Documents; or (iii) is not justified for any other reason, Contractor shall be liable to the District for all costs incurred by the District associated with the processing, reviewing, evaluating and responding to any such request for information, including without limitation, fees of the Architect and any other design consultant to the Architect or the District. In responding to any of Contractor's request(s) for information, the Architect shall, in the response, indicate if the Architect has made the determination pursuant to the preceding sentence and, if so, the amount of costs to be borne by the Contractor for the processing, review, evaluation and response to the request for information. Thereafter, the District is authorized to deduct such amount from any portion of the Contract Price then or thereafter due the Contractor.

3.1.11 Detail Drawings and Instructions.

3.1.11.1 Architect's Additional Details. In case of ambiguity, conflict, or lack of information, Architect shall furnish additional instructions by means of drawings or otherwise, necessary for proper execution of the Work. All such drawings and instructions shall be consistent with Contract Documents, true developments thereof, and reasonably inferable therefrom. Such additional instructions shall be furnished with reasonable promptness, but not more than fourteen (14) days, provided that Contractor informs Architect and District in writing of the relationship of the requested critical path of the Construction Schedule. Architect will furnish necessary additional details to more fully explain the Work, which details shall be deemed part of the Contract Documents.

3.1.11.2 Contractor Notice of Impacts. If the Contractor believes that detail drawings issued by the Architect reflects a change to the scope of work or additional work beyond that reflected in the Contract Documents or reasonably referable therefrom, the Contractor shall give written notice thereof to Architect and District within five (5) days of the receipt of same. If the Contractor does not give the Architect and District such written notice within five (5) days, the details shall be deemed to be reasonable development of the Work depicted in the Contract Documents without adjustment of the Contract Time or the Contract Price. If notice is given by the Contractor, the Contractor shall set forth in detail the extent of Contract Price or Contract Time adjustments resulting from such details along with the basis upon which the requested Contract Time/Contract Price adjustment is computed. The Architect will review any such notice and request for adjustment of the Contract Time/Contract Price and render the Architect's decision in accordance with the Contract Documents.

3.2 Communications; Role of Construction Manager and Architect. All communications regarding the Work, the performance thereof or the Contract Documents shall be in writing; verbal communications shall be reduced to writing. Communications between the Contractor and the District or the Architect shall be through the Construction Manager. Communications between separate contractors, if any, shall be through the Construction Manager. All written

communications between the Contractor and any Subcontractor, Material Supplier or others directly or indirectly engaged by the Contractor to perform or provide any portion of the Work shall be available to the District, the Construction Manager and the Architect for review, inspection and reproduction as may be requested from time to time. Failure or refusal of the Contractor to permit the District, the Construction Manager or Architect to review, inspect or reproduce such written communications may be deemed a default of Contractor hereunder.

3.3 Termination of Architect or Construction Manager; Substitute Architect or Construction Manger. In case of termination of employment of the Architect or the Construction Manager, the District shall appoint a substitute architect or substitute construction manager whose status under the Contract Documents shall be that of the Architect or the Construction Manager, as applicable.

ARTICLE 4: THE CONTRACTOR

4.1 Contractor Review of Contract Documents.

4.1.1 Examination of Contract Documents. The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the District pursuant to the Contract Documents and shall at once report to the Architect any errors, inconsistencies or omissions discovered. If the Contractor performs any Work knowing, or with reasonable diligence should have known that, it involves an error, inconsistency or omission in the Contract Documents without prior notice to the Architect of the same, the Contractor shall assume full responsibility for such performance and shall bear all attributable costs for correction of the same.

4.1.2 Field Measurements. Prior to commencement of the Work, or portions thereof, the Contractor shall take field measurements and verify field conditions at the Site and shall carefully compare such field measurements and conditions and other information known to the Contractor with information provided in the Contract Documents. Errors, inconsistencies or omissions discovered shall be reported to the Architect at once.

4.1.3 Dimensions; Layouts and Field Engineering. Unless otherwise expressly provided, dimensions indicated in the Drawings are intended for reference only. The Drawings are intended to be diagrammatic and schematic in nature; the Contractor shall be solely responsible for coordinating the Work of the Contract Documents. All field engineering required for laying out the Work and establishing grades for earthwork operations shall be by the Contractor at its expense. Any field engineering or other engineering to be provided or performed by the Contractor under the Contract Documents and required or necessary for the proper execution or installation of the Work shall be provided and performed by the an engineer duly registered under the laws of the State of California in the engineering discipline for such portion of the Work. Upon commencement of any item of the Work, the Contractor is responsible for dimensions of such item of Work and related Work; without adjustment of the Contract Time or Contract Price, the Contractor is responsible for making component parts of the Work fit together properly.

4.1.4 Work in Accordance With Contract Documents. The Contractor shall perform all of the Work in strict conformity with the Contract Documents and approved Submittals.

4.2 Site Investigation; Subsurface Conditions.

4.2.1 Contractor Investigation. The Contractor shall be responsible for, and by executing the Agreement acknowledges, that it has carefully examined the Site and has taken all steps it deems reasonably necessary to ascertain all conditions which may effect the Work, or the cost thereof, including, without limitation, conditions bearing upon transportation, disposal, handling or storage of materials; availability of labor and materials; access to the Site; and the physical conditions and the character of equipment, materials, labor and services necessary to perform the Work. Any failure of the Contractor to do so will not relieve it from the responsibility for fully and completely performing all Work without adjustment to the Contract Price or the Contract Time. The District assumes no responsibility to the Contractor for any understandings or representations concerning conditions or characteristics of the Site, or the Work, made by any of its officers, employees or agents prior to the execution of the Agreement, unless such understandings or representations are expressly set forth in the Agreement.

4.2.2 Subsurface Data. By executing the Agreement, the Contractor acknowledges that it has examined the boring data and other subsurface data available and satisfied itself as to the character, quality and quantity of surface and subsurface materials, including without limitation, obstacles which may be encountered in performance of the Work, insofar as this information is reasonably ascertainable from an inspection of the Site, review of available subsurface data and analysis of information furnished by the District under the Contract Documents. Subsurface data or other soils investigation report provided by the District hereunder are not a part of the Contract Documents. Information contained in such data or report regarding subsurface conditions, elevations of existing grades, or below grade elevations are approximate only and is neither guaranteed or warranted by the District to be complete and accurate. The Contractor shall examine all boring and other subsurface data to make its own independent interpretation of the subsurface conditions and acknowledges that its bid is based upon its own opinion of the conditions which may be encountered.

4.2.3 Subsurface Conditions. If the Work under the Contract Documents involves digging trenches or other excavations that extend deeper than four feet below the surface, the Contractor shall promptly and before the following conditions are disturbed, notify the Project Inspector, in writing, of any: (i) material that the Contractor believes may be material that is hazardous waste, as defined in California Health and Safety Code §25117, that is required to be removed to a Class I or Class II or Class III disposal site in accordance with provisions of existing law; (ii) subsurface or latent physical conditions at the site differing from those indicated; or (iii) unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in the Work or the character provided for in the Contract Documents. If upon notice to the District of the conditions described above and upon the District's investigation thereof, the District determines that the conditions so materially differ or involve such hazardous materials which require an adjustment to the Contract Price or the Contract Time, the District shall issue a Change Order in accordance with Article 9 hereof. In accordance with California Public Contract Code §7104, any dispute arising between the Contractor and the District as to any of the conditions listed in (i), (ii) or (iii) above, shall not excuse the Contractor from the completion of the Work within the Contract Time and the Contractor shall proceed with all Work to be performed under the Contract Documents. The District reserves the right to terminate the Contract pursuant to Article 15.2 hereof should the District determine not to proceed because of any condition described in (i), (ii) or (iii) above.

4.3 Supervision and Construction Procedures.

4.3.1 Supervision of the Work. The Contractor shall supervise and direct performance of the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract Documents, unless Contract Documents give other specific instructions concerning these matters. The Contractor shall be responsible for inspection of completed or partially completed portions of Work to determine that such portions are in proper condition to receive subsequent Work.

4.3.2 Responsibility for the Work. The Contractor shall be responsible to the District for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and all other persons performing any portion of the Work under a contract with the Contractor. The Contractor shall not be relieved of the obligation to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager, Project Inspector or the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

4.3.3 Layouts. The Contractor is solely responsible for laying-out the Work so that construction of the Work conforms to the requirements of the Contract Documents and so that all component parts of the Work are coordinated. The Contractor shall be responsible for maintenance and preservation of benchmarks, reference points and stakes for the Work. The cost of maintenance and preservation of benchmarks, reference points and stakes shall be included within the Contract Price. The Contractor shall be solely responsible for all loss or costs resulting from the loss, destruction, disturbance or damage of benchmarks, reference points or stakes.

4.3.4 Construction Utilities. The District will furnish and pay the costs of utility services for the Work as set forth in the Special Conditions; all other utilities necessary to complete the Work and to completely perform all of the Contractors' obligations shall be obtained by the Contractor without adjustment of the Contract Price. The Contractor shall furnish and install necessary or appropriate temporary distributions of utilities, including utilities furnished by the District. Any such temporary distributions shall be removed by the Contractor upon completion of the Work. The costs of all such utility services, including the installation and removal of temporary distributions thereof, shall be borne by the Contractor and included in the Contract Price.

4.3.5 Existing Utilities; Removal, Relocation and Protection. In accordance with California Government Code §4215, the District shall assume the responsibility for the timely removal, relocation, or protection of existing main or trunkline utility facilities located on the Site which are not identified in the Drawings, Specifications or other Contract Documents. Contractor shall be compensated for the costs of locating, repairing damage not due to the Contractor's failure to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Drawings, Specifications and other Contract Documents with reasonable accuracy, and for equipment on the Site necessarily idled during such work. Contractor shall not be assessed Liquidated Damages for delay in completion of the Work when such delay is caused by the failure of the District or the District of the utility to provide for removal or relocation of such utility facilities. Nothing in this Article 4.3.5 shall be deemed to require the District to indicate the presence of existing service laterals or appurtenances whenever the presence of such utilities on the Site can be inferred from the presence of other visible facilities, such as buildings, meters and junction boxes, on or adjacent to the Site. If the

Contractor encounters utility facilities not identified by the District in the Drawings, Specifications, or other Contract Documents, the Contractor shall immediately notify, in writing, the District, the Project Inspector, the Architect, the Construction Manager and the utility owner. In the event that such utility facilities are owned by a public utility, the public utility shall have the sole discretion to perform repairs or relocation work or permit the Contractor to do such repairs or relocation work at a reasonable price.

4.3.6 Conferences and Meetings. A material obligation of the Contractor under the Contract Documents is the attendance at required meetings by the Contractor's supervisory personnel for the Work and the Contractor's management personnel as required by the Contract Documents or as requested by the District. The Contractor's personnel participating in conferences and meetings relating to the Work shall be authorized to act on behalf of the Contractor and to bind the Contractor. The Contractor is solely responsible for arranging for the attendance by Subcontractors, Material Suppliers at meetings and conferences relating to the Work as necessary, appropriate or as requested by the District.

4.3.6.1 Pre-Construction Conference. The Contractor's representatives (and representatives of Subcontractors as requested by the District) shall attend a Pre-Construction Conference at such time and place as designated by the District. The Pre-Construction Conference will generally address the requirements of the Work and Contract Documents, and to establish construction procedures. Subject matters of the Pre-Construction Conference will include as appropriate: (a) administrative matters, including an overview of the respective responsibilities of the District, Architect, Construction Manager, Contractor, Subcontractor, Project Inspector and others performing any part of the Work or services relating to the Work; (b) Submittals; (c) Changes and Change Order processing; (d) employment practices, including Certified Payroll preparation and submission and prevailing wage rate responsibilities of the Contractor and Subcontractors; (e) Progress Schedule development and maintenance; (f) development of Schedule of Values and payment procedures; (g) communication procedures, including the handling of Requests for Information; (h) emergency and safety procedures; (i) Site visitor policies; (j) conduct of Contractor/Subcontractor personnel at the Site; and (k) punchlist/close-out procedures.

4.3.6.2 Progress Meetings. Progress meetings will be conducted on regular intervals (weekly unless otherwise expressly indicated elsewhere in the Contract Documents). The Contractor's representatives and representatives of Subcontractors (as requested by the District) shall attend Progress Meetings. Progress Meetings will be chaired by the Construction Manager and will generally include as agenda items: Site safety, field issues, coordination of Work, construction progress and impacts to timely completion, if any. The purposes of the Progress Meetings include: a formal and regular forum for discussion of the status and progress of the Work by all Project participants, a review of progress or resolution of previously raised issues and action items assigned to the Project participants, and reviews of the Progress Schedule and Submittals.

4.3.6.3 Special Meetings. As deemed necessary or appropriate by the District, Special Meetings will be conducted with the participation of the Contractor, Subcontractors and other Project participants as requested by the District.

4.3.6.4 Minutes of Meetings. Following conclusion of the Pre-Construction Conference, Progress Meetings and Special Meetings, the Construction Manager will prepare and distribute minutes reflecting the items addressed and actions taken at a meeting or

conference. Unless the Contractor notifies the Architect and the Construction Manager in writing of objections or corrections to minutes prepared hereunder within five (5) dates of the date of distribution of the minutes, the minutes as distributed shall constitute the official record of the meeting or conference. No objections or corrections of any Subcontractor or Material Supplier shall be submitted directly to the Architect or the Construction Manager; such objections or corrections shall be submitted to the Architect and the Construction Manager through the Contractor. If the Contractor timely interposes objections or notes corrections, the resolution of such matters shall be addressed at the next scheduled Progress Meeting.

4.3.7 Temporary Sanitary Facilities. At all times during Work at the Site, the Contractor shall obtain and maintain temporary sanitary facilities in conformity with applicable law, rule or regulation. The Contractor shall maintain temporary sanitary facilities in a neat and clean manner with sufficient toilet room supplies. Personnel engaged in the Work are not permitted to use toilet facilities at the Site.

4.3.8 Noise and Dust Control.

4.3.8.1 Noise Control. The Contractor shall install noise reducing devices on construction equipment. Contractor shall comply with the requirements of the city and county having jurisdiction with regard to noise ordinances governing construction sites and activities. Construction Equipment noise at the Site shall be limited and only as permitted by applicable law, rule or regulation. If classes are in session at any point during the progress of the Work, and, in the District's reasonable discretion, the noise from any Work disrupts or disturbs the students or faculty or the normal operation of the college, at the District's request, the Contractor shall schedule the performance of all such Work around normal college hours or make other arrangements so that the Work does not cause such disruption or disturbance. In no event shall such arrangements result in adjustment of the Contract Price or the Contract Time.

4.3.8.2 Dust Control. The Contractor shall be fully and solely responsible for maintaining and upkeeping all areas of the Site and adjoining areas, outdoors and indoors, free from flying debris, grinding powder, sawdust, dirt and dust as well as any other product, product waste or work waste, that by becoming airborne may cause respiratory inconveniences to persons, particularly to students and District personnel. Additionally, the Contractor shall take specific care to avoid deposits of airborne dust or airborne elements. Such protection devices, systems or methods shall be in accordance with the regulations set forth by the EPA and OSHA, and other applicable law, rule or regulation. Additionally, the Contractor shall be the sole party responsible to regularly and routinely clean up and remove any and all deposits of dust and other elements. Damage and/or any liability derived from the Contractor's failure to comply with these requirements shall be exclusively at the cost of the Contractor, including, without limitation, any and all penalties that may be incurred for violations of applicable law, rule or regulation, and any amounts expended by the District to pay such damages shall be due and payable to the District on demand. Contractor shall replace any damages property or part thereof and professionally clean any and all items that become covered or partially covered to any degree by dust or other airborne elements. If classes are in session at any point during the progress of Work, and, in the District's reasonable discretion, flying debris, grinding powder, sawdust, dirt or dust from any Work disrupts or disturbs the students or faculty or the normal operation of the college, at the District's request, the Contractor shall schedule the performance of all such Work

around normal college hours and make other arrangements so that the Work does not cause such disruption or disturbance. In no event shall such arrangements result in adjustment of the Contract Price or the Contract Time.

4.3.8.3 Contractor Failure to Comply. If the Contractor fails to comply with the requirements for dust control, noise control, or any other maintenance or clean up requirement of the Contract Documents, upon notice from the District, Architect, Project Inspector or Construction Manager to the Contractor, the Contractor shall take immediate action. Should the Contractor fail to respond with immediate and responsive action and not later than twenty-four (24) hours from such notification, the District shall have the absolute right to proceed as it may deem necessary to remedy such matter. Any and all costs incurred by the District in connection with such actions shall be the sole responsibility of, and be borne by, the Contractor; the District may deduct such amounts from the Contract Price then or thereafter due the Contractor.

4.3.9 Debris Recycling; Contractor Submittal of Debris Recycling Statement. The Contractor and all Subcontractors shall maintain current, complete and accurate records of debris and other waste (collectively "Waste Materials") resulting from performance of the Work. The Contractor shall compile the records of the Contractor and all Subcontractors on a monthly basis. Based on such compilation, the Contractor shall, each month during performance of the Work, complete the form of Debris Recycling Statement (Attachment C to the Special Conditions) for itself and all Subcontractors performing Work at the Site. The Debris Recycling Statement must be executed by the Contractor's Superintendent, Project Manager or other authorized employee; the completed/executed form of Debris Recycling Statement shall be submitted by the Contractor to the District each month during the Work concurrently with the Contractor's submission of its Applications for Progress Payment.

4.4 Labor and Materials.

4.4.1 Payment for Labor, Materials and Services. Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, Construction Equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated in the Work.

4.4.2 Employee Discipline. The Contractor shall enforce strict discipline and good order among the Contractor's employees, the employees of any Subcontractor or Sub-subcontractor, and all other persons performing any part of the Work at the Site. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. The Contractor shall dismiss from its employ and direct any Subcontractor or Sub-subcontractor to dismiss from their employment any person deemed by the District to be unfit or incompetent to perform Work and thereafter, the Contractor shall not employ nor permit the employment of such person for performance of any part of the Work without the prior written consent of the District, which consent may be withheld in the reasonable discretion of the District.

4.4.3 Contractor's Superintendent. Contractor shall employ a competent Superintendent who is fluent in spoken and written English along with necessary assistants who shall be in attendance at the Site at all times during the performance of Work at the Site. Before commencing the Work, Contractor shall designate in writing the name, qualifications, experience and references from owners and architects on previous projects for Contractor's

proposed Superintendent who, on approval of District, shall have full authority to represent and act for Contractor. All directions given to the Superintendent shall be as binding as if given to Contractor. A facsimile of the signatures of the authorized representatives of Contractor shall be submitted to Architect and District. The Contractor's communications relating to the Work or the Contract Documents shall be through the Contractor's Superintendent. The Superintendent shall represent the Contractor and communications given to the Superintendent shall be binding as if given to the Contractor. The Contractor shall dismiss the Superintendent or any of his/her assistants if they are deemed, in the sole reasonable judgment of the District, to be unfit, incompetent or incapable of performing the functions assigned to them. In such event, the District shall have the right to approve of the replacement superintendent or assistant. Unless expressly excused by the District, the Contractor's Superintendent shall attend all Project meetings as the Contractor's representative.

4.4.4 Prohibition on Harassment.

4.4.4.1 District's Policy Prohibiting Harassment. The District is committed to providing a campus and workplace free of sexual harassment and harassment based on factors such as race, color religion, national origin, ancestry, age, medical condition, marital status, disability or veteran status. Harassment includes without limitation, verbal, physical or visual conduct which creates an intimidating, offensive or hostile environment such as racial slurs; ethnic jokes; posting of offensive statements, posters or cartoons or similar conduct. Sexual harassment includes without limitation the solicitation of sexual favors, unwelcome sexual advances, or other verbal, visual or physical conduct of a sexual nature.

4.4.4.2 Contractor's Adoption of Anti-Harassment Policy. Contractor shall adopt and implement all appropriate and necessary policies prohibiting any form of discrimination in the workplace, including without limitation harassment on the basis of any classification protected under local, state or federal law, regulation or policy. Contractor shall take all reasonable steps to prevent harassment from occurring, including without limitation affirmatively raising the subject of harassment among its employees, expressing strong disapproval of any form of harassment, developing appropriate sanctions, informing employees of their right to raise and how to raise the issue of harassment and informing complainants of the outcome of an investigation into a harassment claim. Contractor shall require that any Subcontractor or Sub-subcontractor performing any portion of the Work to adopt and implement policies in conformity with this Article 4.4.4.

4.4.4.3 Prohibition on Harassment at the Site. Contractor shall not permit any person, whether employed by Contractor, a Subcontractor, Sub-subcontractor, or any other person or entity, performing any Work at or about the Site to engage in any prohibited form of harassment. Any such person engaging in a prohibited form of harassment directed to any individual performing or providing any portion of the Work at or about the Site shall be subject to appropriate sanctions in accordance with the anti-harassment policy adopted and implemented pursuant to Article 4.4.4.2 above. Any person, performing or providing Work on or about the Site engaging in a prohibited form of harassment directed to any student, faculty member or staff of the District or directed to any other person on or about the Site shall be subject to immediate removal and shall be prohibited thereafter from providing or performing any portion of the Work. Upon the District's receipt of any notice or complaint that any person employed directly

or indirectly by Contractor in performing or providing the Work has engaged in a prohibited form of harassment, the District will promptly undertake an investigation of such notice or complaint. In the event that the District, after such investigation, reasonably determines that a prohibited form of harassment has occurred, the District shall promptly notify the Contractor of the same and direct that the person engaging in such conduct be immediately removed from the Site. Unless the District's determination that a prohibited form of harassment has occurred is grossly negligent or without reasonable cause, District shall have no liability for directing the removal of any person determined to have engaged in a prohibited form of harassment nor shall the Contract Price or the Contract Time be adjusted on account thereof. Contractor and the Surety shall defend, indemnify and hold harmless the District and its employees, officers, board of trustees, agents, and representatives from any and all claims, liabilities, judgments, awards, actions or causes of actions, including without limitation, attorneys' fees, which arise out of, or pertain in any manner to: (i) the assertion by any person dismissed from performing or providing work at the direction of the District pursuant to this Article 4.4.4.3; or (ii) the assertion by any person that any person directly or indirectly under the employment or direction of the Contractor has engaged in a prohibited form of harassment directed to or affecting such person. The obligations of the Contractor and the Surety under the preceding sentence are in addition to, and not in lieu of, any other obligation of defense, indemnity and hold harmless whether arising under the Contract Documents, at law or otherwise; these obligations survive completion of the Work or the termination of the Contract.

4.5 Taxes. The Contractor shall pay, without adjustment of the Contract Price, all sales, consumer, use and other taxes for the Work or portions thereof provided by the Contractor under the Contract Documents.

4.6 Permits, Fees and Notices; Compliance With Laws.

4.6.1 Payment of Permits, Fees. The District shall secure and pay for the building permits, other permits, governmental fees, licenses and inspections necessary or required for the proper execution and completion of the Work, except as otherwise provided in the Special Conditions. If permits/approvals are designated in the Special Conditions as the Contractor's responsibility, the Contractor shall obtain such permits/approvals at its sole cost and expense without adjustment of the Contract Price. Fees, costs or other expenses associated with or arising in connection with Deferred Approval Items shall be the responsibility of the Contractor without adjustment of the Contract Price.

4.6.2 Compliance With Laws. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and other orders of public authorities bearing on performance of the Work.

4.6.3 Notice of Variation From Laws. If the Contractor knows, or has reason to believe, that any portion of the Contract Documents are at variance with applicable laws, statutes, ordinances, building codes, regulations or rules, the Contractor shall promptly notify the Architect, Construction Manager and the Project Inspector, in writing, of the same. If the Contractor performs Work knowing, or with reasonable diligence should have known, it to be contrary to laws, statutes, ordinances, building codes, rules or regulations applicable to the Work without such notice to the Architect and the Project Inspector, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs arising or associated therefrom, including without limitation, the removal, replacement or correction of

the same.

4.7 Submittals.

4.7.1 Purpose of Submittals. Shop Drawings, Product Data, Samples and similar submittals (collectively "Submittals") are not Contract Documents. The purpose for submission of Submittals is to demonstrate, for those portions of the Work for which Submittals are required, the manner in which the Contractor proposes to provide or incorporate such item of the Work in conformity with the information given and the design concept expressed in the Contract Documents.

4.7.2 Contractor's Submittals.

4.7.2.1 Prompt Submittals. The Contractor shall review, approve and submit to the Architect or such other person or entity designated by the District, the number of copies of Submittals required by the Contract Documents. All Submittals required by the Contract Documents shall be prepared, assembled and submitted by the Contractor to the Architect within the time frames set forth in the Submittal Schedule incorporated and made a part of the Approved Construction Schedule prepared and submitted by the Contractor pursuant to Article 7 of these General Conditions. Contractor's submission of Submittals in conformity with the Submittal Schedule is a material obligation of the Contractor. In the event of Contractor's failure or refusal to deliver Submittals to the Architect in accordance with the Submittal Schedule, the Contractor shall be subject to per diem assessments in the amount set forth in the Special Conditions for each day of delayed submission for any Submittal beyond the date set forth in the Submittal Schedule for Contractor's submission of such Submittal. Contractor and District acknowledge and agree that if Contractor shall fail to deliver Submittals in accordance with the Submittal Schedule, the District will incur costs and expenses not contemplated by the Contract Documents, the exact amount of which are difficult to ascertain and fix. Contractor and the District acknowledge and agree that the per diem assessment for delayed submission of Submittals set forth in the Special Conditions represents a reasonable estimate of costs and expenses the District will incur as a result of delayed submission of Submittals and that the same is not a penalty. Notwithstanding Contractor's submission of all required Submittals in accordance with the Submittal Schedule, in the event that the District or the Architect reasonably determines that all or any portion of such Submittals fail to comply with the requirements of Articles 4.7.2.2, 4.7.2.3 and 4.7.2.4 of these General Conditions and/or such Submittals are not otherwise complete and accurate so as to require re-submission, Contractor shall bear all costs associated with the review and approval of resubmitted Submittals, including without limitation Architect's fees incurred in connection therewith; provided that such costs are in addition to, and not in lieu of, any per diem assessments imposed under this Article 4.7.2.1 for Contractor's delayed submission of Submittals. In the event of the District's imposition of the per diem assessments due to the Contractor's delayed submission of Submittals or in the event of the District's assessment of costs and expenses incurred to review incomplete or inaccurate Submittals, the District may deduct the same from any portion the Contract Price then or thereafter due the Contractor. Submittals not required by the Contract Documents or which do not otherwise conform with the requirements of the Contract Documents may be returned without action. No adjustment to the Contract Time or the Contract Price shall be granted to the Contractor on account of its failure to make timely submission of any Submittal.

4.7.2.2 Approval of Subcontractor Submittals. All Submittals prepared by Subcontractors, of any tier, Material Suppliers, manufacturers or distributors shall bear the written approval of the Contractor thereto prior to submission to the Architect for review. Any Submittal not bearing the Contractor's written approval shall be subject to return to the Contractor for re-submittal in conformity herewith, with the same being deemed to not have been submitted. Any delay, impact or cost associated therewith shall be the sole and exclusive responsibility of the Contractor without adjustment to the Contract Time or the Contract Price.

4.7.2.3 Verification of Submittal Information. By approving and submission of Submittals, the Contractor represents to the District and Architect that the Contractor has determined and verified materials, field measurements, field construction criteria, catalog numbers and similar data related thereto and has checked and coordinated the information contained within such Submittals with the requirements of the Work and of the Contract Documents. Each Submittal shall include the following certification duly executed by the Contractor's Superintendent or Project Manager for the Work:

> "The Contractor has reviewed and approved the field dimensions and construction criteria of the attached Submittal. The Contractor has verified that the Submittal includes notations of any portion of the Work depicted in the Submittal which is not in strict conformity with the Contract Documents. The information in the attached Submittal has been reviewed and coordinated by the Contractor with information included in other Submittals."

4.7.2.4 Contractor Responsibility for Deviations. The Contractor shall not be relieved of responsibility for correcting deviations from the requirements of the Contract Documents by the Architect's review of Submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submission of the Submittal and the Architect has given written approval to the specific deviation. A material obligation of the Contractor is its specific/detailed identification and notation on the transmittal cover-sheet of each submission of Submittals any deviation between the Work as indicated in the Contract Documents and as indicated in the Submittal. The Contractor shall not be relieved of responsibility for errors or omissions in Submittals by the Architect's review thereof.

4.7.2.5 No Performance of Work Without Architect Review. The Contractor shall perform no portion of the Work requiring the Architect's review of Submittals until the Architect has completed its review and returned the Submittal to the Contractor indicating "No Exception Taken" to such Submittal. The Contractor shall not perform any portion of the Work forming a part of a Submittal or which is affected by a related Submittal until the entirety of the Submittal or other related Submittal has been fully processed. Such Work shall be in accordance with the final action taken by the Architect in review of Submittals and other applicable portions of the Contract Documents.

4.7.3 Architect Review of Submittals. The purpose of the Architect's review of Submittals and the time for the Architect's return of Submittals to the Contractor shall be as set forth elsewhere in the Contract Documents. If the Architect returns a Submittal as rejected or requiring correction(s) with re-submission, the Contractor, so as not to delay the progress of the Work, shall promptly thereafter resubmit a Submittal conforming with the requirements of the Contract Documents; the resubmitted Submittal shall indicate the portions thereof modified in accordance with the Architect's direction. When professional certification of

performance criteria of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications accompanying Submittals. The Architect's review of the Submittals is for the limited purposes described in the Contract Documents.

4.7.4 Deferred Approval Items. In the event that any portion of the Work is designated in the Contract Documents as a "Deferred Approval" item, Contractor shall be solely and exclusively responsible for the preparation of Submittals for such item(s) in a timely manner so as not to delay or hinder the completion of the Work within the Contract Time.

4.8 Materials and Equipment.

4.8.1 Specified Materials, Equipment. References in the Contract Documents to any specific article, device, equipment, product, material, fixture, patented process, form, method or type of construction, by name, make, trade name, or catalog number, with or without the words "or equal" shall be deemed to establish a minimum standard of quality or performance, and shall not be construed as limiting competition.

4.8.2 Approval of Substitutions or Alternatives. The Contractor may propose to furnish alternatives or substitutes for a particular item specified in the Contract Documents, provided that such proposed substitution or alternative complies with the requirements of the Specifications relating to substitutions of specified items and the Contractor certifies to the Architect that the quality, performance capability and functionality (including visual and/or aesthetic effect) of the proposed alternative or substitute will meet or exceed the quality, performance capability and functionality of the item or process specified, and must demonstrate to the Architect that the use of the substitution or alternative is appropriate and will not delay completion of the Work or result in an increase to the Contract Price. The Contractor shall submit engineering, construction, dimension, visual, aesthetic and performance data to the Architect to permit its proper evaluation of the proposed substitution or alternative. If requested by the Architect, Contractor shall promptly furnish any additional information or data regarding a proposed substitution or alternative which the Architect deems reasonably necessary for the evaluation of the proposed substitution or alternative. The Contractor shall not provide, furnish or install any substitution or alternative without the Architect's review and final action on the proposed substitution or alternative; any alternative or substitution installed or incorporated into the Work without first obtaining the Architect's review and final action of the same shall be subject to removal pursuant to Article 12 hereof. The Architect's decision evaluating the Contractor's proposed substitutions or alternatives shall be final. Neither the Contract Time nor the Contract Price shall be increased on account of any substitution or alternative proposed by the Contractor and which is accepted by the Architect; provided, however, that in the event a substitution or alternative accepted by the Architect and purchase, fabrication and/or installation or such accepted substitution or alternative shall be less expensive than the originally specified item, the Contract Price shall be reduced by the actual cost savings realized by the Contractor's furnishing and/or installation of such approved substitution or alternative. The Contractor shall be solely responsible for all costs and fees incurred by the District to review a proposed substitution or alternative, including without limitation fees of the Architect, of the Architect's consultant(s) and/or governmental agencies to review and/or approve any proposed substitution or alternative. The Contractor shall be solely responsible for any increase in the cost of any accepted substitution or alternative or any Work affected by such alternative or substitution. The foregoing notwithstanding, all requests for the Architect's review and approval of any proposed substitution or alternative and all engineering,

construction, dimension and performance data substantiating the equivalency of the proposed substitution or alternative shall be submitted by Contractor not later than thirty-five (35) days following the date of the District's award of the Contract to Contractor by action of the District's Board of Trustees; any request for approval of proposed alternatives or substitutions submitted thereafter may be rejected summarily. The foregoing process and time limits shall apply to any proposed substitution or alternative regardless of whether the substitute or alternate item is to be provided, furnished or installed by Contractor, any Subcontractor, any Sub-Subcontractor, Material Supplier or Manufacturer.

4.8.3 "Sole Source" Products. If any material, equipment, product or other item is designated in the Contract Documents as a "District Standard" or similar words/terms, the District shall be deemed to have made a finding that such material, equipment, product or other item is designated and specified to match other materials, equipment, products, or other item in use in a completed or to be completed work of improvement and not subject to substitution. If any material, equipment, or other item is identified in the Contract Documents as being the only source of the material, equipment or other item necessary to accomplish the intended result(s), such material, equipment or other item shall not be subject to substitution.

4.8.4 Placement of Material and Equipment Orders. Contractor shall, after award of the Contract, promptly and timely place all orders for materials and/or equipment necessary for completion of the Work so that delivery of the same shall be made without delay or interruption to the timely completion of the Work. Contractor shall require that any Subcontractor or Sub-Subcontractor performing any portion of the Work similarly place orders for all materials and/or equipment to be furnished by any such Subcontractor or Sub-Subcontractor in a prompt and timely manner so that delivery of the same shall be made without delay or interruption to the timely completion of the Work. Upon request of the District, Construction Manager or the Architect, the Contractor shall furnish reasonably satisfactory written evidence of the placement of orders for materials and/or equipment necessary for completion of the Work, including without limitation, orders for materials and/or equipment to be provided, furnished or installed by any Subcontractor or Sub-Subcontractor.

4.8.5 District's Right to Place Orders for Materials and/or Equipment. Notwithstanding any other provision of the Contract Documents, in the event that the Contractor shall, upon request of the District or the Architect, fail or refuse, for any reason, to provide reasonably satisfactory written evidence of the placement of orders for materials and/or equipment necessary for completion of the Work, or should the District determine, in its sole and reasonable discretion, that any orders for materials and/or equipment have not been placed in a manner so that such materials and/or equipment will be delivered to the Site so the Work can be completed without delay or interruption, the District shall have the right, but not the obligation, to place such orders on behalf of the Contractor. If the District exercises the right to place orders for materials and/or equipment pursuant to the foregoing, the District's conduct shall not be deemed to be an exercise, by the District, of any control over the means, methods, techniques, sequences or procedures for completion of the Work, all of which remain the responsibility and obligation of the Contractor. Notwithstanding the right of the District to place orders for materials and/or equipment pursuant to the foregoing, the election of the District to exercise, or not to exercise, such right shall not relieve the Contractor from any of Contractor's obligations under the Contract Documents, including without limitation, completion of the Work within the Contract Time and for the Contract Price. If the District exercises the right hereunder to place orders for materials and/or

equipment on behalf of Contractor pursuant to the foregoing, Contractor shall reimburse the District for all costs and fees incurred by the District in placing such orders; such costs and fees may be deducted by the District from the Contract Price then or thereafter due the Contractor.

4.9 Safety.

4.9.1 Safety Programs. The Contractor shall be solely responsible for initiating, maintaining and supervising all safety programs required by applicable law, ordinance, regulation or governmental orders in connection with the performance of the Contract, or otherwise required by the type or nature of the Work. The Contractor's safety program shall include all actions and programs necessary for compliance with California or federally statutorily mandated workplace safety programs, including without limitation, compliance with the California Drug Free Workplace Act of 1990 (California Government Code §§8350 et seq.). Without limiting or relieving the Contractor of its obligations hereunder, the Contractor shall require that its Subcontractors similarly initiate and maintain all appropriate or required safety programs. Prior to commencement of Work at the Site, the Contractor shall provide the Architect, Project Inspector, the Construction Manager and District with the Contractor's proposed safety program for the Work for the Construction Manager's review. The Architect, the Construction Manager and the Project Inspector are authorized to enforce the Contractor's obligation to implement the safety program accepted by the Construction Manager.

4.9.2 Safety Precautions. The Contractor shall be solely responsible for initiating and maintaining reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to: (i) employees on the Work and other persons who may be affected thereby; (ii) the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and (iii) other property or items at the site of the Work, or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction. The Contractor shall take adequate precautions and measures to protect existing roads, sidewalks, curbs, pavement, utilities, adjoining property and improvements thereon (including without limitation, protection from settlement or loss of lateral support) and to avoid damage thereto. Without adjustment of the Contract Price or the Contract Time, the Contractor shall repair, replace or restore any damage or destruction of the foregoing items as a result of performance or installation of the Work.

4.9.3 Safety Signs, Barricades. The Contractor shall erect and maintain, as required by existing conditions and conditions resulting from performance of the Contract, reasonable safeguards for safety and protection of property and persons, including, without limitation, posting danger signs and other warnings against hazards, promulgating safety regulations and notifying Districts and users of adjacent sites and utilities.

4.9.4 Safety Notices. The Contractor shall give or post all notices required by applicable law and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

4.9.5 Safety Coordinator. The Contractor shall designate a responsible member of the Contractor's organization at the Site whose duty shall be the prevention of accidents and the

implementation and maintenance safety precautions and programs. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Project Inspector and the Architect.

4.9.6 Emergencies; First Aid. In an emergency affecting safety of persons or property, the Contractor shall act, to prevent threatened damage, injury or loss. The Contractor shall maintain stocked emergency first aid kits at the Site which comply with applicable law, rule or regulation.

4.9.7 Hazardous Materials.

4.9.7.1 General. In the event that the Contractor, any Subcontractor or anyone employed directly or indirectly by them shall use, at the Site, or incorporate into the Work, any material or substance deemed to be hazardous or toxic under any law, rule, ordinance, regulation or interpretation thereof (collectively "Hazardous Materials"), the Contractor shall comply with all laws, rules, ordinances or regulations applicable thereto and shall exercise all necessary safety precautions relating to the use, storage or disposal thereof.

4.9.7.2 Prohibition on Use of Asbestos Construction Building Materials ("ACBMs"). Notwithstanding any provision of the Drawings or the Specifications to the contrary, it is the intent of the District that ACBMs not be used or incorporated into any portion of the Work. In the event that any portion of the Work depicted in the Drawings or the Specifications shall require materials or products which the Contractor knows, or should have known with reasonably diligent investigation, to contain ACBMs, Contractor shall promptly notify the Architect and the Project Inspector of the same so that an appropriate alternative can be made in a timely manner so as not to delay the progress of the Work. Contractor warrants to the District that there are no materials or products used or incorporated into the Work which contain ACBMs. Whether before or after completion of the Work, if it is discovered that any product or material forming a part of the Work or incorporated into the Work contains ACBMs, the Contractor shall at its sole cost and expense remove such product or material in accordance with any laws, rules, procedures and regulations applicable to the handling, removal and disposal of ACBMs and to replace such product or material with non-ACBM products or materials and to return the affected portion(s) of the Work to the finish condition depicted in the Drawings and Specifications relating to such portion(s) of the Work. Contractor's obligations under the preceding sentence shall survive the termination of the Contract, the warranty period provided under the Contract Documents, the Contractor's completion of the Work or the District's acceptance of the Work. In the event that the Contractor shall fail or refuse, for any reason, to commence the removal and replacement of any material or product containing ACBMs forming a part of, or incorporated into the Work, within ten (10) days of the date of the District's written notice to the Contractor of the existence of ACBM materials or products in the Work, the District may thereafter proceed to cause the removal and replacement of such materials or products in any manner which the District determines to be reasonably necessary and appropriate; all costs, expenses and fees, including without limitation fees and costs of consultants and attorneys, incurred by the District in connection with such removal and replacement shall be the responsibility of the Contractor and the Contractor's Performance Bond Surety.

4.9.7.3 Disposal of Hazardous Materials. Contractor shall be solely and exclusively

responsible for the disposal of any Hazardous Materials on or about Site resulting from the Contractor's performance of Work and other activities. The Contractor's obligations hereunder shall include without limitation, the transportation and disposal of any Hazardous Materials in strict conformity with any and all applicable laws, regulations, orders, procedures or ordinances.

4.10 Maintenance of Documents.

4.10.1 Documents at Site. The Contractor shall maintain at the Site: (i) one record copy of the Drawings, Specifications and all addenda thereto; (ii) Change Orders approved by the District and all other modifications to the Contract Documents; (iii) Submittals reviewed by the Architect; (iv) Record Drawings; (v) Material Safety Data Sheets ("MSDS") accompanying any materials, equipment or products delivered or stored at the Site or incorporated into the Work; and (vi) all building and other codes or regulations applicable to the Work, including without limitation, Title 24, Part 2 of the California Code of Regulations. During performance of the Work, all documents maintained by Contractor at the Site shall be available to the District, the Construction Manager, the Architect, the Project Inspector and DSA for review, inspection or reproduction. Upon completion of the Work, all documents maintained at the Site by the Contractor pursuant to the foregoing shall be assembled and transmitted to the Architect for delivery to the District.

4.10.2 Maintenance of Record Drawings. During its performance of the Work, the Contractor shall maintain Record Drawings consisting of a set of the Drawings which are marked to indicate all field changes made to adapt the Work depicted in the Drawings to field conditions, changes resulting from Change Orders and all concealed or buried installations, including without limitation, piping, conduit and utility services. All buried or concealed items of Work shall be completely and accurately marked and located on the Record Drawings. The Record Drawings shall be clean and all changes, corrections and dimensions shall be marked in a neat and legible manner in a contrasting color. Record Drawings relating to the Structural, Mechanical, Electrical and Plumbing portions of the Work shall indicate without limitation, circuiting, wiring sizes, equipment/member sizing and shall depict the entirety of the as built conditions of such portions of the Work. The Record Drawings shall be continuously maintained by the Contractor during the performance of the Work. At any time during the Contractor's performance of the Work, upon the request of the District, the Project Inspector or the Architect, the Contractor shall make the Record Drawings maintained here under available for the District's review and inspection. The District's review and inspection of the Record Drawings during the Contractor's performance of the Work shall be only for the purpose of generally verifying that Contractor is continuously maintaining the Record Drawings in a complete and accurate manner; any such inspection or review shall not be deemed to be the District's approval or verification of the completeness or accuracy thereof. The failure or refusal of the Contractor to continuously maintain complete and accurate Record Drawings or to make available the Record Drawings for inspection and review by the District may be deemed by the District to be Contractor's default of a material obligation hereunder. Without waiving, restricting or limiting any other right or remedy of the District for the Contractor's failure or refusal to continuously maintain the Record Drawings, the District may, upon reasonably determining that the Contractor has not, or is not, continuously maintaining the Record Drawings in a complete and accurate manner, take appropriate action to cause the continuous maintenance of complete and accurate Record Drawings, in which event all fees and costs incurred or associated with such action shall be charged to the Contractor and the District may deduct the amount of such fees and costs from any portion of the Contract Price then

or thereafter due the Contractor. In accordance with Article 8.4.2 of these General Conditions, prior to receipt of the Final Payment, Contractor shall deliver the Record Drawings to the Construction Manager for transmittal of the District.

4.11 Use of Site. The Contractor shall confine operations at the Site to areas permitted by law, ordinances or permits, subject to any restrictions or limitations set forth in the Contract Documents. The Contractor shall not unreasonably encumber the Site or adjoining areas with materials or equipment. The Contractor shall be solely responsible for providing security at the Site with all such costs included in the Contract Price. The District shall at all times have access to the Site.

4.12 Clean-Up. The Contractor shall at all times keep the Site and all adjoining areas free from the accumulation of any waste material or rubbish caused or generated by performance of the Work. Without limiting the generality of the foregoing, Contractor shall maintain the Site in a "broom-clean" standard on a daily basis. In the event that the Work of the Contract Documents includes painting and/or the installation of floor covering, prior to commencement of any painting operations or the installation of any flooring covering, the area and adjoining areas of the Site where paint is to be applied or floor covering is to be installed shall be in a "broom-clean" condition. Prior to completion of the Work, Contractor shall remove from the Site all rubbish, waste material, excess excavated material, tools, Construction Equipment, machinery, surplus material and any other items which are not the property of the District under the Contract Documents. At completion of the Work, the Contractor shall clean the building interior and exterior, including fixtures, equipment, walls, floors, ceilings, roofs, window sills and ledges, horizontal surfaces, areas where debris, dust and similar items have collected, clean and polish all glass, plumbing fixtures, finish hardware, metal/wood/stone finishes. As directed by the Construction Manager, District or Architect, the Contractor shall remove temporary fencing, barricades, planking, temporary sanitary facilities, temporary utility distributions and other temporary facilities. Upon completion of the Work, the Site and all adjoining areas shall be left in a neat and broom clean condition satisfactory to District. The Project Inspector or Construction Manager shall be authorized to direct the Contractor's clean-up obligations hereunder. If the Contractor fails to clean up as provided for in the Contract Documents, the District may do so, and all costs incurred in connection therewith shall be charged to the Contractor; the District may deduct such costs from any portion of the Contract Price then or thereafter due the Contractor.

4.13 Access to the Work. The Contractor shall provide the DSA, the District, the Construction Manager, the Project Inspector, the Architect and the Architect's consultant(s) with access to the Work, whether in place, preparation and progress and wherever located.

4.14 Information and Facilities/Services for the Project Inspector. The Contractor shall furnish the Project Inspector access to the Work for obtaining such information as may be necessary to keep the Project Inspector fully informed respecting the progress, quality and character of the Work and materials, equipment or other items incorporated therein. The Contractor shall provide, without adjustment of the Contract Price, for use by the Project Inspector, the District and Construction Manager the facilities, equipment, furnishings and services set forth in the Special Conditions. If the Contractor does not provide the facilities, furnishings, equipment and services set forth in the Special Conditions, or fails to pay timely any charges or fees arising out of the use of the same, the District may, as applicable, procure facilities, furnishings, equipment and services required by the Contract Documents or pay outstanding charges. Contractor shall reimburse the District for all costs, including the District's administrative costs, incurred by the District pursuant to the preceding sentence; in lieu of the Contractor's reimbursement and at the sole and exclusive discretion of the District, such costs may be deducted by the District from any

portion of the Contract Price or thereafter due the Contractor.

4.15 Patents and Royalties. The Contractor and the Surety shall defend, indemnify and hold harmless the District and its agents, employees and officers from any claim, demand or legal proceeding arising out of or pertaining, in any manner, to any actual or claimed infringement of patent rights in connection with performance of the Work under the Contract Documents.

4.16 Cutting and Patching. The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make the component parts thereof fit together properly. The Contractor shall not damage or endanger any portion of the Work, or the fully or partially completed construction of the District or separate contractors by cutting, patching, excavation or other alteration. When modifying new Work or when installing Work adjacent to an existing structure/facility, the Contractor shall match, as closely as conditions of the Site and materials will allow, the finishes, textures and colors of the existing structure/facility and refinish elements of the existing structure/facility. The Contractor shall not cut, patch or otherwise alter the construction by the District or separate contractor without the prior written consent of the District or separate contractor thereto, which consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold consent to the request of the District or separate contractor to cut, patch or otherwise alter the Work.

4.17 Encountering of Hazardous Materials. In the event the Contractor encounters Hazardous Materials at the Site which have not been rendered harmless or for which there is no provision in the Contract Documents for containment, removal, abatement or handling of such Hazardous Materials, the Contractor shall immediately stop the Work in the affected area, but shall diligently proceed with the Work in all other unaffected areas. Upon encountering such Hazardous Materials, the Contractor shall immediately notify the Project Inspector and the Architect, in writing, of such condition. The Contractor shall proceed with the Work in such affected area only after such Hazardous Materials have been rendered harmless, contained, removed or abated. In the event such Hazardous Materials are encountered, the Contractor shall be entitled to an adjustment of the Contract Time to the extent that the Work is stopped and Substantial Completion of the Work is affected thereby. In no event shall there be an adjustment to the Contract Price solely on account of the Contractor encountering such Hazardous Materials.

4.18 Wage Rates; Employment of Labor.

4.18.1 Determination of Prevailing Rates. Pursuant to the provisions of Division 2, Part 7, Chapter 1, Article 2 of the California Labor Code at §§1770 et seq., the District has obtained from the Director of the Department of Industrial Relations the general prevailing rate of per diem wages and the prevailing rate for holiday and overtime work in the locality in which the Work is to be performed. Holidays shall be as defined in the collective bargaining agreement applicable to each particular craft, classification or type of worker employed under the Contract. Per diem wages include employer payments for health and welfare, pensions, vacation, travel time and subsistence pay as provided in California Labor Code §1773.8, apprenticeship or other training programs authorized by California Labor Code §3093, and similar purposes when the term "per diem wages" is used herein. Holiday and overtime work, when permitted by law, shall be paid for at the rate of at least one and one-half (1½) times the above specified rate of per diem wages, unless otherwise specified. The Contractor shall post, at appropriate and conspicuous locations on the Site, a schedule showing all determined general prevailing wage rates.

4.18.2 Payment of Prevailing Rates. There shall be paid each worker of the Contractor, or

any Subcontractor, of any tier, engaged in the Work, not less than the general prevailing wage rate, regardless of any contractual relationship which may be alleged to exist between the Contractor or any Subcontractor, of any tier, and such worker.

4.18.3 Prevailing Rate Penalty. The Contractor shall, as a penalty, forfeit not more than Fifty Dollars ($50.00) to the District for each calendar day or portion thereof, for each worker paid less than the prevailing rates for such work or craft in which such worker is employed for the Work by the Contractor or by any Subcontractor, of any tier, in connection with the Work. The amount of the penalty for failure to pay applicable prevailing wage rates shall be determined and assessed in accordance with the standards established pursuant to Labor Code §1775(a)(2). The amount of the penalty shall be determined based on consideration of both of the following: (i) whether the failure of the Contractor or Subcontractor to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily corrected when brought to the attention of the Contractor or Subcontractor; and (ii) whether the Contractor or Subcontractor has a prior record of failing to meet its prevailing wage obligations. The penalty may not be less than ten dollars ($10) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rate, unless the failure of the Contractor or Subcontractor to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily corrected when brought to the attention of the contractor or subcontractor. The penalty may not be less than twenty dollars ($20) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rate, if the Contractor or Subcontractor has been assessed penalties within the previous three years for failing to meet its prevailing wage obligations on a separate contract, unless those penalties were subsequently withdrawn or overturned. The penalty may not be less than thirty dollars ($30) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rate, if the Labor Commissioner determines that the violation was willful, as defined in subdivision (c) of Section 1777.1. When the penalty amount due hereunder is collected from the Contractor or Subcontractor, any outstanding wage claim under Chapter 1 (commencing with Section 1720) of Part 7 of Division 2 against that Contractor or Subcontractor shall be satisfied before applying that amount to the penalty imposed on that Contractor or Subcontractor hereunder. The difference between prevailing wage rates and the amount paid to each worker each calendar day, or portion thereof, for which each worker paid less than the prevailing wage rate, shall be paid to each worker by the Contractor.

4.18.4 Payroll Records. Pursuant to California Labor Code §1776, the Contractor and each Subcontractor, of any tier, shall keep an accurate payroll record, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each person employed for the Work. The payroll records shall be certified and available for inspection at all reasonable hours at the principal office of the Contractor on the following basis: (i) a certified copy of an employee's payroll record shall be made available for inspection or furnished to such employee or his/her authorized representative on request; (ii) a certified copy of all payroll records shall be made available for inspection or furnished upon request to the District, the Division of Labor Standards Enforcement and the Division of Apprenticeship Standards of the Department of Industrial Relations; (iii) a certified copy of payroll records shall be made available upon request to the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through either the District, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided, the requesting party shall, prior to being provided the records, reimburse the cost of preparation by the

Contractor, Subcontractors and the entity through which the request was made; the public shall not be given access to such records at the principal office of the Contractor; (iv) the Contractor shall file a certified copy of the payroll records with the entity that requested such records within ten (10) days after receipt of a written request; (v) any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the District, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address and social security number. The name and address of the Contractor or any Subcontractor, of any tier, performing a part of the Work shall not be marked or obliterated. The Contractor shall inform the District of the location of payroll records, including the street address, city and county and shall, within five (5) working days, provide a notice of a change or location and address. In the event of noncompliance with the requirements of this Article 4.18.4, the Contractor shall have ten (10) days in which to comply, subsequent to receipt of written notice specifying in what respects the Contractor must comply herewith. Should noncompliance still be evident after such 10-day period, the Contractor shall, as a penalty to the District, forfeit Twenty-Five Dollars ($25.00) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, such penalties shall be withheld from any portion of the Contract Price then or thereafter due the Contractor. The Contractor is solely responsible for compliance with the foregoing provisions.

4.18.5 Hours of Work.

4.18.5.1 Limits on Hours of Work. Pursuant to California Labor Code §1810, eight (8) hours of labor shall constitute a legal day's work. Pursuant to California Labor Code §1811, the time of service of any worker employed at any time by the Contractor or by a Subcontractor, of any tier, upon the Work or upon any part of the Work, is limited and restricted to eight (8) hours during any one calendar day and forty (40) hours during any one calendar week, except as hereafter provided. Notwithstanding the foregoing provisions, Work performed by employees of Contractor or any Subcontractor, of any tier, in excess of eight (8) hours per day and forty (40) hours during any one week, shall be permitted upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half (1½) times the basic rate of pay.

4.18.5.2 Penalty for Excess Hours. The Contractor shall pay to the District a penalty of Twenty-five Dollars ($25.00) for each worker employed on the Work by the Contractor or any Subcontractor, of any tier, for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any calendar day and forty (40) hours in any one calendar week, in violation of the provisions of the California Labor Code, unless compensation to the worker so employed by the Contractor is not less than one and one-half (1½) times the basic rate of pay for all hours worked in excess of eight (8) hours per day.

4.18.5.3 Contractor Responsibility. Any Work performed by workers necessary to be performed after regular working hours or on Sundays or other holidays shall be performed without adjustment to the Contract Price or any other additional expense to the District. The Contractor shall be responsible for costs incurred by the District which arise out of Work performed by the Contractor at times other than regular working hours and regular working days. Upon determination of such costs, the District may deduct such costs from the Contract Price then or thereafter due the Contractor.

4.18.6 Apprentices.

4.18.6.1 Employment of Apprentices. Any apprentices employed to perform any of the Work shall be paid the standard wage paid to apprentices under the regulations of the craft or trade for which such apprentice is employed, and such individual shall be employed only for the work of the craft or trade to which such individual is registered. Only apprentices, as defined in California Labor Code §3077 who are in training under apprenticeship standards and written apprenticeship agreements under California Labor Code §§3070 et seq. are eligible to be employed for the Work. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which such apprentice is training.

4.18.6.2 Apprenticeship Certificate. When the Contractor or any Subcontractor, of any tier, in performing any of the Work employs workers in any Apprenticeable Craft or Trade, the Contractor and such Subcontractor shall apply to the Joint Apprenticeship Committee administering the apprenticeship standards of the craft or trade in the area of the site of the Work for a certificate approving the Contractor or such Subcontractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected, provided, however, that the approval as established by the Joint Apprenticeship Committee or Committees shall be subject to the approval of the Administrator of Apprenticeship. The Joint Apprenticeship Committee or Committees, subsequent to approving the Contractor or Subcontractor, shall arrange for the dispatch of apprentices to the Contractor or such Subcontractor in order to comply with California Labor Code §1777.5. The Contractor and Subcontractors shall submit contract award information to the applicable Joint Apprenticeship Committee which shall include an estimate of journeyman hours to be performed under the Contract, the number of apprentices to be employed, and the approximate dates the apprentices will be employed. There shall be an affirmative duty upon the Joint Apprenticeship Committee or Committees, administering the apprenticeship standards of the crafts or trades in the area of the site of the Work, to ensure equal employment and affirmative action and apprenticeship for women and minorities. Contractors or Subcontractors shall not be required to submit individual applications for approval to local Joint Apprenticeship Committees provided they are already covered by the local apprenticeship standards.

4.18.6.3 Ratio of Apprentices to Journeymen. The ratio of Work performed by apprentices to journeymen, who shall be employed in the Work, may be the ratio stipulated in the apprenticeship standards under which the Joint Apprenticeship Committee operates, but in no case shall the ratio be less than one hour of apprentice work for each five hours of labor performed by a journeyman, except as otherwise provided in California Labor Code §1777.5. The minimum ratio for the land surveyor classification shall not be less than one apprentice for each five journeymen. Any ratio shall apply during any day or portion of a day when any journeyman, or the higher standard stipulated by the Joint Apprenticeship Committee, is employed at the site of the Work and shall be computed on the basis of the hours worked during the day by journeymen so employed, except for the land surveyor classification. The Contractor shall employ apprentices for the number of hours computed as above before the completion of the Work. The Contractor shall, however, endeavor, to the greatest extent possible, to employ apprentices during the same time period that the journeymen in the same craft or trade are employed at the site of the Work. Where an

hourly apprenticeship ratio is not feasible for a particular craft or trade, the Division of Apprenticeship Standards, upon application of a Joint Apprenticeship Committee, may order a minimum ratio of not less than one apprentice for each five journeymen in a craft or trade classification. The Contractor or any Subcontractor covered by this Article and California Labor Code §1777.5, upon the issuance of the approval certificate, or if it has been previously approved in such craft or trade, shall employ the number of apprentices or the ratio of apprentices to journeymen stipulated in the apprenticeship standards. Upon proper showing by the Contractor that it employs apprentices in such craft or trade in the State of California on all of its contracts on an annual average of not less than one apprentice to each five journeymen, the Division of Apprenticeship Standards may grant a certificate exempting the Contractor from the 1-to-5 ratio as set forth in this Article and California Labor Code §1777.5. This Article shall not apply to contracts of general contractors, or to contracts of specialty contractors not bidding for work through a general or prime contractor, involving less than Thirty Thousand Dollars ($30,000.00) or twenty (20) working days. The term "Apprenticeable Craft or Trade," as used herein shall mean a craft or trade determined as an Apprenticeable occupation in accordance with rules and regulations prescribed by the Apprenticeship Council.

4.18.6.4 Exemption From Ratios. The Joint Apprenticeship Committee shall have the discretion to grant a certificate, which shall be subject to the approval of the Administrator of Apprenticeship, exempting the Contractor from the 1-to-5 ratio set forth in this Article when it finds that any one of the following conditions are met: (i) unemployment for the previous three-month period in such area exceeds an average of fifteen percent (15%) or; (ii) the number of apprentices in training in such area exceeds a ratio of 1-to-5 in relation to journeymen, or; (iii) the Apprenticeable Craft or Trade is replacing at least one-thirtieth (1/30) of its journeymen annually through apprenticeship training, either on a statewide basis or on a local basis, or; (iv) if assignment of an apprentice to any Work performed under the Contract Documents would create a condition which would jeopardize such apprentice's life or the life, safety or property of fellow employees or the public at large, or if the specific task to which the apprentice is to be assigned is of such a nature that training cannot be provided by a journeyman. When such exemptions from the 1-to-5 ratio between apprentices and journeymen are granted to an organization which represents contractors in a specific trade on a local or statewide basis, the member contractors will not be required to submit individual applications for approval to local Joint Apprenticeship Committees, provided they are already covered by the local apprenticeship standards.

4.18.6.5 Contributions to Trust Funds. The Contractor or any Subcontractor, of any tier, who, performs any of the Work by employment of journeymen or apprentices in any Apprenticeable Craft or Trade and who is not contributing to a fund or funds to administer and conduct the apprenticeship program in any such craft or trade in the area of the site of the Work, to which fund or funds other contractors in the area of the site of the Work are contributing, shall contribute to the fund or funds in each craft or trade in which it employs journeymen or apprentices in the same amount or upon the same basis and in the same manner as the other contractors do, but where the trust fund administrators are unable to accept such funds, contractors not signatory to the trust agreement shall pay a like amount to the California Apprenticeship Council. The Division of Labor Standards Enforcement is authorized to enforce the payment of such contributions to such fund(s) as set forth in California Labor Code §227. Such contributions shall not result in an increase in the Contract Price.

4.18.6.6 Contractor's Compliance. The responsibility of compliance with this Article for all Apprenticeable Trades or Crafts is solely and exclusively that of the Contractor. All decisions of the Joint Apprenticeship Committee(s) under this Article are subject to the provisions of California Labor Code §3081. In the event the Contractor willfully fails to comply with the provisions of this Article and California Labor Code §1777.5, pursuant to California Labor Code §1777.7, the Contractor shall: (i) be denied the right to bid on any public works contract for a period of one (1) year from the date the determination of non-compliance is made by the Administrator of Apprenticeship; and (ii) forfeit, as a civil penalty, Fifty Dollars ($50.00) for each calendar day of noncompliance. Notwithstanding the provisions of California Labor Code §1727, upon receipt of such determination, the District shall withhold such amount from the Contract Price then due or to become due. Any such determination shall be issued after a full investigation, a fair and impartial hearing, and reasonable notice thereof in accordance with reasonable rules and procedures prescribed by the California Apprenticeship Council. Any funds withheld by the District pursuant to this Article shall be deposited in the General Fund or other similar fund of the District. The interpretation and enforcement of California Labor Code §§1777.5 and 1777.7 shall be in accordance with the rules and procedures of the California Apprenticeship Council.

4.18.7 Employment of Independent Contractors. Pursuant to California Labor Code §1021.5, Contractor shall not willingly and knowingly enter into any agreement with any person, as an independent contractor, to provide any services in connection with the Work where the services provided or to be provided requires that such person hold a valid contractors license issued pursuant to California Business and Professions Code §§7000 et seq. and such person does not meet the burden of proof of his/her independent contractor status pursuant to California Labor Code §2750.5. In the event that Contractor shall employ any person in violation of the foregoing, Contractor shall be subject to the civil penalties under California Labor Code §1021.5 and any other penalty provided by law. In addition to the penalties provided under California Labor Code §1021.5, Contractor's violation of this Article 4.18.7 or the provisions of California Labor Code §1021.5 shall be deemed an event of Contractor's default under Article 15.1 of these General Conditions. The Contractor shall require any Subcontractor or Sub-Subcontractor performing or providing any portion of the Work to adhere to and comply with the foregoing provisions.

4.19 Assignment of Antitrust Claims. Pursuant to California Government Code §4551, the Contractor and its Subcontractor(s), of any tier, hereby offers and agrees to assign to the District all rights, title and interest in and to all causes of action they may have under Section 4 of the Clayton Act, (15 U.S.C. §15) or under the Cartwright Act (California Business and Professions Code §§16700 et seq.), arising from purchases of goods, services or materials hereunder or any Subcontract. This assignment shall be made and become effective at the time the District tenders Final Payment to the Contractor, without further acknowledgment by the parties. If the District receives, either through judgment or settlement, a monetary recovery in connection with a cause of action assigned under California Government Code §§4550 et seq., the assignor thereof shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the District any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the District as part of the Contract Price, less the expenses incurred by the District in obtaining that portion of the recovery. Upon demand in writing by the assignor, the District shall, within one year from such demand, reassign the cause of action assigned pursuant to this Article if the assignor has been or may have been injured by the violation of law for which the cause of action arose: and (i) the District has not been injured thereby; or (ii) the District declines to file a court action for the

cause of action.

4.20 Limitations Upon Site Activities. Except in the circumstances of an emergency, no construction activities shall be permitted at or about the Site except during the District's hours and days set forth in the Special Conditions. Work performed outside of the hours and days noted in the Special Conditions will not result in adjustment of the Contract Time or the Contract Price; unless Work outside of the hours and days noted in the Special Conditions is expressly authorized by the District.

4.21 Labor Compliance Program ("LCP"). Pursuant to Labor Code §1771.7, the District has established a Labor Compliance Program. Unless otherwise expressly provided in the Contract Documents, the LCP is applicable to the entirety of the Work. A material obligation of the Contractor awarded the Contract is its strict compliance with all applicable provisions and requirements of the LCP and its strict enforcement of such provisions and requirements on its Subcontractors and others under the direction or control of the Contractor relating to the Work or the Project. A copy of the LCP is available for review and reproduction in the District's administrative office.

4.21.1 Pre-Construction Conference. In addition to the matters included in the scope of the Pre-Conference, as set forth in Article 4.3.6.1 of the General Conditions, the Pre-Construction conference will include a discussion of the subject matters indicated in the Pre-Construction Conference portion of the LCP, including general requirements of the LCP, measures for compliance with, and enforcement of, LCP requirements, and penalties for failure to comply. The Contractor awarded the Contract and each Subcontractor identified by such Contractor in its Subcontractors List submitted with its Bid Proposal. The foregoing notwithstanding, if the District reasonably determines that individuals or entities in addition to the Contractor and its listed Subcontractor are necessary attendees at the Pre-Construction conference, the Contractor is responsible for measures necessary to secure the attendance of such other persons or entities at the Pre-Construction conference.

4.21.2 Maintenance and Weekly Submission of Certified Payroll Records. The Contractor and each of its Subcontractors shall maintain accurate, complete and current payroll records as required by the LCP. During the progress of the Work, until Final Payment is due, the Contractor and its Subcontractors shall maintain and submit Certified Payroll Records on a weekly basis. No later than the 5:00 P.M. on each Monday during the Work, the Contractor shall submit to the Construction Manager Certified Payroll Records for the Contractor and its Subcontractors for all persons providing or performing any Work in the immediately preceding week. The Certified Payroll Records maintained and submitted hereunder shall be in strict conformity with requirements established in the LCP. A material obligation of the Contractor under the Contract Documents is the Contractor's and its Subcontractor's strict compliance with requirements of the LCP relating to maintenance and submission of Certified Payroll Records. The Contractor's submittal of weekly Certified Payroll Records in strict conformity with requirements of the LCP is an express condition precedent to the District's obligation to disburse any Progress Payment to the Contractor and the Contractor's entitlement to receipt of any Progress Payment.

4.21.3 District Audit of Certified Payroll Records. Pursuant to the LCP, the District shall, as appropriate or necessary conduct audits of Certified Payroll Records. If upon conducting such audits, the District determines that the Contractor or its Subcontractors have committed violations of the LCP, the Contractor and/or its Subcontractors shall be subject to all penalties, assessments and other remedies set forth in the LCP or by operation of law for

such violations.

4.21.4 Contractor's Rights Upon Determination of Violation. If upon audit of Certified Payroll Records, the District determines that the Contractor has violated, or failed to comply with, applicable provisions of the LCP, the Contractor shall be subject to the penalties, assessments and other remedies set forth in the LCP for the Contractor's violation of, or failure to comply with, the LCP. To the extent applicable, the Contractor shall be entitled to contest or appeal such determination, as set forth in the LCP, provided that the Contractor strict complies with all applicable provisions of applicable law and the LCP relating to the initiation and completion of proceeding to contest or appeal a determination that the Contractor has committed a violation of, is has failed to comply with, the LCP.

4.21.5 LCP Not Exclusive. The LCP is not the exclusive source of Contractor's obligations relating to the payment of prevailing wages and compliance with apprenticeship standards. A material obligation of the Contractor under the Contract Documents is the Contractor's compliance with all applicable laws, codes, regulations, rules and orders relating to the employment of labor, working conditions, and payments to laborers for Work performed or provided by laborers.

4.22 State Audit. Pursuant to and in accordance with the provisions of Government Code §8546.7, or any amendments thereto, all books, records and files of the District, the Contractor, or any Subcontractor relating to the Work or the performance of work involving the expenditure of public funds in excess of Ten Thousand Dollars ($10,000), including, but not limited to, the administration thereof, shall be subject to the examination and audit by the State Auditor of the State of California, at the request of District or as part of any audit of District, for a period of three (3) years after Final Payment is made under this Contract. Contractor shall preserve and cause to be preserved such books, records and files for the audit period. Upon request of the District, the Contractor shall make all such books, records or files available for review, inspection and/or reproduction.

ARTICLE 5: SUBCONTRACTORS

5.1 Subcontracts. Any Work performed for the Contractor by a Subcontractor shall be pursuant to a written agreement between the Contractor and such Subcontractor which specifically incorporates by reference the Contract Documents and which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents, including without limitation, the policies of insurance required under Article 6 of these General Conditions and the termination provisions of Article 15, and obligates the Subcontractor to assume toward the Contractor all the obligations and responsibilities of the Contractor which by the Contract Documents the Contractor assumes toward the District, the Project Inspector, DSA, the Construction Manager and the Architect. The foregoing notwithstanding, no contractual relationship shall exist, or be deemed to exist, between any Subcontractor and the District, unless the Contract is terminated and District, in writing, elects to assume the Subcontract. Each Subcontract for a portion of the Work shall provide that such Subcontract may be assigned to the District if the Contract is terminated by the District pursuant to Article 15.1 hereof, subject to the prior rights of the Surety obligated under a bond relating to the Contract. The Contractor shall provide to the District copies of all executed Subcontracts and Purchase Orders to which Contractor is a party within thirty (30) days after Contractor's execution of the Agreement. During performance of the Work, the Contractor shall, from time to time, as and when requested by the District, the Architect or the Construction Manager provide the District with copies of any and all Subcontracts or Purchase Orders relating to the Work and all modifications thereto. The

Contractor's failure or refusal, for any reason, to provide copies of such Subcontracts or Purchase Orders in accordance with the two preceding sentences is Contractor's default of a material term of the Contract Documents.

5.2 Substitution of Listed Subcontractor.

5.2.1 Substitution Process. Any request of the Contractor to substitute a listed Subcontractor will be considered only if such request is in strict conformity with this Article 5.2 and California Public Contract Code §4107. All costs incurred by the District, including without limitation, costs of the Project Inspector, the Architect, the Construction Manager or attorneys fees in the review and evaluation of a request to substitute a listed Subcontractor shall be borne by the Contractor; such costs may be deducted by the District from the Contract Price then or thereafter due the Contractor.

5.2.2 Responsibilities of Contractor Upon Substitution of Subcontractor. The District's consent to Contractor's substitution of a listed Subcontractor shall not relieve Contractor from its obligation to complete the Work within the Contract Time and for the Contract Price. The substitution of a listed Subcontractor shall not, under any circumstance, result in, or give rise to any to any increase of the Contract Price or the Contract Time on account of such substitution. In the event of the District's consent to the substitution of a listed Subcontractor, the Architect shall determine the extent to which, if any, revised or additional Submittals will be required of the newly substituted Subcontractor. In the event that the Architect determines that revised or additional Submittals are required of the newly substituted Subcontractor, the Architect shall promptly notify the Contractor, in writing, of such requirement. In such event, revised or additional Submittals shall be submitted to Architect not later than thirty (30) days following the date of the Architect's written notice to the Contractor pursuant to the foregoing sentence; provided that if in the reasonable and good faith judgment of the Architect, the progress of the Work or completion of the Work requires submission of additional or revised Submittals by the newly substituted Subcontractor in less than thirty (30) days, the Architect shall so state in its written notice to the Contractor. In the event that the revised or additional Submittals are not submitted by Contractor within thirty (30) days, or such earlier time as determined by the Architect pursuant to the preceding sentence, following the Architect's written notice of the requirement for revised or additional Submittals, Contractor shall be subject to the per diem assessments for late Submittals as set forth in Article 4.7.2.1 of these General Conditions. Any revised or additional Submittals required pursuant to this Article 5.2.2 shall conform with the requirements of Article 4.7 of these General Conditions. Contractor shall reimburse the District for all fees and costs, including without limitation fees of the Construction Manager, Architect and/or any design consultant to the Architect or the District and DSA fees, incurred or associated with the processing, review and evaluation of any revised or additional Submittals required pursuant to this Article 5.2.2; the District may deduct such fees and costs from any portion of the Contract Price then or thereafter due the Contractor. In the event that additional or revised Submittals are required pursuant to this Article 5.2.2, such requirement shall not result in an increase to the Contract Time or the Contract Price.

5.3 Subcontractors' Work. Whenever the Work of a Subcontractor is dependent upon the Work of the Contractor or another Subcontractor, the Contractor shall require the Subcontractor to: (a) coordinate its Work with the dependent Work; (b) provide necessary dependent data and requirements; (c) supply and/or install items to built into the dependent Work of others; (d) make appropriate provisions for dependent Work of others; (e) carefully examine and understand the portions of the Contract Documents (including Drawings, Specifications and Field Clarifications)

and Submittals relating to the dependent Work; and (f) examine the existing dependent Work and verify that the dependent Work is in proper condition for the Subcontractor's Work. If the dependent Work is not in a proper condition, the Subcontractor shall notify the Contractor in writing and not proceed with the Subcontractor's Work until the dependent Work has been corrected or replaced and is in a proper condition for the Subcontractor's Work.

5.4 Subcontractors' Compliance With LCP. As applicable, each Subcontractor performing Work shall comply with the LCP. A material obligation of the Contractor is its enforcement of Subcontractor obligations relating to the LCP; failure of the Contractor to strictly enforce such Subcontractor obligations is a material obligation of the Contractor under the Contract Documents.

ARTICLE 6: INSURANCE; INDEMNITY; BONDS

6.1 Workers' Compensation Insurance; Employer's Liability Insurance. The Contractor shall purchase and maintain Workers' Compensation Insurance as will protect the Contractor from claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. Contractor shall purchase and maintain Employer's Liability Insurance covering bodily injury (including death) by accident or disease to any employee which arises out of the employee's employment by Contractor. The Employer's Liability Insurance required of Contractor hereunder may be obtained by Contractor as a separate policy of insurance or as an additional coverage under the Workers' Compensation Insurance required to be obtained and maintained by Contractor hereunder. The limits of liability for the Employer's Liability Insurance required hereunder shall be as set forth in the Special Conditions.

6.2 Commercial General Liability and Property Insurance. The Contractor shall purchase and maintain Commercial General Liability and Property Insurance covering the types of claims set forth below which may arise out of or result from Contractor's operations under the Contract Documents and for which the Contractor may be legally responsible: (i) claims for damages because of bodily injury, sickness or disease or death of any person other than the Contractor's employees; (ii) claims for damages insured by usual personal injury liability coverage which are sustained (a) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (b) by another person; (iii) claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom; (iv) claims for damages because of bodily injury, death of a person or property damages arising out of ownership, maintenance or use of a motor vehicle; (v) contractual liability insurance applicable to the Contractor's obligations under the Contract Documents; and (vi) Completed Operations.

6.3 Builder's Risk "All-Risk" Insurance. The Contractor shall obtain Builders Risk insurance covering the full insurable value of the Work from risks of loss, damage or destruction of Work in progress or in place at the Site prior to Final Acceptance including without limitation coverage for losses resulting from the perils of fire, malicious mischief, vandalism, and collapse. The Builder's Risk Insurance Policy shall include coverage for seismic risks if so indicated in the Special Conditions.

6.4 Insurance Policy Requirements. Each policy of insurance required by the Contract Documents shall confirm the following requirements.

6.4.1 Minimum Coverage Amounts. The insurance required of the Contractor hereunder shall be written for not less than any limits of liability specified in the Contract Documents, or required by law, whichever is greater. In the event of any loss or damage covered by a policy of insurance required to be obtained and maintained by the Contractor hereunder, the Contractor shall be solely and exclusively responsible for the payment of the deductible, if any, under such policy of insurance, without adjustment to the Contract Price on account thereof.

6.4.2 Required Qualifications of Insurers. The Contractor and Subcontractors' policies of Commercial General Liability and Property/Casualty insurance and the Contractor's Builders Risk insurance will be accepted by the District only if the insurer(s) are: (a) A.M. Best rated A- or better; (b) A.M. Best Financial Size Category VII or higher; and (c) authorized under California law to transact business in the State of California and authorized to issue insurance policies in the State of California. If at any time during performance of the Work, the insurer(s) issuing a policy of insurance covering Commercial General Liability, Property/Casualty or Builder Risk is/are not A.M. Best rated A- or better and is/are not A.M. Best Financial Size Category VII or higher, the Contractor or Subcontractor, as applicable shall within thirty (30) days of the District's written notice of the insufficiency of an insurer to the Contractor, obtain insurance coverage(s) from alternative insurer(s) who is/are then A.M. Best rated A- or better and who is/are A.M. Best Financial Size Category VII or higher. If the Contractor fails to deliver Certificate(s) of Insurance from an alternative insurer(s) meeting or exceeding the A.M. Best rating and A.M. Best Financial Size Category set forth above, within thirty (30) days of the date of the District's issuance of a written notice pursuant to the preceding sentence, in addition to any other right or remedy of the District under the Contract Documents or arising by operation of law, the District may withhold disbursement of any Progress Payment otherwise due hereunder until the Contractor has delivered such Certificate(s) of Insurance from an alternative insurer(s).

6.5 Evidence of Insurance; Subcontractor's Insurance.

6.5.1 Certificates of Insurance. Prior to commencing the Work, Contractor shall deliver to the District Certificates of Insurance evidencing the insurance coverages required by the Contract Documents. Failure or refusal of the Contractor to so deliver Certificates of Insurance may be deemed by the District to be a default of a material obligation of the Contractor under the Contract Documents, and thereupon the District may proceed to exercise any right or remedy provided for under the Contract Documents or at law. The Certificates of Insurance and the insurance policies required by the Contract Documents shall contain a provision that coverages afforded under such policies will not be canceled or allowed to expire until at least thirty (30) days prior written notice has been given to the District. The insurance policies required of Contractor hereunder shall also name the District, the Architect and the Construction Manager as additional insureds as their interests may appear. Should any policy of insurance be canceled before Final Acceptance of the Work by the District and the Contractor fails to immediately procure replacement insurance as required, the District reserves the right to procure such insurance and to deduct the premium cost thereof and other costs incurred by the District in connection therewith from any sum then or thereafter due the Contractor under the Contract Documents. The Contractor shall, from time to time, furnish the District, when requested, with satisfactory proof of coverage of each type of insurance required by the Contract Documents; failure of the Contractor to comply with the District's request may be deemed by the District to be a default of a material obligation of the Contractor under the Contract Documents.

6.5.2 Subcontractors' Insurance. Contractor shall require that every Subcontractor, of any tier, performing or providing any portion of the Work obtain and maintain the policies of insurance set forth in Articles 6.1 and 6.2 of these General Conditions; the coverages and limits of liability of such policies of insurance to be obtained and maintained by Subcontractors shall be as set forth in the Special Conditions. The policies of insurance to be obtained and maintained by Subcontractors hereunder are in addition to, and not in lieu of, Contractor obtaining and maintaining such policies of insurance. Each of the policies of insurance obtained and maintained by a Subcontractor hereunder shall conform with the requirements of this Article 6. Upon request of the District, Contractor shall promptly deliver to the District Certificates of Insurance evidencing that the Subcontractors have obtained and maintained policies of insurance in conformity with the requirements of this Article 6. Failure or refusal of the Contractor to provide the District with Subcontractors' Certificates of Insurance evidencing the insurance coverages required hereunder is a material default of Contractor hereunder.

6.6 Maintenance of Insurance. Any insurance bearing on the adequacy of performance of Work shall be maintained after the District's Final Acceptance of all of the Work for the full one year correction of Work period and any longer specific guarantee or warranty periods set forth in the Contract Documents. Should such insurance be canceled before the end of any such periods and the Contractor fails to immediately procure replacement insurance as specified, the District reserves the right to procure such insurance and to charge the cost thereof to the Contractor. Nothing contained in these insurance requirements is to be construed as limiting the extent of the Contractor's responsibility for payment of damages resulting from its operations or performance of the Work under the Contract Documents, including without limitation the Contractor's obligation to pay Liquidated Damages. In no instance will the District's exercise of its option to occupy and use completed portions of the Work relieve the Contractor of its obligation to maintain insurance required under this Article until the date of Final Acceptance of the Work by the District, or such time thereafter as required by the Contract Documents. The insurer providing any insurance coverage required hereunder shall be to the reasonable satisfaction of the District.

6.7 Contractor's Insurance Primary. All insurance and the coverages thereunder required to be obtained and maintained by Contractor hereunder, if overlapping with any policy of insurance maintained by the District, shall be deemed to be primary and non-contributing with any policy maintained by the District and any policy or coverage thereunder maintained by District shall be deemed excess insurance. To the extent that the District maintains a policy of insurance covering property damage arising out of the perils of fire or other casualty covered by the Contractor's Builder's Risk Insurance or the Comprehensive General Liability Insurance of the Contractor or any Subcontractor, the District, Contractor and all Subcontractors waive rights of subrogation against the others. The costs for obtaining and maintaining the insurance coverages required herein shall be included in the Contract Price.

6.8 Indemnity. Unless arising solely out of the active negligence, gross negligence or willful misconduct the District or the Architect, the Contractor shall indemnify, defend and hold harmless the Indemnified Parties who are: (i) the District and its Board of Trustees, officers, employees, agents and representatives (including the Project Inspector); (ii) the Architect and its consultants for the Work and their respective agents and employees; and (iii) the Construction Manager and its agents and employees. The Contractor's obligations hereunder includes indemnity, defense and hold harmless of the Indemnified Parties from and against any and all damages, losses, claims, demands or liabilities whether for damages, losses or other relief, including, without limitation attorneys fees and costs which arise, in whole or in part, from the

Work, the Contract Documents or the acts, omissions or other conduct of the Contractor, any Subcontractor or any person or entity engaged by them for the Work. The Contractor's obligations under the foregoing include without limitation: (i) injuries to or death of persons; (ii) damage to property; or (iii) theft or loss of property; (iv) Stop Notice claims asserted by any person or entity in connection with the Work; and (v) other losses, liabilities, damages or costs resulting from, in whole or part, any acts, omissions or other conduct of Contractor, any of Contractor's Subcontractors, of any tier, or any other person or entity employed directly or indirectly by Contractor in connection with the Work and their respective agents, officers or employees. The obligations of the Contractor, as set forth in (v) above shall include, without limitation losses, costs, expenses, damages and other claims asserted by any other Contractor to the District in connection with the Work or in connection with a work of improvement related to or affected by the Work. If any action or proceeding, whether judicial, administrative, arbitration or otherwise, shall be commenced on account of any claim, demand or liability subject to Contractor's obligations hereunder, and such action or proceeding names any of the Indemnified Parties as a party thereto, the Contractor shall, at its sole cost and expense, defend the named Indemnified Parties in such action or proceeding with counsel reasonably satisfactory to the named Indemnified Parties. In the event that there shall be any judgment, award, ruling, settlement, or other relief arising out of any such action or proceeding to which any of the Indemnified Parties are subject to, or bound by, Contractor shall pay, satisfy or otherwise discharge any such judgment, award, ruling, settlement or relief; Contractor shall indemnify and hold harmless the Indemnified Parties from any and all liability or responsibility arising out of any such judgment, award, ruling, settlement or relief. The Contractor's obligations hereunder are binding upon Contractor's Performance Bond Surety and these obligations shall survive notwithstanding Contractor's completion of the Work or the termination of the Contract.

6.9 Payment Bond; Performance Bond. Prior to commencement of the Work, the Contractor shall furnish a Performance Bond as security for Contractor's faithful performance of the Contract and a Labor and Material Payment Bond as security for payment of persons or entities performing work, labor or furnishing materials in connection with Contractor's performance of the Work under the Contract Documents. Unless otherwise stated in the Special Conditions, the amounts of the Performance Bond and the Payment Bond required hereunder shall be one hundred percent (100%) of the Contract Price. Said Labor and Material Payment Bond and Performance Bond shall be in the form and content set forth in the Contract Documents. The failure or refusal of the Contractor to furnish either the Performance Bond or the Labor and Material Payment Bond in strict conformity with this Article 6.9 may be deemed by the District as a default by the Contractor of a material obligation hereunder. Upon request of the Contractor, the District may consider and accept, but is not obligated to do so, multiple sureties on such bonds. The Surety on any bond required under the Contract Documents shall be: (i) an Admitted Surety Insurer as that term is defined in California Code of Civil Procedure §995.120; (ii) A.M. Best rated A- or better; and (iii) A.M. Best Financial Size Category VII or better. The Contractor's delivery of Bonds issued by a Surety who does not meet or exceed each of the criteria set forth above will be rejected.

ARTICLE 7: CONTRACT TIME

7.1 Substantial Completion of the Work Within Contract Time. Unless otherwise expressly provided in the Contract Documents, the Contract Time is the period of time, including authorized adjustments thereto, allotted in the Contract Documents for achieving Substantial Completion of the Work. The date for commencement of the Work is the date established by the Notice to Proceed issued by the District pursuant to the Agreement, which shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the

Contractor is responsible. The date of Substantial Completion is the date certified by the Architect and the Project Inspector as such in accordance with the Contract Documents.

7.2 Progress and Completion of the Work.

7.2.1 Time of Essence. Time limits stated in the Contract Documents are of the essence. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing and achieving Substantial Completion of the Work. The Contractor shall employ and supply a sufficient force of workers, material and equipment, and prosecute the Work with diligence so as to maintain progress, to prevent Work stoppage and to achieve Substantial Completion of the Work within the Contract Time.

7.2.2 Substantial Completion. Substantial Completion is that stage in the progress of the Work when the Work is complete in accordance with the Contract Documents so the District can occupy or use the Work for its intended purpose. Substantial Completion shall be determined by the Architect, the Construction Manager and the Project Inspector upon request by the Contractor in accordance with the Contract Documents. The good faith and reasonable determination of Substantial Completion by the Project Inspector, the Construction Manager and the Architect shall be controlling and final.

7.2.3 Correction or Completion of the Work After Substantial Completion.

7.2.3.1 Punchlist. Upon achieving Substantial Completion of the Work, the District, The Project Inspector, the Construction Manager, the Architect and the Contractor shall jointly inspect the Work and prepare a comprehensive list of items of the Work to be corrected or completed by the Contractor ("the Punchlist"). The exclusion of, or failure to include, any item on the Punchlist shall not alter or limit the obligation of the Contractor to complete or correct any portion of the Work in accordance with the Contract Documents.

7.2.3.2 Time for Completing Punchlist Items. In addition to setting forth items for correction or completion pursuant to Article 7.2.3.1, the Construction Manager, if any, Contractor and Architect shall, after the joint inspection, establish a reasonable time for Contractors' completion of all Punchlist items. If mutual agreement is not reached for the Contractor's completion of Punchlist items, the Architect shall determine such time, and in such event, the time determined by the Architect shall be final and binding upon the District and Contractor so long as the Architect's determination is made in good faith. The Contractor shall promptly and diligently proceed to complete all Punchlist items within the time established. In the event that the Contractor shall fail or refuse, for any reason, to complete all Punchlist items within the time established, Contractor shall be subject to assessment of Liquidated Damages in accordance with Article 7.4 hereof. The foregoing notwithstanding, if the Contractor fails or refuses to complete all Punchlist items, the District may in its sole and exclusive discretion and without further notice to Contractor, elect to cause the completion of all remaining Punchlist items provided, however that such election by the District is in addition to and not in lieu of any other right or remedy of the District under the Contract Documents or at law. If the District elects to complete Punchlist items of the Work, pursuant to the foregoing, Contractor shall be responsible for all costs incurred by the District in connection herewith and the District may deduct such costs from the Contract Price then or thereafter due the Contractor, if these costs exceed the remaining Contract Price due to the Contractor, the Contractor and the Performance Bond Surety are liable to District

for any such excess costs

7.2.4 Final Completion. Final Completion is that stage of the Work when all Work has been completed in accordance with the Contract Documents, including without limitation, the performance of all correction or completion items noted upon Substantial Completion, and the Contract has been otherwise fully performed by the Contractor. Final Completion shall be determined by the Architect and the Project Inspector upon request of the Contractor. The good faith and reasonable determination of Final Completion by the Project Inspector and the Architect shall be controlling and final.

7.2.5 Contractor Responsibility for Multiple Inspections. In the event the Contractor shall request determination of Substantial Completion or Final Completion by the Project Inspector and the Architect and it is determined by the Project Inspector and the Architect that the Work does not then justify certification of Substantial Completion or Final Completion and re-inspection is required at a subsequent time to make such determination, the Contractor shall be responsible for all costs of such reinspection, including without limitation, the fees of the Architect and the salary of the Project Inspector. The District may deduct such costs from the Contract Price then due or thereafter due to the Contractor.

7.2.6 Final Acceptance. Final Acceptance of the Work shall occur upon approval of the Work by the District's Board of Trustees; such approval shall be submitted for adoption at the next regularly scheduled meeting of the District's Board of Trustees after the determination of Final Completion. The commencement of any warranty or guarantee period under the Contract Documents shall be deemed to be the date upon which the District's Board of Trustees approves of the Final Acceptance of the Work.

7.3 Construction Schedule.

7.3.1 Submittal of Preliminary Construction Schedule. Within five (5) days following execution of the Agreement, the Contractor shall prepare and submit to the District, the Construction Manager and the Architect a Preliminary Construction Schedule indicating, in graphic form, the estimated rate of progress and sequence of all Work required under the Contract Documents. The purpose of the Preliminary Construction Schedule is to assure adequate planning and execution of the Work so that it is completed within the Contract Time and to permit evaluation of the progress of the Work. Unless otherwise provided in the Special Conditions, the Construction Schedules required under this Article 7 shall; (i) be prepared utilizing the then most recent edition of Primerva Suretrak or Microsoft Project; (ii) indicate the date(s) for commencement and completion of various portions of the Work including without limitation, procurement, fabrication and delivery of major items, materials or equipment; (iii) indicate manpower and other resources required for completion of each Construction Schedule activity; (iv) indicate costs for completion of each Construction Schedule activity; (v) identify each Submittal required by the Contract Documents, the date for the Contractor's submission of each Submittal and the date for the return of the reviewed Submittal to the Contractor. The Contractor may submit a Preliminary Construction Schedule depicting completion of the Work in a duration shorter than the Contract Time; provided that such Preliminary Construction Schedule shall not be a basis for adjustment to the Contract Price in the event that completion of the Work shall occur after the time depicted therein, nor shall such Preliminary Construction Schedule be the basis for any extension of the Contract Time, the Contractor's entitlement to any extension of the Contract Time shall be based upon the Contract Time and not on any shorter duration which may be depicted in the Contractor's Preliminary Construction Schedule. If the Construction

Schedules required under this Article 7.3 incorporate therein any "float" time, such float shall be deemed to jointly belong to and owned by the District and the Contractor. As used herein, "float time" shall be deemed to refer to the time between earliest finish date and the latest finish date of each activity shown on the Construction Schedule.

7.3.2 Review of Preliminary Construction Schedule. The District, the Construction Manager and the Architect shall review the Preliminary Construction Schedule submitted by the Contractor pursuant to Article 7.3.1 above for conformity with the requirements of the Contract Documents. Within fifteen (15) days of the date of receipt of the Preliminary Construction Schedule, the Preliminary Construction Schedule will be returned to the Contractor with comments to the form or content thereof. Review of the Preliminary Progress Schedule and any comments thereto by the District, the Construction Manager and/or the Architect shall not be deemed to be the assumption of construction means, methods or sequences by the District, the Construction Manager or the Architect, all of which remain the Contractor's obligations under the Contract Documents.

7.3.3 Preparation and Submittal of Contract Construction Schedule. Within ten (10) days of the District's return of the Preliminary Construction Schedule to the Contractor pursuant to Article 7.3.2 above, the Contractor shall prepare and submit to the Architect and the Project Manger the Construction Schedule which incorporates therein the comments to the Preliminary Construction Schedule. Upon the Contractor's submittal of such Construction Schedule, the District, the Construction Manager and the Architect shall review the same for purposes of determining conformity with the requirements of the Contract Documents. Within fifteen (15) days of the receipt of the Construction Schedule, the District will approve such Construction Schedule or will return the same to the Contractor with comments to the form or content. In the event there are comments to the form or content thereof, the Contractor, shall within seven (7) days of receipt of such comments, revise and resubmit the Construction Schedule incorporating therein such comments. Upon the District's approval of the form and content of a Construction Schedule, the same shall be deemed the "Approved Construction Schedule." The District's approval of a Construction Schedule shall be for the sole and limited purpose of determining conformity with the requirements of the Contract Documents. By the Approved Construction Schedule, the District shall not be deemed to have exercised control over, or approval of, construction means, methods or sequences, all of which remain the responsibility and obligation of the Contractor in accordance with the terms of the Contract Documents. Further, the Approved Construction Schedule shall not operate to limit or restrict any of Contractor's obligations under the Contract Documents nor relieve the Contractor from the full, faithful and timely performance of such obligations in accordance with the terms of the Contract Documents. The activities, commencement and completion dates of activities, and the sequencing of activities depicted on the Approved Construction Schedule shall not be modified or revised by the Contractor without the prior consent, or direction, of the District and the Architect. Updates to the Approved Construction Schedule pursuant to Article 7.3.5 below shall not be deemed revisions to the Approved Construction Schedule. In the event that the Approved Construction Schedule shall depict completion of the Work in a duration shorter than the Contract Time, the same shall not be a basis for an adjustment of the Contract Time or the Contract Price in the event that actual completion of the Work shall occur after such the time depicted in such Approved Construction Schedule. In such event, the Contract Price shall not be subject to adjustment on account of any additional costs incurred by the Contractor to complete the Work prior to the Contract Time, as adjusted in accordance with the terms of the Contract Documents. Any adjustment of the Contract Time or the Contract Price shall be based upon the Contract Time set forth in the Contract Documents and not any shorter duration

which may depicted in the Approved Construction Schedule.

7.3.4 Revisions to Approved Construction Schedule. In the event that the progress of the Work or the sequencing of the activities of the Work shall materially differ from that indicated in the Approved Construction Schedule, as determined by the District in its reasonable discretion and judgment, the District may direct the Contractor to revise the Approved Construction Schedule; within fifteen (15) days of the District's direction, the Contractor shall prepare and submit to the Architect and the Construction Manager a revised Approved Construction Schedule, for review and approval by the District. The Contractor may request consent of the District to revise the Approved Construction Schedule. Any such request shall be considered by the District only if in writing setting forth the Contractor's proposed revision(s) to the Approved Construction Schedule and the reason(s) therefor. The District may consent to, or deny, any such request of the Contractor to revise the Approved Construction Schedule in its reasonable discretion.

7.3.5 Updates to Approved Construction Schedule. The Contractor shall monitor and update the Approved Construction Schedule on a monthly basis, or more frequently as required by the conditions or progress of the Work, or as may be requested by the District. The Contractor shall provide the District, the Construction Manager and the Architect with updated Approved Construction Schedules indicating progress achieved and activities commenced or completed within the prior updated Approved Construction Schedule. Updates to the Approved Construction Schedule shall not include any revisions to the activities, commencement and completion dates of activities or the sequencing of activities depicted on the Approved Construction Schedule. Any such revisions to the Approved Construction Schedule shall result in the District's rejection of such update and Contractor shall, within seven (7) days of the District's rejection of such update, submit to the Architect and the Construction Manager an Updated Approved Construction Schedule which does not incorporate any such revisions. The Contractor shall also submit, with its updates to the Approved Construction Schedule a narrative statement including a description of current and anticipated problem areas of the Work, delaying factors and their impact, and an explanation of corrective action taken or proposed by the Contractor. If the progress of the Work is behind the Approved Construction Schedule, the Contractor shall indicate what measures will be taken to place the Work back on schedule. The District may, from time to time, and in the District's sole and exclusive discretion, transmit to the Contractor's Performance Bond Surety the Approved Construction Schedule, any updates thereof and the narrative statement described hereinabove. The District's election to transmit, or not to transmit such information, to the Contractor's Performance Bond Surety shall not limit the Contractor's obligations under the Contract Documents.

7.3.6 Contractor Responsibility for Construction Schedule. The Contractor shall be responsible for the preparation, submittal and maintenance of the Construction Schedules required by the Contract Documents, and any failure of the Contractor to do so may be deemed by the District as the Contractor's default in the performance of a material obligation under Contract Documents. Any and all costs or expenses required or incurred to prepare, submit, maintain, and update the Construction Schedules shall be solely that of the Contractor and no such cost or expense shall be charged to the District. The Contract Price shall not be subject to adjustment on account of costs, fees or expenses incurred or associated with the Contractor's preparation, submittal, and maintenance or updating of the Construction Schedules.

7.3.7 Intentionally Left Blank

7.3.8 Three (3) Week Look-Ahead Schedule; One (1) Week As Built Schedule. A combined three (3) week Look-Ahead Schedule for the three (3) week period immediately following each weekly Progress Meeting with a one (1) week As-Built Schedule for the previous week shall be prepared by the Contractor and submitted by the Contractor to the Construction Manager for review and approval at each weekly Progress Meeting. The Contractor's preparation and submittal of the Three (3) Week Look-Ahead Schedule; One (1) Week As Built Schedule described above are material obligations of the Contractor; failure or refusal of the Contractor to strictly comply with the foregoing shall be a basis for the District's exercise of the default termination procedures set forth in the Contract Documents.

7.3.9 Unanticipated Unusually Severe Weather Conditions. The Baseline Construction Schedule and all subsequent Construction Schedule Updates shall incorporate a critical path activity entitled "Remaining Inclement Weather Days" which shall be the last activity in each Construction Schedule prior to the activity entitled "Final Completion". The sole successor to "Remaining Inclement Weather Days" (with zero lag) shall be "Final Completion" and the sole predecessor (with zero lag) shall be "Punchlist".
The Contractor shall apply in writing to the District to use an Inclement Weather Day only when a critical path activity on the then current Updated Construction Schedule has been delayed because of inclement weather conditions. The duration of the "Remaining Inclement Weather Days" activity shall be reduced by the number of approved work days of actual weather caused delay and be included in the monthly schedule updates.
The "Remaining Inclement Weather Days" activity shall have an initial duration as set forth in the Special Conditions, Paragraph 4.3. If, at Final Completion, there are inclement weather days remaining, the unused days shall be considered "float" as defined by Paragraph 7.3.1 of the General Conditions. If, additional inclement weather days are required, the District shall adjust the Substantial Completion date accordingly.

7.4 Adjustment of Contract Time. If Substantial Completion is delayed, adjustment, if any, to the Contract Time on account of such delay shall be in accordance with this Article 7.4.

7.4.1 Excusable Delays. If Substantial Completion of the Work is delayed by Excusable Delays, the Contract Time shall be subject to adjustment for such reasonable period of time as determined by the Architect; Excusable Delays shall not result in any increase in the Contract Price. Excusable Delays refer to unforeseeable and unavoidable casualties or other unforeseen causes beyond the control, and without fault or neglect, of the Contractor, any Subcontractor, Material Supplier or other person directly or indirectly engaged by the Contractor in performance of any portion of the Work. Excusable Delays include unanticipated and unavoidable labor disputes, unusual and unanticipated delays in transportation of equipment, materials or Construction Equipment reasonably necessary for completion and proper execution of the Work, unanticipated unusually severe weather conditions or DSA directive to stop the Work. Neither the financial resources of the Contractor or any person or entity directly or indirectly engaged by the Contractor in performance of any portion of the Work shall be deemed conditions beyond the control of the Contractor. If an event of Excusable Delay occurs, the Contract Time shall be subject to adjustment hereunder only if the Contractor establishes: (i) full compliance with all applicable provisions of the Contract Documents relative to the method, manner and time for Contractor's notice and request for adjustment of the Contract Time; (ii) that the event(s) forming the basis for Contractor's request to adjust the Contract Time are outside the reasonable control and without any fault or neglect of the Contractor or any person or entity directly or indirectly engaged by Contractor in performance of any portion of the Work; and (iii) that the event(s) forming the basis for Contractor's request to adjust the Contract Time directly and adversely impacted the critical path of the Work as indicated in the Approved

Construction Schedule or the most recent updated Approved Construction Schedule relative to the date(s) of the claimed event(s) of Excusable Delay. The foregoing provisions notwithstanding, if the Special Conditions set forth a number of "Rain Days" to be anticipated during performance of the Work, the Contract Time shall not be adjusted for rain related unusually severe weather conditions until and unless the actual number of Rain Days during performance of the Work shall exceed those noted in the Special Conditions and such additional Rain Days shall have directly and adversely impacted the critical path of the Work as depicted in the Approved Construction Schedule or the most recent updated Approved Construction Schedule relative to the date(s) of such additional Rain Days.

7.4.2 Compensable Delays. If Substantial Completion of the Work is delayed and such delay is caused by the acts or omissions of the District, the Architect, or separate contractor employed by the District (collectively "Compensable Delays"), upon Contractor's request and notice, in strict conformity with Articles 7 and 9 of these General Conditions, the Contract Time will be adjusted by Change Order for such reasonable period of time as determined by the Architect and the District. In accordance with California Public Contract Code §7102, if the Contractor's progress is delayed by any of the events described in the preceding sentence, Contractor shall not be precluded from the recovery of damages directly and proximately resulting therefrom, provided that the District is liable for the delay, the delay is unreasonable under the circumstances involved and the delay was not within the reasonable contemplation of the District and the Contractor at the time of execution of the Agreement. In such event, Contractor's damages, if any, shall be limited to direct, actual and unavoidable additional costs of labor, materials or Construction Equipment directly resulting from such delay, and shall exclude indirect or other consequential damages. Except as expressly provided for herein, Contractor shall not have any other claim, demand or right to adjustment of the Contract Price arising out of delay, interruption, hindrance or disruption to the progress of the Work. Adjustments to the Contract Price and the Contract

Time, if any, on account of Changes to the Work or Suspension of the Work shall be governed by the applicable provisions of the Contract Documents, including without limitation, Articles 9 and 14 of these General Conditions.

7.4.3 Unexcusable Delays. Unexcusable Delays refer to any delay to the progress of the Work caused by events or factors other than those specifically identified in Articles 7.4.1 and 7.4.2 above. Neither the Contract Price nor the Contract Time shall be adjusted on account of Unexcusable Delays.

7.4.4 Adjustment of Contract Time.

7.4.4.1 Procedure for Adjustment of Contract Time. The Contract Time shall be subject to adjustment only in strict conformity with applicable provisions of the Contract Documents. Failure of Contractor to request adjustment(s) of the Contract Time in strict conformity with applicable provisions of the Contract Documents shall be deemed Contractor's waiver of the same.

7.4.4.2 Limitations Upon Adjustment of Contract Time on Account of Delays. Any adjustment of the Contract Time on account of an Excusable Delay or a Compensable Delay shall be limited as set forth herein. If an Excusable Delay and a Compensable Delay occur concurrently, the maximum extension of the Contract Time shall be the number of days from the commencement of the first delay to the cessation of the delay which ends last. If an Unexcusable Delay occurs concurrently with either an Excusable Delay or a Compensable Delay, the maximum extension of the Contract Time shall be the number of days, if any, which the Excusable Delay or the Compensable Delay exceeds the period of time of the Unexcusable Delay. In addition to the foregoing limitations upon extension of the Contract Time, no adjustment of the Contract Time shall be made on account of any Excusable Delays or Compensable Delays unless such delay(s) actually and directly impact Work or Work activities on the critical path of the then current and updated Approved Construction Schedule as of the date on which such delay first occurs. The District shall not be deemed in breach of, or otherwise in default of any obligation hereunder, if the District shall deny any request by the Contractor for an adjustment of the Contract Time for any delay which does not actually and directly impact Work or Work activities on the critical path of the then current and updated Approved Construction Schedule.

7.5 Liquidated Damages. Should the Contractor neglect, fail or refuse to: (i) submit Submittals in accordance with the Approved Construction Schedule; (ii) achieve Substantial Completion of the Work within the Contract Time, (subject to adjustments authorized under the Contract Documents); (iii) or to complete Punchlist items within the time established pursuant to the Contract Documents, the Contractor agrees to pay to the District the amount of per diem Liquidated Damages set forth in the Special Conditions, not as a penalty but as Liquidated Damages, for every day beyond the Contract Time, as adjusted, until Submittals are submitted, Substantial Completion or completion of the Punchlist items are achieved. The Liquidated Damages amounts set forth in the Special Conditions are agreed upon by and between the Contractor and the District because of the difficulty of fixing the District's actual damages in the event of delayed submission of Submittals, Substantial Completion or completion of Punchlist items. The Contractor and the District specifically agree that said amounts are reasonable estimates of the District's damages in such event, and that such amounts do not constitute a penalty. Liquidated Damages may be deducted from the Contract Price then or thereafter due the Contractor. The Contractor and the Surety shall be liable to the District for any Liquidated

Damages exceeding any amount of the Contract Price then held or retained by the District. In the event that the Contractor shall fail or refuse to complete Punchlist items and the District elects to exercise its right to cause completion or correction of such items pursuant to Article 7.2.3.2 hereof, the District's assessment of Liquidated Damages pursuant to the foregoing shall be in addition, and not in lieu of, the District's right to charge Contractor with the cost of completing or correcting such items of the Work, as provided for under Article 7.2.3.2. The Contractor and the District acknowledge and agree that the provisions of this Article 7.5 are reasonable under the circumstances existing at the time of the Contractor's execution of the Agreement.

7.6 District Right to Take-Over Work. Unless caused by the District, Architect, Construction Manager or the Project Inspector, if the Contractor fails or refuses, for any reason and at any time, to furnish adequate materials, labor, equipment or services to maintain progress of the Work in accordance with the then current Construction Schedule after twenty-four (24) hour advance written notice from the Construction Manager to the Contractor of its failure or refusal, the District may thereafter furnish or cause to be furnish such materials, labor, equipment or services necessary to maintain progress of the Work in accordance with the then current Construction Schedule. All costs, expenses or other charges (whether direct, indirect and administrative) incurred by the District in furnishing such materials, labor, equipment or services shall be at the sole cost of the Contractor and the District may deduct the same from the Contract Price then or thereafter due the Contractor. The District's exercise of rights pursuant to the foregoing shall not be deemed a waiver or limitation of any other right or remedy of the District under the Contract Documents.

ARTICLE 8: CONTRACT PRICE

8.1 Contract Price. The Contract Price is the amount stated in the Agreement as such, and subject to any authorized adjustments thereto in accordance with the Contract Documents, is the total amount payable by the District to the Contractor for performance of the Work under the Contract Documents. The District's payment of the Contract Price to the Contractor shall be in accordance with the Contract Documents.

8.2 Cost Breakdown. Within fifteen (15) days of the execution of the Agreement by Contractor, Contractor shall furnish, on forms provided by the District, a detailed estimate and complete Cost Breakdown of the Contract Price. The Cost Breakdown shall be subject to review and approval by the Construction Manager and District of the form and content thereof. In the event that the District shall reasonably object to any portion of the Cost Breakdown, within ten (10) days of the District's receipt of the Cost Breakdown, the District shall notify the Contractor, in writing of the District's objection(s) to the Cost Breakdown. Within five (5) days of the date of the District's and the Construction Manager's written objection(s), Contractor shall submit a revised Cost Breakdown to the District and the Construction Manager for review and acceptance. The foregoing procedure for the preparation, review and approval of the Cost Breakdown shall continue until the District and the Construction Manager have approved of the entirety of the Cost Breakdown. Once the Cost Breakdown is accepted by the District and the Construction Manager, the Cost Breakdown shall not be thereafter modified or amended by the Contractor without the prior consent and approval of the District and the Construction Manager, which may be granted or withheld in their sole reasonable discretion.

8.3 Progress Payments.

8.3.1 Applications for Progress Payments. During the Contractor's performance of the

Work, the Contractor shall submit monthly, on the first working day of each month, to the Project Inspector, Construction Manager and the Architect, Applications for Progress Payments, on forms approved by the District, setting forth an itemized estimate of Work completed in the preceding month for the purpose of the District's making of Progress Payments thereon. Values utilized in the Applications for Progress Payments shall be based upon the District approved Cost Breakdown pursuant to Article 8.2 above and such values shall be only for determining the basis of Progress Payments to Contractor, and shall not be considered as fixing a basis for adjustments, whether additive or deductive, to the Contract Price, or for determining the extent of Work actually completed.

8.3.2 Initial Progress Payment Meeting. Prior to submitting any Application for Progress Payment and for the purpose of expediting review of Application for Progress Payments and disbursement of Progress Payments, Contractor agrees to meet with the Project Inspector, Construction Manager and Architect to review and discuss each of the Contractor's Proposed Applications for Progress Payment. If any item submitted for payment is disputed during this review, Contractor agrees to use its best efforts to resolve the disputed items with Project Inspector, Construction Manager and Architect before formally submitting the Application for Progress Payment to Architect. Architect and District specifically reserve the right to dispute any item included in Contractor's Application for Progress Payment, regardless of whether an item was identified as disputed in the initial review process provided for herein.

8.3.3 District's Review of Applications for Progress Payments. In accordance with Public Contract Code §20104.50, upon receipt of an Application for Progress Payment, the District shall cause the same to be reviewed by the Project Inspector, the Construction Manager, if one is designated by the District, and the Architect, as soon as is practicable after receipt of such Application for Progress Payment. Such review shall be for the purpose of determining that the Application for Progress Payment is a proper Progress Payment request. For purposes of this Article 8.3.2, an Application for Progress Payment shall be deemed "proper" only if it is submitted on the form approved by the District, with all of the requested information of such form of Application for Progress Payment completely and accurately provided by the Contractor and such completed Application for Progress Payment is accompanied by: (i) a Certification, executed under penalty of perjury by the Contractor's Superintendent and/or Project Manager, that all weekly Certified Payroll Records for the Contractor and all Subcontractors required to submit weekly Certified Payroll Records under the LCP for the period of time covered by the Application for Progress Payment have been completed and submitted in strict conformity with the LCP; (ii) Certified Payrolls of the any Subcontractors, of any tier, (who are not required under the LCP to submit Certified Payroll Records on weekly basis) for laborers performing any portion of the Work for which a Progress Payment is requested; (iii) duly completed and executed forms of Conditional Waiver and Release of Rights Upon Progress Payment in accordance with California Civil Code §3262 of the Contractor, all Subcontractors of any tier, and Material Suppliers covering the Progress Payment requested; (iv) duly completed and executed forms of Unconditional Waiver and Release of Rights upon Progress Payment in accordance with California Civil Code §3262 of the Contractor, all Subcontractors of any tier, and Material Suppliers covering the Progress Payment received by the Contractor under the prior Application for Progress Payment; (v) an updated Construction Schedule in accordance with Article 7.3.5 of the General Conditions and applicable provisions of the Specifications relating to the Contractor's updates to the Construction Schedule; (vi) a certification by the Contractor that it has continuously maintained, or caused to maintained, the Record Drawings reflecting the actual as-built conditions of the Work performed be for

which the Progress Payment is requested, it being understood that such certification is subject to verification by the District, Architect, Project Inspector or the Construction Manager prior to disbursement of the Progress Payment; and (vii) completed/executed form of Debris Recycling Statement. In accordance with Public Contract Code §20104.50, an Application for Progress Payment determined by the District not to be a proper Application for Progress Payment shall be returned by the District to the Contractor as soon as is practicable after receipt of the same from the Contractor, but in no event not more than seven (7) days after the District's receipt thereof. The District's return of any Application for Progress Payment pursuant to the preceding sentence shall be accompanied by a written document setting forth the reason(s) why the Application for Progress Payment is not proper.

8.3.4 Review of Applications for Progress Payments. Upon receipt of an Application for Progress Payment, the Architect, Construction Manager and the Project Inspector shall inspect and verify the Work to determine whether it has been performed in accordance with the terms of the Contract Documents and to determine the portion of the Application for Progress Payment which is properly due to the Contractor under the terms of the Contract Documents.

8.3.5 District's Disbursement of Progress Payments

8.3.5.1 Timely Disbursement of Progress Payments. In accordance with Public Contract Code §20104.50, within thirty (30) days after the District's receipt of a proper Application for Progress Payment, there shall be paid, by District, to Contractor a sum equal to ninety percent (90%) of the value of the Work indicated in the Application for Progress Payment which is actually in place as of the date of the Application for Progress Payment and as verified and approved by the Project Inspector and the Architect and the pro rata portion of the Contractor's overhead, supervision and general conditions costs and profit for that month; provided, however, that the District's obligation to disburse any Progress Payment shall be subject to the District's receipt of all documents set forth in Article 8.3.2 above, each and all of which are conditions precedent to the District's obligation to disburse Progress Payments. If an Application for Progress Payment is determined not to be proper due to the failure or refusal of the Contractor to submit documents with the Application for Progress Payment, as required by Article 8.3.2, or incompleteness or inaccuracies in any such documents submitted or if it is reasonably determined that the Record Drawings have not been continuously maintained to reflect the actual as built conditions of the Work completed in the period for which the Progress Payment is requested, the thirty (30) day period hereunder for the District's timely disbursement of a Progress Payment shall be deemed to commence on the date that the District is actually in receipt of documents not submitted with the Application for Progress Payment, or corrections to documents with the Application for Progress Payment so as to render them complete and accurate, or the date upon which the Contractor accurately and fully completes preparation of the Record Drawings relating to the Work for which the Progress Payment is requested.

8.3.5.2 Untimely Disbursement of Progress Payments. In accordance with Public Contract Code §20104.50, in the event that the District shall fail to make any Progress Payment within thirty (30) days after receipt of an undisputed and properly submitted Application for Progress Payment, the District shall pay the Contractor interest on the undisputed amount of such Application for Progress Payment equal to the legal rate of interest set forth in California Code of Civil Procedure §685.010(a). The foregoing

notwithstanding, in the event that the District shall determine that any Application for Progress Payment is not proper, pursuant to Article 8.3.2 above, and the District does not return such Application for Progress Payment within the seven (7) day period provided for in Article 8.3.2, the period of time for the District's disbursement of the Progress Payment on such Application for Progress Payment without incurring the interest liability shall be reduced by the number of days exceeding the seven (7) day return period.

8.3.5.3 District's Right to Disburse Progress Payments by Joint Checks. Provided that the District is in receipt of the applicable Subcontract or Purchase Order, the District, may in its sole discretion, issue joint checks to the Contractor and such Subcontractor or Material Supplier in satisfaction of its obligation to make Progress Payments or the Final Payment due hereunder.

8.3.5.4 No Waiver of Defective or Non-Conforming Work. The approval of any Application for Progress Payment or the disbursement of any Progress Payment to the Contractor shall not be deemed nor constitute acceptance of defective Work or Work not in conformity with the Contract Documents.

8.3.6 Progress Payments for Changed Work. The Contractor's Applications for Progress Payment may include requests for payment on account of Changes in the Work which have been properly authorized and approved by the Project Inspector, the Architect and all other governmental agencies with jurisdiction over such Change in accordance with the terms of the Contract Documents and for which a Change Order has been issued. Except as provided for herein, no other payment shall be made by the District for Changes in the Work.

8.3.7 Materials or Equipment Not Incorporated Into the Work.

8.3.7.1 Limitations Upon Payment. Except as expressly provided for herein, no payments shall be made by the District on account of any item of the Work, including without limitation, materials or equipment which, at the time of the Contractor's submittal of an Application for Progress Payment, has/have not been incorporated into and made a part of the Work.

8.3.7.2 Materials or Equipment Delivered and Stored at the Site. The District may, in its sole and exclusive discretion, make payment for materials or equipment not yet incorporated into the Work if, at or prior to the time of the Contractor's submittal of a an Application for Progress Payment incorporating therein a request for payment of such materials or equipment if all of the following are complied with: (a) the materials or equipment have been delivered to the Site; (b) adequate arrangements, reasonably satisfactory to the District, have been made by the Contractor to store and protect such materials or equipment at the Site including without limitation, insurance reasonably satisfactory to the District, covering and protecting against the risk of loss, destruction, theft or other damage to such materials or equipment while in storage if such coverage is not afforded under the policy of Builder's Risk insurance obtained by the District pursuant to the Contract Documents; and (c) the establishment of procedures reasonably satisfactory to the District by which title to such materials or equipment will be vested in the District upon the District's payment therefor. The Contractor acknowledges that the discretion to make, or not to make, payment for materials or equipment delivered or stored at the site of the Work pursuant to the preceding

sentence shall be exercised exclusively by the District; the District's exercise of discretion not to make payment for materials or equipment delivered or stored at the Site, but not yet incorporated into the Work shall not be deemed the District's default hereunder. In the event that the District shall elect to make payment for materials or equipment delivered and stored at the Site, the costs and expenses incurred to comply with the requirements of (b) and (c) of this Article 8.3.6.2 shall be borne solely and exclusively by the Contractor and no payment shall be made by the District on account of such costs and expenses.

8.3.7.3 Materials or Equipment Not Delivered or Stored at the Site. No payments shall be made by the District for materials or equipment to be incorporated into the Work where such materials or equipment have not been delivered or stored at the Site. The foregoing notwithstanding, the District may, in its sole and exclusive discretion, elect to make payment for materials or equipment not incorporated into the Work and which are not delivered or stored at the Site at or prior to the time of the Contractor's submittal of an Application for Progress Payment incorporating therein a request for payment of such materials or equipment provided that each and all of the following have been complied with: (a) adequate arrangements, reasonably satisfactory to the District, have been made by the Contractor to store and protect such materials or equipment which include without limitation, insurance reasonably satisfactory to the District, covering and protecting against the risk of loss, destruction, theft or other damage to such materials or equipment while in storage if coverage for the same is not afforded under the policy of Builder's Risk insurance obtained by the District pursuant to the Contract Documents; and (b) the establishment of procedures reasonably satisfactory to the District by which title to such materials or equipment will be vested in the District upon the District's payment therefor. The Contractor acknowledges that the discretion to make, or not to make, payment for such materials or equipment pursuant to the preceding sentence shall be exercised exclusively by the District; the District's exercise of discretion not to make payment for such materials or equipment shall not be deemed the District's default hereunder. In the event that the District shall elect to make payment for materials or equipment not at the Site, the costs and expenses incurred to comply with the requirements of (a) and (b) of this Article 8.3.6.3 shall be borne solely and exclusively by the Contractor and no payment shall be made by the District on account of such costs and expenses.

8.3.7.4 Materials or Equipment in Fabrication or Transit. The provisions of this Article 8.3.6 notwithstanding, the District shall not make any payment on account of any materials or equipment which are in the process of being fabricated or which are in transit to the Site of or other storage location.

8.3.8 Exclusions From Progress Payments. In addition to the District's right to withhold disbursement of any Progress Payment provided for in the Contract Documents, neither the Contractor's Application for Progress Payment shall include, nor shall the District be obligated to disburse any portion of the Contract Price for amounts which the Contractor does not intend to pay any Subcontractor, of any tier, or Material Supplier because of a dispute or any other reason.

8.3.9 Title to Work. The Contractor warrants that title to all Work covered by an Application for Progress Payment will pass to the District no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Progress Payment, all Work for which a Progress Payment has been previously issued and the Contractor has

received payment from the District therefor shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, stop notices, security interests or encumbrances in favor of the Contractor, Subcontractors, Material Suppliers or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

8.3.10 Substitute Security for Retention. In accordance with the provisions of California Public Contract Code §22300, eligible and equivalent securities may be substituted for any monies withheld by the District to ensure the Contractor's performance under the Contract Documents at the request and expense of the Contractor and in conformity with the provisions of California Public Contract Code §22300. The foregoing and the provisions of California Public Contract Code §22300 notwithstanding, failure of the Contractor to request the substitution of eligible and equivalent securities for monies to be withheld by the District prior to the Contractor's submission of its first Application for Progress Payment shall be deemed a waiver of such right.

8.4 Final Payment.

8.4.1 Application for Final Payment. When the Contractor has achieved Final Completion of the Work and has otherwise fully performed its obligations under the Contract Documents, the Contractor shall submit an Application for Final Payment on such form as approved by the District. Thereupon, the Architect and the Project Inspector will promptly make a final inspection of the Work and when the Architect and the Project Inspector find the Work acceptable under the Contract Documents and that the Contract has been fully performed by the Contractor, the Architect and the Project Inspector will thereupon promptly approve the Application for Final Payment, stating that to the best their knowledge, information and belief, the Work has been completed in accordance with the terms of the Contract Documents. The Final Payment shall include the remaining balance of the Contract Price and any retention from Progress Payments previously withheld by the District.

8.4.2 Conditions Precedent to Disbursement of Final Payment. Neither Final Payment nor any remaining Contract Price shall become due until the Contractor submits to the District each and all of the following, the submittal of which are conditions precedent to the District's obligation to disburse the Final Payment: (i) an affidavit or certification by the Contractor that payrolls, bills for materials and other indebtedness incurred in connection with the Work for which the District or the District's property may or might be responsible or encumbered have been paid or otherwise satisfied; (ii) a certificate evidencing that insurance required by the Contract Documents to remain in force after the Contractor's receipt of Final Payment is currently in effect; (iii) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover any period following Final Payment as required by the Contract Documents; (iv) consent of the Surety on the Labor and Material Payment Bond and Performance Bond, to Final Payment if required; (v) duly completed and executed forms of Conditional or Unconditional Waivers and Releases of rights upon Final Payment of the Contractor, Subcontractors of any tier and Material Suppliers in accordance with California Civil Code §3262, with each of the same stating that there are, or will be, no claims for additional compensation after disbursement of the Final Payment; (vi) Operations and Maintenance manuals and separate warranties provided by any manufacturer or distributor of any materials or equipment incorporated into the Work; (vii) the Record Drawings; (viii) the form of Guarantee included in the Contract Documents duly executed by an authorized representative of the Contractor; (ix) any and all other items or documents required by the Contract Documents to be delivered to the District upon completion of the

Work; (x) the completion and submittal of all reports required by the Contract Documents, including without limitation, verified reports required by applicable provisions of the California Code of Regulations; and (xi) if required by the District, such other data establishing payment or satisfaction of obligations such as receipts, releases and waivers of liens, stop notices, claims, security interest or encumbrances arising out of the Contract to the extent and in such form as may be required by the District.

8.4.3 Disbursement of Final Payment. Provided that the District is then in receipt of all documents and other items in Article 8.4.2 above as conditions precedent to the District's obligation to disburse Final Payment, not later than sixty (60) days following Final Acceptance the District shall disburse the Final Payment to the Contractor. Pursuant to California Public Contract Code §7107, if there is any dispute between the District and the Contractor at the time that disbursement of the Final Payment is due, the District may withhold from disbursement of the Final Payment an amount not to exceed one hundred fifty percent (150%) of the amount in dispute.

8.4.4 Waiver of Claims. The Contractor's acceptance of the Final Payment is a waiver and release by the Contractor of any and all claims against the District for compensation or otherwise in connection with the Contractor's performance of the Contract.

8.4.5 Claims Asserted After Final Payment. Any lien, stop notice or other claim filed or asserted after the Contractor's acceptance of the Final Payment by any Subcontractor, of any tier, laborer, Material Supplier or others in connection with or for Work performed under the Contract Documents shall be the sole and exclusive responsibility of the Contractor who further agrees to indemnify, defend and hold harmless the District and its officers, agents, representatives and employees from and against any claims, demands or judgments arising or associated therewith, including without limitation attorneys fees incurred by the District in connection therewith. In the event any lien, stop notice or other claim of any Subcontractor, Laborer, Material Supplier or others performing Work under the Contract Documents remain unsatisfied after Final Payment is made, Contractor shall refund to District all monies that the District may pay or be compelled to pay in discharging any lien, stop notice or other claim, including, without limitation all costs and reasonable attorneys fees incurred by District in connection therewith.

8.5 Withholding of Payments. The District may withhold any Progress Payment or the Final Payment, in whole or in part, or backcharge the Contractor to the extent it may deem advisable to protect the District on account of: (i) defective Work or Work not in conformity with the requirements of the Contract Documents which is not remedied; (ii) failure of the Contractor to make payments when due Subcontractors or Material Suppliers for materials or labor; (iii) claims filed or reasonable evidence of the probable filing of claims by Subcontractors, laborers, Material Suppliers, or others performing any portion of the Work under the Contract Documents for which the District may be liable or responsible including, without limitation, Stop Notice Claims filed with the District pursuant to California Civil Code §3179 et seq.; (iv) a reasonable doubt that the Contract can be completed for the then unpaid balance of the Contract Price; (v) tax demands filed in accordance with California Government Code §12419.4; (vi) other claims, penalties and/or forfeitures for which the District is required or authorized to retain funds otherwise due the Contractor; (vii) any amounts due from the Contractor to the District under the terms of the Contract Documents; (viii) violations of the LCP or other obligations of the Contractor or any Subcontractor relating to the employment of labor in connection with the Work (including without limitation, delinquent submission of weekly Certified Payroll Records or the submission of inadequate weekly Certified Payroll Records; or (ix) the Contractor's failure to perform any of its

obligations under the Contract Documents or its default under the Contract Documents or its failure to maintain adequate progress of the Work. In addition to the foregoing, the District shall not be obligated to process any Application for Progress Payment or Final Payment, nor shall Contractor be entitled to any Progress Payment or Final Payment so long as any lawful or proper direction concerning the Work or the performance thereof or any portion thereof, given by the District, the Project Inspector, the Architect or any public authority having jurisdiction over the Work, or any portion thereof, shall not be fully and completely complied with by the Contractor. When the District is reasonably satisfied that the Contractor has remedied any such deficiency, payment shall be made of the amount withheld. In lieu of making payment of withheld amounts to the Contractor, the District may, in its sole exclusive discretion, apply withheld amounts to the payment and satisfactions of debts and obligations of the Contractor relating to the Work. In doing, the District shall be an agent of the Contractor for the sole and limited purpose of making payment(s) to others for the Work on behalf of the Contractor; payments made by the District pursuant to the foregoing shall be deemed payments to the Contractor and the Contract Price shall be adjusted to reflect such payment(s). The District shall not be liable to the Contractor or others for its good faith decision to make or not make payment(s) of amounts withheld from the Contractor pursuant to the foregoing. If the District elects to make payments to other of amounts withheld from the Contractor, the District may do so without prior judicial determination; the District will render the Contractor a complete and accurate accounting of amounts withheld and paid to others on behalf of the Contractor.

8.6 Payments to Subcontractors. The Contractor shall pay all Subcontractors for and on account of Work of the Contract performed by such Subcontractors in accordance with the terms of their respective subcontracts and as provided for pursuant to California Public Contract Code §10262, the provisions of which are deemed incorporated herein by this reference. In the event of the Contractor's failure to make payment to Subcontractors in conformity with California Public Contract Code §10262, the provisions of California Public Contract Code §10253 shall apply; by this reference, the provisions of California Public Contract Code §10253 are incorporated herein in its entirety, except that the references in said Section 10253 to “the director” shall be deemed to refer to the District. The Contractor shall timely make payment of retention due Subcontractors in accordance with Public Contract Code §7107.

8.7 Computerized Job Cost Reporting System.

8.7.1 Job Cost Reporting. The Contractor and each Subcontractor with a Subcontract valued at Five Hundred Thousand Dollars ($500,000) or greater shall maintain a computerized job cost reporting system conforming with the requirements set forth herein. The computer program(s) utilized by the Contractor and applicable Subcontractors shall be subject to the review and acceptance by the District. The job cost reporting systems for the Work shall be updated in regular intervals of not more than one (1) calendar month.

8.7.2 Job Cost Reporting System Requirements. The computerized job cost programs utilized by the Contractor and applicable Subcontractors shall conform and comply with generally accepted accounting principles applied in a consistent manner and with recognized and generally accepted construction industry accounting standards, guidelines and procedures. The job cost reporting system format and configuration shall follow the general format of the District approved Cost Breakdown and budgets established for each line item shall be traceable to a bid estimate of costs. The job cost reporting systems utilized by the Contractor and applicable Subcontractors shall be capable of: (a) providing overall cost status on a monthly and cumulative basis; (b) providing comparative analysis of the original budgeted costs, actual costs, remaining budget, and projected cost of

completion; the job cost reporting system shall be capable of providing comparative analysis for individual line items and the totality of the Work reflected in the job cost report and; (c) tracking adjustments to original budget amounts for Changes to the Work (including, without limitation, issued, pending and potential Change Orders).

8.7.3 Job Cost System Information. Upon request of the District or the Construction Manager, the Contractor and applicable Subcontractors shall make available written job cost reports and provide the District and the Construction Manager with the electronic files of the then current or requested job cost report. The Contractor's obligations hereunder are material.

ARTICLE 9: CHANGES

9.1 Changes in the Work. The District, at any time, by written order, may make Changes within the general scope of the Work under the Contract Documents or issue additional instructions, require additional Work or direct deletion of Work. The Contractor shall not proceed with any Change involving an increase or decrease in the Contract Price or the Contract Time without prior written authorization from the District. The foregoing notwithstanding, the Contractor shall promptly commence and diligently complete any Change to the Work subject to the District's written authorized issued pursuant to the preceding sentence; the Contractor shall not be relieved or excused from its prompt commencement and diligent completion of any Change subject to the District's written authorization by virtue of the absence or inability of the Contractor and the District to agree upon the extent of any adjustment to the Contract Time or the Contract Price on account of such Change. The issuance of a Change Order pursuant to this Article 9 in connection with any Change authorized by the District under this Article 9.1 shall not be deemed a condition precedent to Contractor's obligation to promptly commence and diligently complete any such Change authorized by the District hereunder. The District's right to make Changes shall not invalidate the Contract nor relieve the Contractor of any liability or other obligations under the Contract Documents. Any requirement of notice of Changes in the scope of Work to the Surety shall be the responsibility of the Contractor. Changes to the Work depicted or described in the Drawings or the Specifications shall be subject to approval by the DSA. The District may make Changes to bring the Work or the Project into compliance with environmental requirements or standards established by state or federal statutes and regulations enacted after award of the Contract.

9.2 Oral Order of Change in the Work. Any oral order, direction, instruction, interpretation, or determination from the District, the Project Inspector or the Architect which in the opinion of the Contractor causes any change to the scope of the Work, or otherwise requires an adjustment to the Contract Price or the Contract Time, shall be treated as a Change only if the Contractor gives the Architect and the Project Inspector written notice within ten (10) days of the order, directions, instructions, interpretation or determination and prior to acting in accordance therewith. Time is of the essence in Contractor's written notice pursuant to the preceding sentence so that the District can promptly investigate and consider alternative measures to address the order, direction, instruction, interpretation or determination giving rise to Contractor's notice. Accordingly, Contractor acknowledges that its failure, for any reason, to give written notice within ten (10) days of such order, direction, instruction, interpretation or determination shall be deemed Contractor's waiver of any right to assert or claim any entitlement to an adjustment of the Contract Time or the Contract Price on account of such order, direction, instruction, interpretation or determination. The written notice shall state the date, circumstances, extent of adjustment to the Contract Price or the Contract Time, if any, requested, and the source of the order, directions, instructions, interpretation or determination

that the Contractor regards as a Change. Unless the Contractor acts in strict accordance with this procedure, any such order, direction, instruction, interpretation or determination shall not be treated as a Change and the Contractor hereby waives any claim for any adjustment to the Contract Price or the Contract Time on account thereof.

9.3 Contractor Submittal of Data. Within ten (10) days after receipt of a written order directing a Change in the Work or furnishing the written notice regarding any oral order directing a Change in the Work, the Contractor shall submit to the Architect, the Project Inspector, the Construction Manager and the District a detailed written statement setting forth the general nature of the Change, the amount of any adjustment to the Contract Price on account thereof, properly itemized and supported by sufficient substantiating data to permit evaluation of the same, and the extent of adjustment of the Contract Time, if any, required by such Change. No claim or adjustment to the Contract Price or the Contract Time shall be allowed if not asserted by the Contractor in strict conformity herewith or if asserted after Final Payment is made under the Contract Documents.

9.4 Adjustment to Contract Price and Contract Time on Account of Changes to the Work.

9.4.1 Adjustment to Contract Price. Adjustments to the Contract Price due to Changes in the Work shall be determined by application of one of the following methods, in the following order of priority:

9.4.1.1 Mutual Agreement. By negotiation and mutual agreement, on a lump sum basis, between the District and the Contractor on the basis of the estimate of the actual and direct increase or decrease in costs on account of the Change. Upon request of the District or the Architect, the Contractor shall provide a detailed estimate of increase or decrease in costs directly associated with performance of the Change along with cost breakdowns of the components of the Change and supporting data and documentation. The Contractor's estimate of increase or decrease in costs pursuant to the foregoing, if requested, shall be in sufficient detail and in such form as to allow the District, the Project Inspector and the Architect to review and assess the completeness and accuracy thereof. The Contractor shall be solely responsible for any additional costs or additional time arising out of, or related in any manner to, its failure to provide the estimate of costs within the time specified in the request of the District or the Architect for such estimate.

9.4.1.2 Determination by the District. By the District, whether or not negotiations are initiated pursuant to Article 9.4.1.1 above, based upon actual and necessary costs incurred by the Contractor as determined by the District on the basis of the Contractor's records. In the event that the procedure set forth in this Article 9.4.1.2 is utilized to determine the extent of adjustment to the Contract Price on account of Changes to the Work, promptly upon determining the extent of adjustment to the Contract Price, the District shall notify the Contractor in writing of the same; the Contractor shall be deemed to have accepted the District's determination of the amount of adjustment to the Contract Price on account of a Change to the Work unless Contractor shall notify the District, the Architect and the Project Inspector, in writing, not more than fifteen (15) days from the date of the District's written notice, of any objection to the District's determination. Failure of the Contractor to timely notify the District, the Architect and the Project Inspector of Contractor's objections to the District's determination of the extent of adjustment to the Contract Price shall be deemed Contractor's acceptance of the District's determination and a waiver of any right or basis of the Contractor to

thereafter protest or otherwise object to the District's determination. Notwithstanding any objection of the Contractor to the District's determination of the extent of any adjustment to the Contract Price pursuant to this Article 9.4.1.2, Contractor shall, pursuant to Article 9.7 below, diligently proceed to perform and complete any such Change.

9.4.1.3 Basis for Adjustment of Contract Price. If Changes in the Work require an adjustment of the Contract Price pursuant to Articles 9.4.1.1 or 9.4.1.2 above, the basis for adjustment of the Contract Price shall be as follows:

9.4.1.3.1 Labor. Contractor shall be compensated for the costs of labor actually and directly utilized in the performance of the Change. Such labor costs shall be limited to field labor for which there is a prevailing wage rate classification. Wage rates for labor shall not exceed the prevailing wage rates in the locality of the Site and shall be in the labor classification(s) necessary for the performance of the Change. Use of a labor classification which would increase labor costs associated with any Change shall not be permitted. Labor costs shall exclude costs incurred by the Contractor in preparing estimate(s) of the costs of the Change, in the maintenance of records relating to the costs of the Change, coordination and assembly of materials and information relating to the Change or performance thereof, or the supervision and other overhead and general conditions costs associated with the Change or performance thereof.

9.4.1.3.2 Materials and Equipment. Contractor shall be compensated for the costs of materials and equipment necessarily and actually used or consumed in connection with the performance of Changes. Costs of materials and equipment may include reasonable costs of transportation from a source closest to the site of the Work and delivery to the Site. If discounts by Material Suppliers are available for materials necessarily used in the performance of Changes, they shall be credited to the District. If materials and/or equipment necessarily used in the performance of Changes are obtained from a supplier or source owned in whole or in part by the Contractor, compensation therefor shall not exceed the current wholesale price for such materials or equipment. If, in the reasonable opinion of the District, the costs asserted by the Contractor for materials and/or equipment in connection with any Change is excessive, or if the Contractor fails to provide satisfactory evidence of the actual costs of such materials and/or equipment from its supplier or vendor of the same, the costs of such materials and/or equipment and the District's obligation for payment of the same shall be limited to the then lowest wholesale price at which similar materials and/or equipment are available in the quantities required to perform the Change. The District may elect to furnish materials and/or equipment for Changes to the Work, in which event the Contractor shall not be compensated for the costs of furnishing such materials and/or equipment or any mark-up thereon.

9.4.1.3.3 Construction Equipment. Contractor shall be compensated for the actual cost of the necessary and direct use of Construction Equipment in the performance of Changes to the Work. Use of such Construction Equipment in the performance of Changes to the Work shall be compensated in increments of fifteen (15) minutes. Rental time for Construction Equipment moved by its own power shall include time required to move such Construction Equipment to the site of the Work from the nearest available rental source of the same. If Construction Equipment is

not moved to the Site by its own power, Contractor will be compensated for the loading and transportation costs in lieu of rental time. The foregoing notwithstanding, neither moving time or loading and transportation time shall be allowed if the Construction Equipment is used for performance of any portion of the Work other than Changes to the Work. Unless prior approval in writing is obtained by the Contractor from the Architect, the Project Inspector and the District, no costs or compensation shall be allowed for time while Construction Equipment is inoperative, idle or on standby, for any reason. The Contractor shall not be entitled to an allowance or any other compensation for Construction Equipment or tools used in the performance of Changes to the Work where such Construction Equipment or tools have a replacement value of $500.00 or less. Construction Equipment costs claimed by the Contractor in connection with the performance of any Change to the Work shall not exceed rental rates established by distributors or construction equipment rental agencies in the locality of the Site; any costs asserted which exceed such rental rates shall not be allowed or paid. Unless otherwise specifically approved in writing by the Architect, the Project Inspector and the District, the allowable rate for the use of Construction Equipment in connection with Changes to the Work shall constitute full compensation to the Contractor for the cost of rental, fuel, power, oil, lubrication, supplies, necessary attachments, repairs or maintenance of any kind, depreciation, storage, insurance, labor (exclusive of labor costs of the Construction Equipment operator), and any all other costs incurred by the Contractor incidental to the use of such Construction Equipment.

9.4.1.3.4 Mark-up on Costs of Changes to the Work. In determining the cost to the District and the extent of increase to the Contract Price resulting from a Change adding to the Work, the allowance for mark-ups on the costs of the Change for all overhead (including home office and field overhead), general conditions costs and profit associated with the Change shall not exceed the percentage set forth in the Special Conditions, regardless of the number of Subcontractors, of any tier, performing any portion of any Change to the Work. If a Change to the Work reduces the Contract Price, no profit, general conditions or overhead costs shall be paid by the District to the Contractor for the reduced or deleted Work. In such event, the adjustment to the Contract Price shall be the actual cost reduction realized by the reduced or deleted Work multiplied by the percentage set forth in the Special Conditions for mark-ups on the cost of a Change adding to the scope of the Work.

9.4.1.3.5 Contractor Maintenance of Records. In the event that Contractor shall be directed to perform any Changes to the Work pursuant to Article 9.1 or 9.2, or should the Contractor encounter conditions which the Contractor, pursuant to Article 9.6, believes would obligate the District to adjust the Contract Price and/or the Contract Time, Contractor shall maintain detailed records on a daily basis. Such records shall include without limitation hourly records for labor and Construction Equipment and itemized records of materials and equipment used that day in connection with the performance of any Change to the Work. In the event that more than one Change to the Work is performed by the Contractor in a calendar day, Contractor shall maintain separate records of labor, Construction Equipment, materials and equipment for each such Change. In the event that any Subcontractor, of any tier, shall provide or perform any portion of any Change to the Work, Contractor shall require that each such Subcontractor maintain records

in accordance with this Article. Each daily record maintained hereunder shall be signed by Contractor's Superintendent or Contractor's authorized representative; such signature shall be deemed Contractor's representation and warranty that all information contained therein is true, accurate, complete and relate only to the Change referenced therein. All records maintained by a Subcontractor, of any tier, relating to the costs of a Change to the Work shall be signed by such Subcontractor's authorized representative or Superintendent. All records maintained hereunder shall be subject to inspection, review and/or reproduction by the District, the Architect or the Project Inspector upon request. In the event that Contractor shall fail or refuse, for any reason, to maintain or make available for inspection, review and/or reproduction such records and the adjustment to the Contract Price on account of any Change to the Work is determined pursuant to this Article, the District's reasonable good faith determination of the extent of adjustment to the Contract Price on account of such Change shall be final, conclusive, dispositive and binding upon Contractor. Contractor's obligation to maintain records hereunder is in addition to, and not in lieu of, any other Contractor obligation under the Contract Documents with respect to Changes to the Work.

9.4.2 Adjustment to Contract Time. In the event of any Change(s) to the Work pursuant to this Article 9, the Contract Time shall be extended or reduced by Change Order for a period of time commensurate with the time reasonably necessary to perform such Change. In the event that any Change shall require an extension of the Contract Time, the Contractor shall not be subject to Liquidated Damages for such period of time. If completion of the Work is delayed by causes for which the District is responsible and the delay is unreasonable under the circumstances involved, and not within the contemplation of the Contractor and the District at the time of execution of the Agreement, the Contractor shall not be precluded from the recovery of damages arising therefrom.

9.4.3 Addition or Deletion of Alternate Bid Item(s). If the Bid for the Work includes proposal(s) for Alternate Bid Item(s), during Contractor's performance of the Work, the District may elect, pursuant to this Article to add any such Alternate Bid Item(s) if the same did not form a basis for award of the Contract or delete any such Alternate Bid Item(s) if the same formed a basis for award of the Contract. If the District elects to add or delete any such Alternate Bid Item(s) pursuant to the foregoing, the cost or credit for such Alternate Bid Item(s) shall be as set forth in the Contractor's Bid. If any Alternate Bid Item is added or deleted from the Work pursuant to the foregoing, the Contract Time shall be adjusted by the number of days allocated for the added or deleted Alternate Bid Item in the Contract Documents; if days are not allocated for any Alternate Bid Item added or deleted pursuant to the foregoing, the Contract Time shall be equitably adjusted.

9.5 Change Orders. If the District approves of a Change, a written Change Order prepared by the Architect on behalf of the District shall be forwarded to the Contractor describing the Change and setting forth the adjustment to the Contract Time and the Contract Price, if any, on account of such Change. All Change Orders shall be in full payment and final settlement of all claims for direct, indirect and consequential costs, including without limitation, costs of delays or impacts related to, or arising out of, items covered and affected by the Change Order, as well as any adjustments to the Contract Time. Any claim or item relating to any Change incorporated into a Change Order not presented by the Contractor for inclusion in the Change Order shall be deemed waived. The Contractor shall execute the Change Order prepared pursuant to the foregoing; once the Change Order has been prepared and forwarded to the Contractor for

execution, without the prior approval of the District which may be granted or withheld in the sole and exclusive discretion of the District, the Contractor shall not modify or amend the form or content of such Change Order, or any portion thereof. The Contractor's attempted or purported modification or amendment of any such Change Order, without the prior approval of the District, shall not be binding upon the District; any such unapproved modification or amendment to such Change Order shall be null, void and unenforceable. Unless otherwise expressly provided for in the Contract Documents or in the Change Order, any Change Order issued hereunder shall be binding upon the District only upon action of the District's Board of Trustees approving and ratifying such Change Order. In the event of any amendment or modification made by the Contractor to a Change Order for which there is no prior approval by the District, in accordance with the provisions of this Article 9.5, unless otherwise expressly stated in its approval and ratification of such Change Order, any action of the Board of Trustees to approve and ratify such Change Order shall be deemed to be limited to the Change Order as prepared by the Architect; such approval and ratification of such Change Order shall not be deemed the District's approval and ratification of any unapproved amendment or modification by the Contractor to such Change Order. Change Orders shall be issued on the form of Change Order and the content thereof, as attached to the Special Conditions.

9.6 Contractor Notice of Changes. If the Contractor should claim that any instruction, request, the Drawings, the Specifications, action, condition, omission, default, or other situation obligates the District to increase the Contract Price or to extend the Contract Time, the Contractor shall notify the Project Inspector and the Architect, in writing, of such claim within ten (10) days from the date of its actual or constructive notice of the factual basis supporting the same. The District shall consider any such claim of the Contractor only if sufficient supporting documentation is submitted with the Contractor's notice to the Project Inspector and the Architect. Time is of the essence in Contractor's written notice pursuant to the preceding sentence so that the District can promptly investigate and consider alternative measures to the address such instruction, request, Drawings, Specifications, action, condition, omission, default or other situation. Accordingly, Contractor acknowledges that its failure, for any reason, to give written notice (with sufficient supporting documentation to permit the District's review and evaluation) within ten (10) days of its actual or constructive knowledge of any instruction, request, Drawings, Specifications, action, condition, omission, default or other situation for which the Contractor believes there should an adjustment of the Contract Time or the Contract Price shall be deemed Contractor's waiver, release, discharge and relinquishment of any right to assert or claim any entitlement to an adjustment of the Contract Time or the Contract Price on account of any such instruction, request, Drawings, Specifications, action, condition, omission, default or other situation. In the event that the District determines that the Contract Price or the Contract Time are subject to adjustment based upon the events, circumstances and supporting documentation submitted with the Contractor's written notice under this Article 9.6, any such adjustment shall be determined in accordance with the provisions of Articles 9.4.1 and 9.4.2.

9.7 Disputed Changes. In the event of any dispute or disagreement between the Contractor and the District or the Architect regarding the characterization of any item as a Change to the Work or as to the appropriate adjustment of the Contract Price or the Contract Time on account thereof, the Contractor shall promptly proceed with the performance of such item of the Work, subject to a subsequent resolution of such dispute or disagreement in accordance with the terms of the Contract Documents. The Contractor's failure or refusal to so proceed with such Work may be deemed to be Contractor's default of a material obligation of the Contractor under the Contract Documents.

9.8 Emergencies. In an emergency affecting the safety of life, or of the Work, or of property, the

Contractor, without special instruction or prior authorization from the District or the Architect, is permitted to act at its discretion to prevent such threatened loss or injury. Any compensation claimed by the Contractor on account of such emergency work shall be submitted and determined in accordance with this Article 9.

9.9 Minor Changes in the Work. The Architect may order minor Changes in the Work not involving an adjustment in the Contract Price or the Contract Time and not inconsistent with the intent of the Contract Documents. Such Changes shall be effected by written order and shall be binding on the District and the Contractor. The Construction Manager or the Project Inspector may direct the Contractor to perform Changes provided that each such Change does not result in an increase of more than $500.00 to the Contract Price and no adjustment of the Contract Time. The Contractor shall carry out such orders promptly.

9.10 Unauthorized Changes. Any Work beyond the extent of Work shown on the Contract Documents, or any extra Work performed or provided by the Contractor without notice to the Architect, the Construction Manager and the Project Inspector in the manner and within the time set forth in Articles 9.2 or 9.6 shall be considered unauthorized and at the sole expense of the Contractor. Work so done will not be measured or paid for, no extension to the Contract Time will be granted on account thereof and any such Work may be ordered removed at the Contractor's sole cost and expense. The failure of the District to direct or order removal of such Work shall not constitute acceptance or approval of such Work nor relieve the Contractor from any liability on account thereof.

ARTICLE 10: SEPARATE CONTRACTORS

10.1 District's Right to Award Separate Contracts. The District reserves the right to perform construction or operations related to the Project with the District's own forces or to award separate contracts in connection with other portions of the Project or other construction or operations at or about the Site. If the Contractor claims that delay or additional cost is involved because of such action by the District, the Contractor shall seek an adjustment to the Contract Price or the Contract Time as provided for in the Contract Documents. Failure of the Contractor to request such an adjustment of the Contract Time or the Contract Price in strict conformity with the provisions of the Contract Documents applicable thereto shall be deemed a waiver of the same.

10.2 District's Coordination of Separate Contractors. The District shall provide for coordination of the activities of the District's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the District in reviewing their respective Construction Schedules when directed to do so. The Contractor shall make any revisions to the Approved Construction Schedule for the Work hereunder deemed necessary after a joint review and mutual agreement. The Construction Schedules shall then constitute the Construction Schedules to be used by the Contractor, separate contractors and the District until subsequently revised.

10.3 Mutual Responsibility. The Contractor shall afford the District and separate contractors reasonable opportunity for storage of their materials and equipment and performance of their activities at the Site and shall connect and coordinate the Contractor's Work, construction and operations with theirs as required by the Contract Documents.

10.4 Discrepancies or Defects. If part of the Contractor's Work depends for proper execution or results upon construction or operations by the District or a separate contractor, the Contractor

shall, prior to proceeding with that portion of the Work, promptly report to the Architect and the Project Inspector any apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor to so report shall constitute an acknowledgment that the District's or separate contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then discoverable by the Contractor's reasonable diligence.

ARTICLE 11: TESTS AND INSPECTIONS

11.1 Tests; Inspections; Observations.

11.1.1 Contractor's Notice. If the Contract Documents, laws, ordinances or any public authority with jurisdiction over the Work requires the Work, or any portion thereof, to be specially tested, inspected or approved, the Contractor shall give the Architect, the Construction Manager and the Project Inspector written notice of the readiness of such Work for observation, testing or inspection at least two (2) working days prior to the time for the conducting of such test, inspection or observation. If inspection, testing or observation is by authority other than the District, the Contractor shall inform the Project Inspector and the Construction Manager not less than two (2) working days prior to the date fixed for such inspection, test or observation. The Contractor shall not cover up any portion of the Work subject to tests, inspections or observations prior to the completion and satisfaction of the requirements of such test, inspection or observation. In the event that any portion of the Work subject to tests, inspection or approval shall be covered up by Contractor prior to completion and satisfaction of the requirements of such tests, inspection or approval, Contractor shall be responsible for the uncovering of such portion of the Work as is necessary for performing such tests, inspection or approval without adjustment of the Contract Price or the Contract Time on account thereof.

11.1.2 Cost of Tests and Inspections. Except as set forth below, the District will pay for fees, costs and expenses to complete the initial tests/inspections of portions of the Work as required by law, code or regulation, provided that such tests/inspections are conducted and completed at a location within a one hundred (100) mile radius of the Site. The foregoing notwithstanding, if the portion(s) of the Work subject to tests/inspections is/are not ready for such test/inspection at the time indicated in the Contractor's notice under Article 11.1.1 or if upon completion of such test/inspection, the portion(s) of the Work subject to such test/inspection do not meet or exceed the minimum requirements of such test/inspection, the Contractor shall be solely responsible for the payment of all fees, costs or expenses arising out of or related in any manner to subsequent tests/inspections of such portion(s) of the Work. Notwithstanding the District's payment of fees, costs or expenses for conducting initial tests/inspections, if any actions or failures to act of the Contractor or person or entity providing or performing Work under the direction or control of the Contractor require tests/inspections to be conducted over a period of more than eight (8) hours per day by any single person or on weekends/holidays, the Contractor shall be solely responsible for the payment of fees, costs or expenses which result from test/inspection services which exceed eight (8) hours per day by any single person or on weekends/holidays. If any tests/inspections are conducted outside a one hundred (100) mile radius of the Site, the Contractor shall be solely responsible for all costs, fees or expenses to conduct and complete such tests/inspections conducted at such location, including without limitation, costs to complete such tests/inspections and travel, meal and related expenses.

11.1.3 Testing/Inspection Laboratory. The District shall select duly qualified person(s) or

testing laboratory(ies) to conduct the tests and inspections to be paid for by the District and required by the Contract Documents. Tests and inspections required of the Work shall be as set forth in the Contract Documents and as required by applicable law, rule or regulation, including without limitation, Title 24 of the California Code of Regulations. Test/inspection standards shall be as set forth in the Contract Documents or established by applicable law, rule or regulation. Where inspection or testing is to be conducted by an independent laboratory or testing agency, materials or samples thereof shall be selected by the laboratory, testing agency, the Project Inspector, the Construction Manager or the Architect and not by the Contractor.

11.1.4 Additional Tests, Inspections and Approvals. If the Architect, the Construction Manager, the Project Inspector or public authorities having jurisdiction over the Work determine that portions of the Work require additional testing, inspection or approval, the Architect will, upon written authorization from the District, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the District, and the Contractor shall give timely notice to the Architect, the Construction Manager and the Project Inspector of when and where tests and inspections are to be made so the Project Inspector and the Architect may observe such procedures. The District shall bear the costs of such additional tests, inspections or approvals, except to the extent that such additional tests, inspections or approvals reveal any failure of the Work to comply with the requirements of the Contract Documents, in which case the Contractor shall bear all costs made necessary by such failures, including without limitation, the costs of corrections, repeat tests, inspections or approvals and the costs of the Architect's services or its consultants in connection therewith.

11.2 Delivery of Certificates. Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager.

11.3 Timeliness of Tests, Inspections and Approvals. Tests or inspections required and conducted pursuant to the Contract Documents shall be made or arranged by Contractor to avoid delay in the progress of the Work. Neither the Contract Time nor Contract Price shall be adjusted on account of the failure of the Contractor to timely arrange for the conduct of required tests/inspections and the Contractor shall be liable to the District for all consequences of such failures, including without limitation, the assessment of Liquidated Damages for delayed Substantial Completion of the Work resulting from such failure of the Contractor.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.1 Inspection of the Work.

12.1.1 Access to the Work. All Work and all materials and equipment forming a part of the Work or incorporated into the Work are subject to inspection by the District, the Construction Manager, the Architect and the Project Inspector for conformity with the Contract Documents. The Contractor shall, at its cost and without adjustment to the Contract Price or the Contract Time, furnish any facilities necessary for sufficient and safe access to the Work for purposes of inspection by the District, the Construction Manager, the Architect, the Project Inspector, DSA or any other public or quasi-public authority with jurisdiction over the Work or any portion thereof.

12.1.2 Limitations Upon Inspections. Inspections, tests, measurements, or other acts of the

Architect, the Construction Manager and the Project Inspector hereunder are for the sole purpose of assisting them in determining that the Work, materials, equipment, progress of the Work, and quantities generally comply and conform with the requirements of the Contract Documents. These acts or functions shall not relieve the Contractor from performing the Work in full compliance with the Contract Documents. No inspection by the Architect or the Project Inspector shall constitute or imply acceptance of Work inspected. Inspection of the Work hereunder is in addition to, and not in lieu of, any other testing, inspections or approvals of the Work required under the Contract Documents.

12.2 Uncovering of Work. If any portion of the Work is covered contrary to the request of the Architect, the Construction Manager, the Project Inspector or the requirements of the Contract Documents, it must, if required by the Architect or the Project Inspector, be uncovered for observation by the Architect, Construction Manager and the Project Inspector and be replaced at the Contractor's expense without adjustment of the Contract Time or the Contract Price.

12.3 Rejection of Work. Prior to the District's Final Acceptance of the Work, any Work or materials or equipment forming a part of the Work or incorporated into the Work which is defective or not in conformity with the Contract Documents may be rejected by the District, the Construction Manager the Architect or the Project Inspector and the Contractor shall correct such rejected Work without any adjustment to the Contract Price or the Contract Time, even if the Work, materials or equipment have been previously inspected by the Architect or the Project Inspector or even if they failed to observe the defective or non-conforming Work, materials or equipment.

12.4 Correction of Work. The Contractor shall promptly correct any portion of the Work rejected by the District, the Construction Manager, the Architect or the Project Inspector for failing to conform to the requirements of the Contract Documents, or which is determined by them to be defective, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including additional testing and inspections and compensation for the Architect's services and expenses made necessary thereby. The Contractor shall bear all costs of correcting destroyed or damaged construction, whether completed or partially completed, of the District or separate contractors, caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents, or which is defective.

12.5 Removal of Non-Conforming or Defective Work. The Contractor shall, at its sole cost and expense, remove from the Site all portions of the Work which are defective or are not in accordance with the requirements of the Contract Documents which are neither corrected by the Contractor nor accepted by the District.

12.6 Failure of Contractor to Correct Work. If the Contractor fails to commence to correct defective or non-conforming Work within 3 days of notice of such condition and promptly thereafter complete the same within a reasonable time, the District may correct it in accordance with the Contract Documents. If the Contractor does not proceed with correction of such defective or non-conforming Work within the time fixed herein, the District may remove it and store the salvable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage after written notice, the District may sell such materials or equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including without limitation compensation for the Architect's services, attorneys fees and other expenses made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, the Contract Price shall be reduced by the deficiency. If payments of the Contract Price then or

thereafter due the Contractor are not sufficient to cover such amount, the Contractor and the Surety shall promptly pay the difference to the District.

12.7 Acceptance of Defective or Non-Conforming Work. The District may, in its sole and exclusive discretion, elect to accept Work which is defective or which is not in accordance with the requirements of the Contract Documents, instead of requiring its removal and correction, in which case the Contract Price shall be reduced as appropriate and equitable.

ARTICLE 13: WARRANTIES

13.1 Workmanship and Materials. The Contractor warrants to the District that all materials and equipment furnished under the Contract Documents shall be new, of good quality and of the most suitable grade and quality for the purpose intended, unless otherwise specified in the Contract Documents. All Work shall be of good quality, free from faults and defects and in conformity with the requirements of the Contract Documents. If required by the Architect or the District, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment incorporated into the Work. Any Work, or portion thereof not conforming to these requirements, including substitutions or alternatives not properly approved in accordance with the Contract Documents may be deemed defective. Where there is an approved substitution of, or alternative to, material or equipment specified in the Contract Documents, the Contractor warrants to the District that such installation, construction, material, or equipment will equally perform the function and have the quality of the originally specified material or equipment. The Contractor expressly warrants the merchantability, the fitness for use, and quality of all substitute or alternative items in addition to any warranty given by the manufacturer or supplier of such item.

13.2 Warranty Work. If, within two years after the date of Final Acceptance, or such other time frame set forth elsewhere in the Contract Documents, any of the Work is found to be defective or not in accordance with the requirements of the Contract Documents, or otherwise contrary to the warranties contained in the Contract Documents, the Contractor shall commence all necessary corrective action not more than seven (7) days after receipt of a written notice from the District to do so, and to thereafter diligently complete the same. In the event that Contractor shall fail or refuse to commence correction of any such item within said seven (7) day period or to diligently prosecute such corrective actions to completion, the District may, without further notice to Contractor, cause such corrective Work to be performed and completed. In such event, Contractor and Contractor's Performance Bond Surety shall be responsible for all costs in connection with such corrective Work, including without limitation, general administrative overhead costs of the District in securing and overseeing such corrective Work. Nothing contained herein shall be construed to establish a period of limitation with respect to any obligation of the Contractor under the Contract Documents. The obligations of the Contractor hereunder shall be in addition to, and not in lieu of, any other obligations imposed by any special guarantee or warranty required by the Contract Documents, guarantees or warranties provided by any manufacturer of any item or equipment forming a part of, or incorporated into the Work, or otherwise recognized, prescribed or imposed by law. Neither the District's Final Acceptance, the making of Final Payment, any provision in Contract Documents, nor the use or occupancy of the Work, in whole or in part, by District shall constitute acceptance of Work not in accordance with the Contract Documents nor relieve the Contractor or the Contractor's Performance Bond Surety from liability with respect to any warranties or responsibility for faulty or defective Work or materials, equipment and workmanship incorporated therein.

13.3 Guarantee. Upon completion of the Work, Contractor shall execute and deliver to the District

the form of Guarantee included within the Contract Documents. The Contractor's execution and delivery of the form of Guarantee is an express condition precedent to any obligation of the District to disburse the Final Payment to the Contractor.

13.4 Survival of Warranties. The provisions of this Article 13 shall survive the Contractor's completion of Work under the Contract Documents, the District's Final Acceptance or the termination of the Contract.

ARTICLE 14: SUSPENSION OF WORK

14.1 District's Right to Suspend Work. The District may, without cause, and without invalidating or terminating the Contract, order the Contractor, in writing, to suspend, delay or interrupt the Work in whole or in part for such period of time as the District may determine. The Contractor shall resume and complete the Work suspended by the District in accordance with the District's directive, whether issued at the time of the directive suspending the Work or subsequent thereto.

14.2 Adjustments to Contract Price and Contract Time. In the event the District shall order suspension of the Work, an adjustment shall be made to the Contract Price for increases in the direct cost of performance of the Work of the Contract Documents, actually caused by suspension, delay or interruption ordered by the District; provided however that no adjustment of the Contract Price shall be made to the extent: (i) that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible under the Contract Documents; or (ii) that an equitable adjustment is made or denied under another provision of the Contract Documents. The foregoing notwithstanding, any such adjustment of the Contract Price shall not include any adjustment to increase the Contractor's overhead, general administrative costs or profit, all of which will remain as reflected in the Cost Breakdown submitted by the Contractor pursuant to the Contract Documents. In the event of the District's suspension of the Work, the Contract Time shall be equitably adjusted.

ARTICLE 15: TERMINATION

15.1 Termination for Cause.

15.1.1 District's Right to Terminate. The District may terminate the Contract upon the occurrence of any one or more of the following events of the Contractor's default: (i) if the Contractor refuses or fails to prosecute the Work with diligence as will insure Substantial Completion of the Work within the Contract Time, or if the Contractor fails to substantially Complete the Work within the Contract Time; (ii) if the Contractor becomes bankrupt or insolvent, or makes a general assignment for the benefit of creditors, or if the Contractor or a third party files a petition to reorganize or for protection under any bankruptcy or similar laws, or if a trustee or receiver is appointed for the Contractor or for any of the Contractor's property on account of the Contractor's insolvency, and the Contractor or its successor in interest does not provide adequate assurance of future performance in accordance with the Contract Documents within 10 days of receipt of a request for such assurance from the District; (iii) if the Contractor repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment; (iv) if the Contractor repeatedly fails to make prompt payments to any Subcontractor, of any tier, or Material Suppliers or others for labor, materials or equipment; (v) if the Contractor disregards laws, ordinances, rules, codes, regulations, orders applicable to the Work or similar requirements of any public entity having jurisdiction over the Work; (vi) if the Contractor disregards proper directives of the Architect, the Project Inspector or District under the Contract Documents; (vii) if the Contractor performs Work

which deviates from the Contract Documents and neglects or refuses to correct such Work; or (viii) if the Contractor otherwise violates in any material way any provisions or requirements of the Contract Documents. Once the District determines that sufficient cause exists to justify the action, the District may terminate the Contract without prejudice to any other right or remedy the District may have, after giving the Contractor and the Surety at least seven (7) days advance written notice of the effective date of termination. The District shall have the sole discretion to permit the Contractor to remedy the cause for the termination without waiving the District's right to terminate the Contract, or otherwise waiving, restricting or limiting any other right or remedy of the District under the Contract Documents or at law.

15.1.2 District's Rights Upon Termination. In the event that the Contract is terminated pursuant to this Article 15.1, the District may take over the Work and prosecute it to completion, by contract or otherwise, and may exclude the Contractor from the site. The District may take possession of the Work and of all of the Contractor's tools, appliances, construction equipment, machinery, materials, and plant which may be on the site of the Work, and use the same to the full extent they could be used by the Contractor without liability to the Contractor. In exercising the District's right to prosecute the completion of the Work, the District may also take possession of all materials and equipment stored at the site of the Work or for which the District has paid the Contractor but which are stored elsewhere, and finish the Work as the District deems expedient. In exercising the District's right to prosecute the completion of the Work, the District shall have the right to exercise its sole discretion as to the manner, methods, and reasonableness of the costs of completing the Work and the District shall not be required to obtain the lowest figure for completion of the Work. In the event that the District takes bids for remedial Work or completion of the Work, the Contractor shall not be eligible for the award of such contract(s).

15.1.3 Completion by the Surety. In the event that the Contract is terminated pursuant to this Article 15.1, the District may demand that the Surety take over and complete the Work. The District may require that in so doing, the Surety not utilize the Contractor in performing and completing the Work. Upon the failure or refusal of the Surety to take over and begin completion of the Work within twenty (20) days after demand therefor, the District may take over the Work and prosecute it to completion as provided for above.

15.1.4 Assignment and Assumption of Subcontracts. The District shall, in its sole and exclusive discretion, have the option of requiring any Subcontractor or Material Supplier to perform in accordance with its Subcontract or Purchase Order with the Contractor and assign the Subcontract or Purchase Order to the District or such other person or entity selected by the District to complete the Work.

15.1.5 Costs of Completion. In the event of termination under this Article 15.1, the Contractor shall not be entitled to receive any further payment of the Contract Price until the Work is completed. If the unpaid balance of the Contract Price as of the date of termination exceeds the District's direct and indirect costs and expenses for completing the Work, including without limitation, attorneys' fees and compensation for additional professional and consultant services, such excess shall be used to pay the Contractor for the cost of the Work performed prior to the effective date of termination with a reasonable allowance for overhead and profit. If the District's costs and expenses to complete the Work exceed the unpaid Contract Price, the Contractor and/or the Surety shall pay the difference to the District.

15.1.6 Contractor Responsibility for Damages. The Contractor and the Surety shall be liable for all damage sustained by the District resulting from, in any manner, the termination of Contract under this Article 15.1, including without limitation, attorneys' fees, and for all costs necessary for repair and completion of the Work over and beyond the Contract Price.

15.1.7 Conversion to Termination for Convenience. In the event the Contract is terminated under this Article 15.1, and it is determined, for any reason, that the Contractor was not in default under the provisions hereof, the termination shall be deemed a Termination for Convenience of the District and thereupon, the rights and obligations of the District and the Contractor shall be determined in accordance with Article 15.2 hereof.

15.1.8 District's Rights Cumulative. In the event the Contract is terminated pursuant to this Article 15.1, the termination shall not affect or limit any rights or remedies of the District against the Contractor or the Surety. The rights and remedies of the District under this Article 15.1 are in addition to, and not in lieu of, any other rights and remedies provided by law or otherwise under the Contract Documents. Any retention or payment of monies to the Contractor by the District shall not be deemed to release the Contractor or the Surety from any liability hereunder.

15.2 Termination for Convenience of the District. The District may at any time, in its sole and exclusive discretion, by written notice to the Contractor, terminate the Contract in whole or in part when it is in the interest of, or for the convenience of, the District. In such case, the Contractor shall be entitled to payment for: (i) Work actually performed and in place as of the effective date of such termination for convenience of the District, with a reasonable allowance for profit and overhead on such Work, and (ii) reasonable termination expenses for reasonable protection of Work in place and suitable storage and protection of materials and equipment delivered to the site of the Work but not yet incorporated into the Work, provided that such payments exclusive of termination expenses shall not exceed the total Contract Price as reduced by payments previously made to the Contractor and as further reduced by the value of the Work as not yet completed. The Contractor shall not be entitled to profit and overhead on Work which was not performed as of the effective date of the termination for convenience of the District. The District may, in its sole discretion, elect to have subcontracts assigned pursuant to Article 15.1.4 above after exercising the right hereunder to terminate for the District's convenience.

ARTICLE 16: MISCELLANEOUS

16.1 Governing Law. This Contract shall be governed by and interpreted in accordance with the laws of the State of California.

16.2 Marginal Headings; Interpretation. The titles of the various Articles of these General Conditions and elsewhere in the Contract Documents are used for convenience of reference only and are not intended to, and shall in no way, enlarge or diminish the rights or obligations of the District or the Contractor and shall have no effect upon the construction or interpretation of the Contract Documents. The Contract Documents shall be construed as a whole in accordance with their fair meaning and not strictly for or against the District or the Contractor.

16.3 Successors and Assigns. Except as otherwise expressly provided in the Contract Documents, all terms, conditions and covenants of the Contract Documents shall be binding upon, and shall inure to the benefit of the District and the Contractor and their respective heirs, representatives, successors-in-interest and assigns.

16.4 Cumulative Rights and Remedies; No Waiver. Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not in lieu of or otherwise a limitation or restriction of duties, obligations, rights and remedies otherwise imposed or available by law. No action or failure to act by the District shall constitute a waiver of a right or remedy afforded it under the Contract Documents or at law nor shall such an action or failure to act constitute approval of or acquiescence in a breach hereunder, except as may be specifically agreed in writing.

16.5 Severability. In the event any provision of the Contract Documents shall be deemed illegal, invalid, unenforceable and/or void, by a court or any other governmental agency of competent jurisdiction, such provision shall be deemed to be severed and deleted from the Contract Documents, but all remaining provisions hereof, shall in all other respects, continue in full force and effect.

16.6 No Assignment by Contractor. The Contractor shall not sublet or assign the Contract, or any portion thereof, or any monies due thereunder, without the express prior written consent and approval of the District, which approval may be withheld in the sole and exclusive discretion of the District. The District's approval to such assignment shall be upon such terms and conditions as determined by the District in its sole and exclusive discretion.

16.7 Gender and Number. Whenever the context of the Contract Documents so require, the neuter gender shall include the feminine and masculine, the masculine gender shall include the feminine and neuter, the singular number shall include the plural and the plural number shall include the singular.

16.8 Independent Contractor Status. In performing its obligations under the Contract Documents, the Contractor is an independent contractor to the District and not an agent or employee of the District. Nothing contained herein shall be deemed or construed as creating a relationship of employer and employee between the District and the Contractor or any Subcontractors, employees of the Contractor or Subcontractors or their respective agents and representatives. Neither the Contractor, Subcontractors nor any employees of the Contractor or Subcontractors are entitled to any rights or privileges of District employees.

16.9 Notices. Except as otherwise expressly provided for in the Contract Documents, all notices which the District or the Contractor may be required, or may desire, to serve on the other, shall be effective only if delivered by personal delivery or by postage prepaid, First Class Certified Return Receipt Requested United States Mail, addressed to the District or the Contractor at their respective address set forth in the Contract Documents, or such other address(es) as either the District or the Contractor may designate from time to time by written notice to the other in conformity with the provisions hereof. In the event of personal delivery, such notices shall be deemed effective upon delivery, provided that such personal delivery requires a signed receipt by the recipient acknowledging delivery of the same. In the event of mailed notices, such notice shall be deemed effective on the third working day after deposit in the mail.

16.10 Disputes; Continuation of Work. Notwithstanding any claim, dispute or other disagreement between the District and the Contractor regarding performance under the Contract Documents, the scope of Work thereunder, or any other matter arising out of or related to, in any manner, the Contract Documents, the Contractor shall proceed diligently with performance of the Work in accordance with the District's written direction, pending any final determination or decision regarding any such claim, dispute or disagreement.

16.11 Dispute Resolution; Arbitration.

16.11.1 Claims Under $375,000.00. Claims between the District and the Contractor of $375,000.00 or less shall be resolved in accordance with the procedures established in Part 3, Chapter 1, Article 1.5 of the California Public Contract Code, §§20104 et seq.; provided however that California Public Contract Code §20104.2(a) shall not supersede the requirements of the Contract Documents with respect to the Contractor's notification to the District of such claim or extend the time for the giving of such notice as provided in the Contract Documents. The term "claims" as used herein shall be as defined in California Public Contract Code §20104(b)(2).

16.11.2 Arbitration. Except as provided in Article 16.11.1, any other claims, disputes, disagreements or other matters in controversy between the District and the Contractor arising out of, or related, in any manner, to the Contract Documents, or the interpretation, clarification or enforcement thereof shall be resolved by arbitration conducted in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association ("AAA") in effect as of the date that a Demand for Arbitration is filed, except as expressly modified herein. The locale for any arbitration commenced hereunder shall be the regional office of the AAA closest to the Site. The award rendered by the Arbitrator(s) shall be final and binding upon the District and the Contractor and shall be supported by law and substantial evidence pursuant to California Code of Civil Procedure §1296. Any written arbitration award that does not include findings of fact and conclusions of law in conformity with California Code of Civil Procedure §1296 and Rule R-43 of the AAA Construction Industry Arbitration Rules shall be invalid and unenforceable. The District and Contractor hereby expressly agree that the Court shall, subject to California Code of Civil Procedure §§1286.4 and 1296, vacate the award if, after review of the award, the Court determines either that the award is not supported by substantial evidence or that it is based on an error of law. The award rendered by the Arbitrator(s) shall be final and binding upon the District and the Contractor. In connection with any arbitration proceeding commenced hereunder, the discovery rights and procedures provided for in California Code of Civil Procedure §1283.05 shall be applicable, and the same shall be deemed incorporated herein by this reference. A Demand for Arbitration shall be filed and served within a reasonable time after the occurrence of the claim, dispute or other disagreement giving rise to the Demand for Arbitration, but in no event shall a Demand for Arbitration be filed or served after the date when the institution of legal or equitable proceedings based upon such claim, dispute or other disagreement would be barred by the applicable statute of limitations. In the event more than one Demand for Arbitration is made by either the District or the Contractor, all such controversies shall be consolidated into a single arbitration proceeding, unless otherwise agreed to by the District and the Contractor. The Contractor's Surety, a Subcontractor or Material Supplier to the Contractor and other third parties may be permitted to join in and be bound by an arbitration commenced hereunder if required by the terms of their respective agreements with the Contractor, except to the extent that such joinder would unduly delay or complicate the expeditious resolution of the claim, dispute or other disagreement between the District and the Contractor, in which case an appropriate severance order shall be issued by the Arbitrator(s). The expenses and fees of the Arbitrator(s) shall be divided equally among the parties to the arbitration. Each party to any arbitration commenced hereunder shall be responsible for and shall bear its own attorneys' fees, witness fees and other cost and expense incurred in connection with such arbitration. The foregoing notwithstanding, the Arbitrator(s) may award arbitration costs, including Arbitrators' fees but excluding attorneys' fees, to the prevailing party. The confirmation, enforcement, vacation or correction of an arbitration award rendered hereunder shall be the

Superior Court of the State of California for the county in which the Site is situated. The substantive and procedural rules for such post-award proceedings shall be as set forth in California Code of Civil Procedure §1285 et seq.

16.11.3 Inapplicability to Bid Bond. The provisions of this Article 16.11 shall not be applicable to disputes, disagreements or enforcement of rights or obligations under the Bid Bond; all claims, disputes and actions to enforce rights or obligations under the Bid Bond shall be adjudicated only by judicial proceedings commenced in a court of competent jurisdiction.

16.12 Capitalized Terms. Except as otherwise expressly provided, capitalized terms used in the Contract Documents shall have the meaning and definition for such term as set forth in the Contract Documents.

16.13 Attorneys Fees. Except as expressly provided for in the Contract Documents, or authorized by law, neither the District nor the Contractor shall recover from the other any attorneys fees or other costs associated with or arising out of any legal, administrative or other proceedings filed or instituted in connection with or arising out of the Contract Documents or the performance of either the District or the Contractor thereunder.

16.14 Waiver of Special/Consequential Damages. Notwithstanding any right conferred by law or arising by operation of law, by executing the Agreement, the Contractor expressly waives and relinquishes any and all right or entitlement to assert or recover any damages, losses or liabilities from the District which are in the nature of special or consequential damages, losses or liabilities arising out of or related in any manner to the District's breach or default of its obligations under the Contract Documents.

16.15 Provisions Required by Law Deemed Inserted. Each and every provision of law and clause required by law to be inserted in the Contract Documents is deemed to be inserted herein and the Contract Documents shall be read and enforced as though such provision or clause are included herein, and if through mistake, or otherwise, any such provision or clause is not inserted or if not correctly inserted, then upon application of either party, the Contract Documents shall forthwith be physically amended to make such insertion or correction.

16.16 Days. Unless otherwise expressly stated, references to "days" in the Contract Documents shall be deemed to be calendar days.

16.17 Prohibited Interests. No employee of the District, who is authorized in such capacity on behalf of the District to negotiate, make, accept or approve, or to take part in negotiating, making, accepting or approving any architectural, engineering, inspection, construction or material supply contract or subcontract in connection with the Work shall become directly or indirectly financially interested in the Work or any part thereof.

16.18 Entire Agreement. The Contract Documents contain the entire agreement and understanding between the District and the Contractor concerning the subject matter hereof, and supersedes and replaces all prior negotiations, proposed agreements or amendments, whether written or oral. No amendment or modification to any provision of the Contract Documents shall be effective or enforceable except by an agreement in writing executed by the District and the Contractor.

[END OF SECTION]

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SPECIAL CONDITIONS

Application of Special Conditions. These Special Conditions for a part of the Contract Documents for the Work generally described as: MPOE Replacement Bldg 300, Learning Skills Testing Relocation Bldg 100

1. **Drawings and Specifications.** The number of sets of the Drawings and Specifications which the District will provide to the Contractor, pursuant to Article 2.1.3 of the General Conditions is Ten (10) Additional sets of the Drawings and Specifications may be obtained by the Contractor from the District at the cost of reproduction.

2. **Insurance.**

2.1 Insurance Requirements for Contractor. Minimum coverage amounts for each policy of insurance required of the Contractor shall be as follows:

Workers Compensation Insurance	In accordance with applicable law
Employers Liability Insurance	$1,000,000
Commercial General Liability Insurance (including coverage for bodily injury, death, property damage and motor vehicle liability)	
Per Occurrence	$2,000,000
Aggregate	$4,000,000
Builder's Risk	Full value of the Work; seismic coverage is not required

2.2 Insurance Requirements for Subcontractors. Minimum coverage amounts for each policy of insurance to be obtained and maintained by each Subcontractor to the Contractor shall be as follows:

Workers Compensation Insurance	In accordance with applicable law
Employers Liability Insurance	$1,000,000
Commercial General Liability Insurance (including coverage for bodily injury, death, property damage and motor vehicle liability)	
Per Occurrence	$1,000,000
Aggregate	$2,000,000

3. **Contract Time; Liquidated Damages**.

3.1 Contract Time. The Contract Time for the Contractor's Substantial Completion of the Work is Seventy (70) calendar days after the date for commencement of the Work as set forth in the Notice to Proceed issued by or on behalf of the District to the Contractor.

3.2 Liquidated Damages.

3.2.1 Delayed Substantial Completion. If the Contractor fails to achieve Substantial

Completion of the Work within the Contract Time, including adjustments thereto in accordance with the Contract Documents, the Contractor shall be subject to assessment of Liquidated Damages in the amount of **One Thousand Dollars ($1,000.00)** per day from the scheduled date of Substantial Completion until Substantial Completion is achieved.

3.2.2 Delayed Completion of Punchlist Items. If the Contractor fails to complete all Punchlist Items noted upon Substantial Completion within the time established for completion of all Punchlist Items, the Contractor shall be subject to assessment of Liquidated Damages in the amount of **One Hundred Fifty Dollars ($150.00)** per day from the scheduled date of completion until all Punchlist Items are completed.

3.2.3 District Withhold of Liquidated Damages; Performance Bond Surety. If the Contractor is subject to assessment of Liquidated Damages for delayed Substantial Completion and/or delay completion of Punchlist Items, the District may withhold such assessments from the Contractor Price then or thereafter due the Contractor. If the assessment of Liquidated Damages exceeds the then remaining balance of the Contractor Price, the Contractor and the Surety issuing the Performance Bond shall be jointly and severally liable to the District for such amounts.

4. Delays due to Unanticipated, Unusually Severe Weather Conditions. Delays due to adverse weather conditions will only be grated to the extent they exceed the "normal" anticipated Inclement Weather Days set forth herein. A weather delay day shall be granted for each calendar day the Contractor can document adverse weather caused critical path delays in excess of (20) calendar days. This is the number to be used in the schedules under the activity entitled "Remaining Inclement Weather Days." See General Conditions Paragraph 7.3.9 for further information and notice requirements document "Inclement Weather Days."

5. Facilities/Services for Project Inspector. Pursuant to Article 4.14 of the General Conditions, during the Work, the Contractor shall provide/furnish the following facilities/services or other items for use by the Project Inspector: NONE

6. District Provided Temporary Utilities. Pursuant to Article 4.3.4 of the General Conditions, during the Contractor's performance of the Work, the District will provide utility services and a point of connection for electrical power and domestic potable water. The connection and placement, relocation and removal of temporary distributions of the electrical power and domestic potable water utility service provided by the District will be by the Contractor at its cost and expense without adjustment of the Contract Price. The Contractor may use the temporary electrical power and domestic potable water service furnished by the District provided that: (a) the District may discontinue, limit or condition use of such services by a Contractor if the District reasonably determines that the Contractor has wasted such utilities, and (b) the District shall not be liable to the Contractor, nor shall the Contract Time or the Contract Price be increased if any District provided temporary utility service is discontinued or disrupted for any reason other than the District's non-payment of undisputed utility charges.

7. Mark-Ups on Changes to the Work. In the event of Changes to the Work, pursuant to Article 9 of the General Conditions, the mark-up for all overhead (including home and field office overhead), general conditions costs and profit, shall not exceed the percentage of allowable direct actual costs for performance of the Change as set forth below. For the portion of any Change performed by Subcontractors of any tier, the percentage mark-up on allowable actual direct labor and materials costs incurred by all Subcontractors of any tier shall be Twelve Percent (12%). In addition, for the portion of any Change performed by a Subcontractor of any tier, the Contractor

may add an amount equal to Five Percent (5%) of the allowable actual direct labor and materials costs of Subcontractors performing the Change. For the portion of any Change performed by the Contractor's own forces, the mark-up on the allowable actual direct labor and materials costs of such portion of a Change shall be Fifteen Percent (15%).

8. **Form and Content of Change Orders**. In accordance with the provisions of Article 9.5 of the General Conditions, if the District approves of a Change Order, the Change Order issued by the District and executed by the District, Architect and Contractor shall be in the form and content as set forth in Attachment A to these Special Conditions.

9. **Asbestos and Other Hazardous Materials Certification**. Upon completion of the Work and as an additional express condition precedent to the District's obligation to disburse the Final Payment to the Contractor, the Contractor's duly authorized representative shall deliver to the District the completed and executed form of Asbestos and Other Hazardous Materials Certification included as Attachment B to the Special Conditions; the signature of the Contractor's representative shall be notarized by a California Notary Public.

10. **Debris Recycling Statement**. The District's form of Debris Recycling Statement is attached to these Special Conditions as Attachment C. The Contractor shall complete, execute and submit the Debris Recycling Statement in accordance with applicable provisions of the General Conditions.

11. **Additional Definitions**. In addition to terms defined elsewhere in the Contract Documents, the following terms used in the Contract Documents are defined as set forth herein.

11.1 Owner. Unless otherwise expressly provided, references to the "Owner" shall be deemed references to the District, as that term is defined in the Contract Documents.

11.2 Inspector; Inspector of Record; IOR; Owner's Inspector. Unless otherwise expressly provided, references to Inspector, Inspector of Record, IOR or Owner's Inspector shall be deemed references to the District Inspector as that term is defined in the Contract Documents.

11.3 Contract Sum. Unless otherwise expressly provided, the terms "Contract Price" and "Contract Sum" are synonymous.

11.4 Campus. Unless otherwise expressly provided, the term "Campus" shall be deemed to refer to **Chabot College**.

CHANGE ORDER FORM
(ATTACHMENT A TO SPECIAL CONDITIONS)

Project:_____ Change Order #:_____
Date:_____ Contract #:_____

Contractor:_____

Pursuant to the General Conditions, this Change Order Form shall be used for all Change Orders associated with the Work. No additions or deletions to this form shall be allowed, except with permission of the District.

You are hereby directed to provide the extra work necessary to comply with this Change Order.

DESCRIPTION OF CHANGE:

Contractor accepts the terms and conditions stated as full and final settlement of any and all claims arising from this Change Order. Contractor agrees to perform the above described changes in accordance with the terms set forth herein and in compliance with applicable sections of the Contract Documents. This Change Order is hereby agreed to, accepted and approved, all in accordance with the General Conditions of the Contract Documents. The adjustment of the Contract Price and the Contract Time for the changes noted in this Change Order (the "Changes") represents the full and complete adjustment of the Contract Time and the Contract Price due the Contractor for providing and completing such Changes, including without limitation: (i) all costs (whether direct or indirect) for labor, equipment, materials, tools, supplies and/or services; (ii) all general and administrative overhead costs (including without limitation, home office, field office and Site general conditions costs) and profit; and (iii) all impacts, delays, disruptions, interferences, or hindrances in providing and completing the Changes. Contractor waives all rights, including without limitation those arising under Civil Code Section 1542, for any other adjustment of the Contract Price or the Contract Time on account of the Changes set forth in this Change Order or the Contractor's performance and completion of the Changes.

NOT VALID UNTIL SIGNED BY THE OWNER, ARCHITECT, AND CONTRACTOR

The original Contract Sum was . . . . . $_____

Net change by previously authorized Change Orders . . . . $_____

The Contract Sum prior to this Change Order was. . . . . $_____

The Contract Sum will be changed by this Change Order in the amount of. . . . . $_____

The adjusted Contract Sum including this Change Order will be. . .. . $_____

The Contract Time will be (increased) (decreased) (unchanged) by. . . . . (_____) Days

The date of Substantial Completion as of the date of this Change Order therefore is: . . ._____/_____/_____

ARCHITECT	CONTRACTOR	OWNER CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT 7600 Dublin Boulevard, 3rd Floor Dublin, California 94568
_____	_____	
By:_____	By:_____	By:_____
Date:_____	Date:_____	Date:_____

ASBESTOS AND OTHER HAZARDOUS MATERIALS CERTIFICATION (ATTACHMENT B TO SPECIAL CONDITIONS)

This Asbestos and Other Hazardous Materials Certification form is part of the Contract made by and between the CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT and _____ ("Contractor") for the work of improvement commonly referred to as MPOE Replacement – Bldg 300, and Learning Skills Testing Relocation – Bldg 100 (hereinafter referred to as the "Project").

To the best of my knowledge, information and belief, in completing the Work of the Project, no materials, equipment or other items furnished, installed or incorporated into the Project contains, or in itself be composed of, any asbestos, polychlorinated biphenyl (PCB), any material listed by the federal or state EPA or federal or state health agencies as a hazardous material, or defined as being hazardous under federal or state laws, rules or regulations.

The undersigned is duly authorized to complete, execute and submit this Asbestos and Other Hazardous Materials Certification on behalf of the Contractor. The undersigned has personal knowledge of the substantive representations set forth hereinabove or has made appropriate diligent inquiry to ascertain that the substantive representations set forth hereinabove are complete, true and accurate and do not omit material facts rendering such representations to be false or misleading.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on this_____day of_____, 20__ at_____.
(City and State)

_____
Name of Contractor (Print or Type)

By:

_____
Signature

_____
Print Name

_____
Title

_____
Subscribed and sworn before me
this_____day of_____, 200

Notary Public in and for the State of California

My Commission Expires:

Chabot – Las Positas Community College District
Construction & Demolition

DEBRIS RECYCLING STATEMENT

Project Name / Location: _____
_____ Demolition Construction
Contractor Name: _____ Contact Name: _____ Phone: _____ Fax: _____ Anticipated Start Date: _____ Anticipated Completion Date: _____ Statement Date: _____
For the period between: _____/_____ and _____/_____
Month Year Month Year

Please indicate estimated quantities by matter, the proposed processing method and the vendor selected. Weight tag required as verification.

	Estimated Amount (Tons or Yards)			
Material	**Recycled**	**Salvaged**	**Landfilled**	**Vendor or Facility Selected**
Asphalt				
Concrete				
Brick/Masonry Tile				
Corrugated Cardboard				
Dirt/Clean Full				
Drywall				
Padding – Carpet Foam				
Building Materials (doors, windows, cabinets, fixtures)				
Scrap Metals				
Mixed Recyclable Debris Other				
Un-painted wood/Pallets				
Green Waste/Yard Waste				
Garbage – Painted Wood-Trash				

If no materials are targeted for recycling, reuse or salvage, please state why: _____
_____
_____

The undersigned certifies that she/he is authorized to execute this Debris Recycling Statement on behalf of the above-identified Contractor. The undersigned further certifies that she/he has personal knowledge of the foregoing, or has made reasonable inquiry to ascertain, that the foregoing is true, complete and correct.

Submitted by: _____ Date: _____

GUARANTEE

District : **CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT**
Project : **MPOE Replacement Bldg 300, Learning Skills Testing Relocation Bldg 100**

Contractor Name: _____

The Contractor hereby warrants and guarantees to the District that all work, materials, equipment and workmanship provided, furnished or installed by or on behalf of Contractor in connection with the above-referenced Project (the "Work") have been provided, furnished and installed in strict conformity with the Contract Documents for the Work, including without limitation, the Drawings and the Specifications. Contractor further warrants and guarantees that all work, materials, equipment and workmanship as provided, furnished and/or installed are fit for use as specified and fulfill all applicable requirements of the Contract Documents including without limitation, the Drawings and the Specifications. Contractor shall, at its sole cost and expense, repair, correct and/or replace any or all of the work, materials, equipment and/or workmanship of the Work, together with any other items which may be affected by any such repairs, corrections or replacement, that may be unfit for use as specified or defective within a period of one (1) year from the date of the District's Final Acceptance of the Work, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of the Contractor's failure and/or refusal to comply with the provisions of this Guarantee, within the period of time set forth in the Contract Documents after the District's issuance of the Notice to the Contractor of any defect(s) in the Work, materials, equipment or workmanship, Contractor authorizes the District, without further notice to Contractor, to repair, correct and/or replace any such defective item at the expense of the Contractor. The Contractor shall reimburse the District for all costs, expenses or fees incurred by the District in providing or performing such repairs, corrections or replacements within ten (10) days of the District's presentation of a demand to the Contractor for the same.

The provisions of this Guarantee and the provisions of the Contract Documents for the Work relating to the Contractor's Guarantee(s) and warranty(ies) relating to the Work shall be binding upon the Contractor's Performance Bond Surety and all successors or assigns of Contractor and/or Contractor's Performance Bond Surety.

The provisions of this Guarantee are in addition to, and not in lieu of, any provisions of the Contract Documents for the Work relating to the Contractor's guarantee(s) and warranty(ies) or any guarantee(s) or warranty(ies) provided by any material supplier or manufacturer of any equipment, materials or other items forming a part of, or incorporated into the Work, or any other guarantee or warranty obligation of the Contractor, prescribed, implied or imposed by law.

The undersigned individual executing this Guarantee on behalf of Contractor warrants and represents that he/she is duly authorized to execute this Guarantee on behalf of Contractor and to bind Contractor to each and every provision hereof.

Dated:_____ By: _____
(Signature)

_____
(Typewritten or handwritten name)

_____
(Title)

CHABOT LAS POSITAS COMMUNITY COLLEGE DISTRICT

PROJECT SPECIFICATIONS

CHABOT LAS POSITAS COMMUNITY COLLEGE

Chabot MPOE / Learning Skills Replacement

Chabot Community College
25555 Hesperian Blvd.
Hayward, CA 94545

ATI Project No. C9506

ATI ARCHITECTS + ENGINEERS

ATI Architects and Engineers
4750 Willow Road, #250
Pleasanton, CA 94588
925-648-8800

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DOCUMENT 00 0107

SEALS PAGE

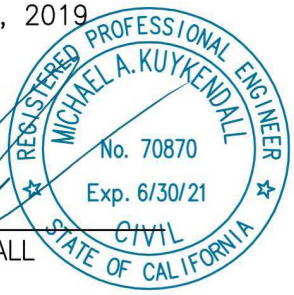
ARCHITECT

ATI Architects and Engineers
4750 Willow Road, Ste. 250
Pleasanton, CA 94588
(925) 648-8800

STRUCTURAL ENGINEER

ATI Architects and Engineers
4750 Willow Road, Ste. 250
Pleasanton, CA 94588
(925) 648-8800

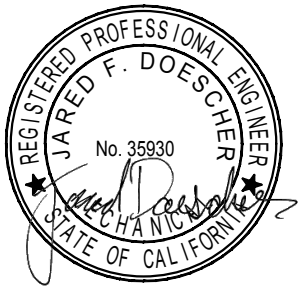
CIVIL ENGINEER
PROFESSIONAL STAMP:
DATE 12 / 06, 2019



MICHAEL A. KUYKENDALL
R.C.E. NO. 70870
EXPIRES 6-30-21

Sandis Civil Engineers
636 9th Street
Oakland, CA 94607
(510) 590-3416

MECHANICAL ENGINEER



Interface Engineering Inc.
135 Main Street, Ste. 400
San Francisco, CA 94105
(415) 489-3225

ELECTRICAL ENGINEER

Metro Power Engineers, Inc.
Consulting Electrical Engineers
3150 Hilltop Mall Road, Ste. 22
Richmond, CA 94806
(510) 275-3000

TITLE 24

Metro Power Engineers, Inc.
Consulting Electrical Engineers
3150 Hilltop Mall Road, Ste. 22
Richmond, CA 94806
(510) 275-3000

TELECOMMUNICATIONS

Date Sealed
11/07/2019

Teecom
1333 Broadway, Ste. 601
Oakland, CA 94612
(510) 250-6624

END OF SECTION

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

DOCUMENT 00 0110

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END OF SECTION

Chabot-Las Positas Community College District

Measure A Bond Program

CONTRACT REQUIREMENTS

DIVISION 1
GENERAL REQUIREMENTS

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SECTION 01 11 00

SUMMARY OF WORK

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes summary of work including:

1. Work covered by Contract Documents
2. Bid items, Allowances and Alternates
3. Work under other contracts
4. Future work
5. Work sequence
6. Cooperation of contractor and coordination with other work
7. Maintenance
8. Occupancy requirements
9. Reference Standards
10. Products ordered in advance
11. CLPCCD furnished products

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. Convert classroom space in Building 300 to Minimum Point of Entry (MPOE) for telecommunication providers and renovate existing custodial room in Building 100 to a Testing Room for DSPS Learning Skills group.

B. The work shall include all work shown and specified except for work indicated “N.I.C” or “Not in Contract”.

C. The Contractor must maintain access to the existing buildings at all times during the project. The contractor is to provide secure fencing and/or barricades to keep the general public from entering work area.

D. Unless provided otherwise in the Contract Documents, all risk of loss of Work covered by the Contract Documents shall rest with the Contractor until Final Completion and Acceptance of the Work.

1.03 BID ITEMS

A. Base Bid- Furnish and install all work shown on Drawings and described in Specifications and all other Contract Documents

B. Allowance-An Owner’s unspecified allowance is as noted in Paragraph 1.1 of the Bid Proposal.

1.04 WORK UNDER OTHER CONTRACTS

Not Applicable

1.05 FUTURE WORK

Not Applicable

1.06 WORK SEQUENCE

A. The contractor shall coordinate their work with the Construction Manager.

1.07 COOPERATION OF CONTRACTOR AND COORDINATION WITH OTHER WORK

A. Should construction work, or work of any other nature, be underway by other forces or by other contractors within or adjacent to the limits of the Work at the time the Work was advertised for bids, the Contractor shall cooperate with all such other contractors or forces to the end that any delay or hindrance to their work will be avoided. The cost of such cooperation will be considered as included in the prices bid and no direct or additional payment will be made therefore. Contractor shall coordinate with such other contractors and forces as required by General Conditions.

B. CLPCCD reserves the right to perform other or additional work, within or adjacent to the limits of the work specified, at any time by the use of other forces. Contractor shall coordinate with CLPCCD and any CLPCCD forces, or other forces, engaged by CLPCCD, as required by General Conditions. In the event that the performance of such other or additional work materially increases or decreases Contractor's costs, the work and the amount to be paid therefore will be appropriately adjusted as determined by the Construction Manager.

C. Limit use of the Site for Work and for construction operations to allow for:

   a. CLPCCD operation

   b. Work by other contractors and tenants

D. Coordinate use of the Site and access to site with other contractors, utilities, and CLPCCD forces, as required by General Conditions. Construction Manager has final authority over coordination, use of the Site, and access to site.

E. Cooperate with CLPCCD and others who may occupy and begin work on site and inside building prior to completion of Work of this Contract.

F. Cooperate with contractors for other area work, not included in Contract, but which may take place during construction period.

1.08 MAINTENANCE

A. Cost of maintenance of systems and equipment prior to Final Acceptance will be considered as included in prices bid and no direct or additional payment will be made therefore.

1.09 OCCUPANCY REQUIREMENTS

A. Whenever, in the opinion of Construction Manager, Work or any part thereof is in a condition suitable for use, and the best interest of CLPCCD requires such use, CLPCCD may take beneficial occupancy of and connect to, open for public use, or use the Work or such part thereof. In such case, CLPCCD will request Architect/Engineer to inspect the Work or part thereof, and issue a Certificate of Substantial Completion for that part of Work.

B. Prior to date of Final Acceptance of the Work by CLPCCD, all necessary repairs or renewals in Work or part thereof so used, not due to ordinary wear and tear, but due to defective materials or workmanship or to operations of Contractor, shall be made at expense of Contractor, as required in General Conditions.

C. Use by CLPCCD of Work or part thereof as contemplated by this section shall in no case be construed as constituting acceptance of Work or any part thereof. Such use shall neither relieve Contractor of any responsibilities under Contract, nor act as waiver by CLPCCD of any of the conditions thereof.

D. CLPCCD may specify in the Contract Documents that portions of the Work, including electrical and mechanical systems or separate structures, shall be substantially completed on milestone dates prior to substantial completion of all of the Work. Contractor shall notify Architect/Engineer in writing when Contractor considers any such part of the Work ready for its intended use and substantially complete and request Architect/Engineer to issue a Certificate of Substantial Completion for that part of the Work.

PART 2 – PRODUCTS

2.01 REFERENCE STANDARDS

A. For products specified by association or trade standards, comply with requirements of standard, except where more rigid requirements are specified or are required by applicable codes.

2.02 PRODUCTS ORDERED IN ADVANCE

Not applicable

2.03 CLPCCD FURNISHED PRODUCTS

A. For CLPCCD furnished products as specified, if any, shall be indicated on Construction Documents.

PART 3 – EXECUTION

Not applicable to this section

END OF SECTION

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SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. This section describes general procedural requirements for alterations, modifications and extras.

B. Related Sections

1. Section 01 11 00: Summary of Work

1.02 GENERAL

A. Any change in scope of work or deviation from Drawings or Specifications shall be accomplished only when authorized in writing by Construction Manager. As appropriate, change orders are subject to approval by the Division of the State Architect. Refer to section 4-338, Part 1, Title 24, California Code of Regulations.

B. Changes in scope of Work or deviation from Drawings or Specifications may be initiated only by the Contractor or the Construction Manager.

1. Contractor may initiate changes by submitting Requests for Information (RFI), Requests for Substitution (RFS), Notice of Concealed or Unknown Conditions, or Notice of Hazardous Waste Conditions.
   a. RFI's shall be submitted to seek clarification of Contract Documents.
   b. RFS's shall be submitted in accordance with paragraph 4.8.2 of General Conditions to request substitution of materials or methods of execution.
   c. Notices of Changes shall be submitted in accordance with paragraph 9.6 of General Conditions.
   d. Notices of Hazardous Waste Conditions shall be submitted in accordance with paragraph 4.17 of General Conditions.
   e. Notices of concealed or unknown conditions shall be submitted to make Owner aware of a potential change in scope of the work.
2. Contractor shall be responsible for its costs to implement and administer RFI's and RFS's throughout the Contract duration. Regardless of the number of RFI's submitted, Contractor will not be entitled to additional compensation. Contractor shall be responsible for both CLPCCD's and Architect's administrative costs for answering its RFI's where the answer could reasonably be found

by reviewing the Contract Documents, as determined by CLPCCD; such costs will be deducted from progress payments.

3. Architect/Engineer may initiate changes by issuing a Supplemental Instruction (which shall require written approval of the Construction Manager).

4. Construction Manager may initiate changes by issuing Requests for Proposal (RFP) or a Field Change Notice (FCN) to Contractor. Such RFP's or FCN's will detail all proposed changes in the Work and request a quotation of changes in Contract Sum and Contract Times from Contractor. A RFP or FCN may require Contractor to expedite the work and proceed on a time and material (force account) basis.

1.03 PROCEDURE

A. Contractor shall submit RFI to Construction manager. Contractor shall reference each RFI to an activity on its Progress Schedule and note the time criticality of the RFI, indicating the time in which the response is required. Architect/Engineer shall respond by issuing a Clarification.

1. If Contractor is satisfied with the Clarification and does not request change in Contract Sum or Contract Times, then the Clarification shall be executed without a change.

2. If Contractor believes that the Clarification results in change in Contract Sum or Contract Times, Contractor shall notify Construction Manager who may then deny request for change or issue RFP.

B. Contractor shall submit RFS to Construction Manager who may then deny request or issue RFP.

C. Contractor shall submit Notices of Changes to resolve unanticipated conditions incurred in the execution of the Work. Procedures in Paragraph 9.6 of General Conditions shall be followed. If Construction Manager determines that a change in Contract Sum or contract Times is justified, Construction Manager shall issue RFP.

D. Contractor shall submit Notices of Hazardous Waste Conditions to resolve problems regarding hazardous materials encountered in the execution of the Work. Procedures in Paragraph 4.17 of General Conditions shall be followed. If Construction Manager determines that a change in Contract Sum or contract Times is justified, Construction Manager shall issue RFP.

E. Architect/Engineer shall issue Supplemental Instruction to the Construction Manager who shall forward onto Contractor. Contractor shall not proceed with Supplemental Instruction until Construction Manager approves it in writing.

1. If Contractor is satisfied with Supplemental Instruction and does not request change in Contract Sum or Contract Times,

then Supplemental Instruction shall be executed without a Change Order.

2. If Contractor believes that Supplemental Instruction results in change in Contract Sum or Contract Times, Contractor shall notify Construction Manager. Construction Manager may then deny request for change, cancel Clarification or issue RFP.

F. Responses by recipients shall be within a reasonable time.

G. Contractor shall respond to Construction Manager's RFP within fifteen (15) working days by furnishing a complete breakdown of costs of both credits and extras; itemizing materials, labor, taxes, overhead and profit. Subcontract work shall be so indicated.

H. Upon approval of RFP, Construction Manager will issue a Change Order directing Contractor to proceed with extra work.

I. Payment shall be made as follows:

1. Change Orders which increase Contract Sum or Contract Times shall be included in next Contract Modification Form, signed by Construction Manager, accepted by Contractor.

2. Payment shall be made for Change Order work along with other work in progress payment following completion of Change Order work. Partial completion of Change Order work shall be paid for that part completed during the period covered by the monthly payment request.

1.04 COST DETERMINATION

A. Total cost of extra work shall be the sum of labor costs, material costs, equipment rental costs and specialist costs as defined herein plus overhead and profit as allowed herein. This limit applies in all cases of claims for extra work, whether calculating Change Orders, RFIs, or calculating claims of all types, and applies even in the event of fault, negligence, strict liability, or tort claims of all kinds, including misrepresentation, concealment, strict liability or negligence. No other costs arising out of or connected with the performance of extra work, of any nature, may be recovered by Contractor. No special, incidental or consequential damages may be claimed or recovered against CLPCCD, its representatives or agents, whether arising from breach of contract, negligence or strict liability, unless specifically authorized in the Contract Documents.

B. Overhead:

1. Overhead shall be as defined in Article 1.08.

C. Taxes:

1. Alameda County Sales Tax should be included.

2. Federal and Excise Tax shall not be included.

D. Owner Operated Equipment

When owner-operated equipment is used to perform extra work, Contractor will be paid for equipment and operator as follows:

1. Payment for equipment will be made in accordance with Paragraph 1.05. C.

2. Payment for cost of labor will be made at no more than rates of such labor established by collective bargaining agreements for type of worker and location of work, whether or not owner-operator is actually covered by such an agreement.

1.05 COST BREAKDOWN

A. Labor - Contractor will be paid cost of labor for workers (including fore persons when authorized by Construction Manager) used in actual and direct performance of extra work. Labor rate, whether employer is Contractor, subcontractor or other forces, will be sum of following:

1. Actual Wages - Actual wages paid shall be limited to the applicable prevailing wage rate for the classification of labor actually and reasonably necessary to complete a Change. Prevailing wage rates shall be deemed to include all direct payment of wages to workers completing a Change and all employer burdens thereon, including without limitation all employer payments to or on behalf of workers for Workers Compensation, health and welfare, pension, vacation and other similar labor burdens. Contractors and subcontractors are required to provide their corresponding wage rate breakdown for the classification of labor under which they will complete a Change and on the form provided by the Owner for review and approval by the Owner and Construction Manager prior to processing and approval of payment for any completed Change.

B. Material - Only materials furnished by Contractor and necessarily used in performance of extra work will be paid for. Cost of such materials will be cost, including sales tax, to purchaser (Contractor, subcontractor or other forces) from supplier thereof, except, as the following are applicable:

1. If cash or trade discount by actual supplier is offered or available to purchaser, it shall be credited to CLPCCD notwithstanding fact that such discount may not have been taken.

2. For materials salvaged upon completion of extra work, salvage value of materials shall be deducted from cost, less discount, of materials.

3. If cost of a material is, in opinion of Construction Manager, excessive, then cost of material shall be deemed to be lowest current wholesale price at which material is available in quantities concerned delivered to Site, less any discounts as provided in subparagraph 1 above.

C. Equipment Rental

For Contractor or subcontractor-owned equipment, payment will be made at the lesser of actual rental rates or the rental rates listed for equipment in California Department of Transportation official equipment rental rate schedule which is in effect on date upon which extra work is accomplished and which schedule is incorporated herein by reference as though fully set forth herein. For rented equipment, payment will be made based on actual rental invoices. Equipment used on extra work shall be of proper size and type. If, however, equipment of unwarranted size or type and cost is used, cost of use of equipment shall be calculated at rental rate for equipment of proper size and type. Rental rates paid shall be deemed to cover cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals. Unless otherwise specified, manufacturer's ratings, and manufacturer-approved modifications, shall be used to classify equipment for determination of applicable rental rates. Individual pieces of equipment or tools not listed in said publication and having a replacement value of five hundred dollars ($500) or less, whether or not consumed by use, shall be considered to be small tools and no payment will be made therefore as payment is included in payment for labor. Rental time will not be allowed while equipment is inoperative due to breakdowns.

1. For equipment on Site, rental time to be paid for equipment shall be the time equipment is in operation on extra work being performed. The following shall be used in computing rental time of equipment:

    a. When hourly rates are listed, less than thirty (30) minutes of operation shall be considered to be one-half (1/2) hour of operation.

    b. When daily rates are listed, less than four (4) hours of operation shall be considered to be one-half (1/2) day of operation. Anything over four (4) hours and not more than eight (8) hours is considered one (1) full day of operation.

2. For equipment, which must be brought to Site to be used exclusively on extra work, cost of transporting equipment to Site and its return to its original location shall be determined as follows:

    a. CLPCCD will pay for costs of loading and unloading equipment.

    b. Cost of transporting equipment in low bed trailers shall not exceed hourly rates charged by established haulers.

    c. Cost of transporting equipment shall not exceed applicable minimum established rates of California Public Utilities Commission.

    d. Payment for transporting, and loading and unloading equipment as above provided will not be made if equipment is used on Work in any other way than upon extra work.

3. Rental period shall begin at time equipment is unloaded at Site of extra work and terminate at end of day on which Construction Manager directs Contractor to discontinue use of equipment. Excluding Saturdays, Sundays, and legal holidays, unless equipment is used to perform extra work on such days, rental time to be paid per day shall be four (4) hours for zero (0) hours of operation, six (6) hours for four (4) hours of operation and eight (8) hours for eight (8) hours of operation, time being prorated between these parameters. Hours to be paid for equipment, which is operated less than eight (8) hours due to breakdowns, shall not exceed eight (8) less number of hours equipment is inoperative due to breakdowns.

D. Work Performed by Special Forces or Other Special Services

When Construction Manager and Contractor, by agreement, determine that special service or item of extra work cannot be performed by forces of Contractor or those of any subcontractors, service or extra work item may be performed by specialist. Invoices for service or item of extra work on basis of current market price thereof may be accepted without complete itemization of labor, material, and equipment rental costs when it is impracticable and not in accordance with established practice of special service industry to provide complete itemization. In those instances wherein Contractor is required to perform extra work necessitating a fabrication or machining process in a fabrication or machine shop facility away from Site, charges for that portion of extra work performed in such facility may, by agreement, be accepted as a specialist billing. Construction Manager must be notified in advance of all offsite work. To specialist invoice price, less credit to CLPCCD for any cash or trade discount offered or available, whether or not such discount may have been taken, will be added 15 percent (15%) in lieu of overhead and profit provided in Paragraph 1.04.B.

1.06 FORCE-ACCOUNT

A. If it is impracticable because of nature of work, or for any other reason, to fix an increase or decrease in price definitely in advance, Change Order may fix a maximum price which shall not under any circumstances be exceeded, and subject to such limitation, such alteration, modification or extra shall be paid for at actual necessary cost as determined by CLPCCD Authority, which cost shall be determined pursuant to Article 1.04, and shall be known as Force-Account work.

B. Whenever any Force-Account work is in progress, definite price for which has not been agreed on in advance, Contractor shall report to Construction Manager each day in writing in detail amount and cost of labor and material used, and any other expense incurred in Force-Account work on preceding work day, and no claim for compensation for Force-Account work will be allowed unless report shall have been made. Daily report(s) shall be delivered to Construction Manager within one (1) business day of the day the work was performed. No late

reports will be accepted. The intent is to have daily agreement on hours expended for labor and equipment on Force-Account work.

C. Above described methods of determining payment for work and materials shall not apply to performance of work or furnishings of material, which, in judgment of Construction Manager, may properly be classified under items for which prices are established in Contract.

1.07 CLPCCD FURNISHED MATERIALS

CLPCCD reserves right to furnish materials, as it deems advisable, and Contractor shall have no claims for costs and overhead and profit on such materials.

1.08 OVERHEAD DEFINED

The following constitutes charges that are included in overhead for all contract modifications, including Force-Account work:

1. Drawings: field drawings, shop drawings, etc. including submissions of drawings
2. Routine field inspection of work proposed
3. General Superintendence
4. General administration and preparation of change orders
5. Computer services
6. Reproduction services
7. Salaries of project engineer, Construction Manager, superintendent, timekeeper, storekeeper and secretaries
8. Janitorial services
9. Temporary on-site facilities
    a. Offices
    b. Telephones
    c. Plumbing
    d. Electrical: Power, lighting
    e. Platforms
    f. Fencing, etc.
10. Home office expenses
11. Insurance Premium
12. Procurement and use of vehicles and fuel used coincidentally in base bid work
13. Surveying
14. Estimating
15. Protection of work

16. Final cleanup
17. Other incidental work
18. Record Drawings
19. Warranty
20. Transportation expense to site for labor

1.09 RECORDS AND CERTIFICATION

A. Force-Account (cost reimbursement) charges shall be recorded daily upon Cost Breakdown for Contract Modification Form obtained from Inspector. Contractor or authorized representative shall complete and sign form. Inspector shall sign form for approval. Contract Modification Form shall provide names and classifications of workers and hours worked by each, itemize materials used, and also list size type and identification number of equipment, and hours operated, and shall indicate work done by specialists.

B. No payment for Force-Account work shall be made until Contractor submits original invoices substantiating materials and specialist charges.

C. CLPCCD shall have the right to audit all records in possession of Contractor relating to activities covered by Contractor's claims for modification of Contract, including Force-Account work, as set forth in General Conditions.

D. Further, CLPCCD shall have right to audit, inspect, or copy all records maintained in connection with this Contract, including financial records, in possession of Contractor relating to any transaction or activity occurring or arising out of, or by virtue of, Contract. If Contractor is a joint venture, right of CLPCCD shall apply collaterally to same extent to records of joint venture sponsor, and of each individual joint venture member.

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

Not applicable to this section.

SAMPLE ONLY
COST BREAKDOWN FORM FOR CONTRACT MODIFICATION

One separate form shall be used by Contractor, each first tier subcontractor and each lower tier subcontractor. One form for each shall be used for each change order. One form for each, for each day shall be used for Force-Account work.

COST BREAKDOWN FOR CONTRACTOR PRICE PROPOSAL

SHEET 1 OF 3

GENERAL CONTRACTOR FORM

PROJECT NUMBER: _____

PROJECT NAME: _____

CONTRACTOR : _____

CHANGE ORDER NUMBER : _____ **DATE:** _____

CHANGE ORDER DESCRIPTION: _____

SUMMARY OF TOTAL COSTS					
1. TOTAL LABOR COSTS		$ -			
2. Fifteen percent (15%) of Line 1		$ -			
3. Sum of Lines 1 & 2			$ -		
4. TOTAL MATERIAL COSTS		$ -			
5. Fifteen percent (15%) of Line 4		$ -			
6. Sum of Lines 4 & 5			$ -		
7. TOTAL EQUIPMENT RENTAL COSTS		$ -			
8. Fifteen percent (15%) of line 7		$ -			
9. Sum of lines 7 & 8			$ -		
10. TOTAL OF SUBCONTRACTED COST		$ -			
11. Five percent (5%) of line 10 (excluding subcontractor markup)		$ -			
12. Sum of Lines 10 & 11			$ -		
SUBTOTAL OF DIRECT COSTS & MARK-UP				$ -	

COST OF BONDS (does not apply to subcontractors)		$ -
TOTAL OF CONTRACT MODIFICATION		**$ -**

COST BREAKDOWN FOR CONTRACTOR PRICE PROPOSAL

SHEET 2 OF 3

CONTRACTOR : _____

CHANGE ORDER NUMBER : _____ DATE: _____

CHANGE ORDER DESCRIPTION: _____

LABOR				
NAME	**CLASSIFICATION**	**HOURS**	**RATE**	**TOTAL**
				$ -
				$ -
				$ -
				$ -
TOTAL LABOR COSTS (Transfers to Line 1 of Sheet 1)				$ -

MATERIALS	
DESCRIPTION	**COST**
SUBTOTAL MATERIAL COSTS (Without Sales Tax)	$ -
SALES TAX ON MATERIAL AT 9.00%	$ -
TOTAL MATERIAL COSTS (Transfers to Line 4 of Sheet 1)	$ -

EQUIPMENT				
SIZE AND TYPE	**I.D. #**	**HOURS**	**RATE**	**TOTAL**
				$ -

				$ -
				$ -
				$ -
TOTAL EQUIPMENT RENTAL COSTS (Transfers to Line 7 of Sheet 1)				$ -

COST BREAKDOWN FORM FOR CONTRACT MODIFICATION

SHEET 3 OF 3

CHANGE ORDER NUMBER : _____ DATE: _____

CHANGE ORDER DESCRIPTION: _____

SUBCONTRACTED WORK		
SUBCONTRACTOR	**DESCRIPTION OF WORK SUBCONTRACTED**	**COST**
TOTAL COST OF SUBCONTRACTED WORK (Transfers to Line 10 of Sheet 1)		$ -

CONTRACTOR: _____ Date: _____

VERIFIED BY INSPECTOR: _____ Date: _____

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SECTION 01 31 00

PROJECT COORDINATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Project coordination.

B. Field engineering.

C. Coordination drawings.

D. Workmanship.

E. Incidental costs.

F. Correspondence and Notices.

G. Miscellaneous provisions.

H. Damage and restoration.

1.02 RELATED SECTIONS

A. Section 011100 - Summary of Work.

B. Section 014500 - Quality Control.

C. Section 015000 – Temporary Facilities.

D. Section 017000 - Contract Closeout.

1.03 PROJECT COORDINATION

A. Coordination scheduling, submittals, and Work of the various Sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements and installation of mechanical and electrical work, which are indicted diagrammatically on drawings. Follow route shown for pipes, ducts, and conduit, as closely as practicable: place runs parallel with line of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finished elements.

E. Submit a copy of site drawing and certificate signed by the Civil Engineer that the elevations and locations of the Work of separate Sections in preparation for Substantial Completion.

F. Coordinate completion and cleanup of Work of separate Sections in preparation for Substantial Completion.

G. After Owner occupancy of the Site, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.04 FIELD ENGINEERING

A. Contractor shall locate and protect survey control and reference points.

B. Control datum for survey is that shown on drawings.

C. Contractor shall verify setbacks and easements; confirm drawing dimensions and elevations.

D. Provide field engineering services. Contractor shall establish lines, and levels, utilizing recognized engineering practices

1.05 COORDINATION DRAWINGS

A. Provide information required by Architect for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

1.06 WORKMANSHIP

A. Work shall be performed by craftsmen well experienced and competent in their particular trade.

B. Workmanship shall be thorough, finished and complete in every detail for finest quality installations as intended under these specifications.

1.07 INCIDENTAL COSTS

A. In addition to cost associated with GC Article 6: Insurance; Indemnity; Bonds:

1. Utilities: Refer to Section 01 50 00.

2. Contractors and Subcontractors shall furnish at their own cost and expense all tools, consumable supplies, appliances, equipment, etc., necessary for execution of their work; and shall be responsible for care and guarding thereof.

3. Contractors and Subcontractors shall be entirely responsible for professional, trade, business or other licenses required by state statute or local government.

1.08 CORRESPONDENCE AND NOTICES

A. Clearly identify correspondence, notices and submittals with project name, subject and detailed references to drawings and specifications.

B. Notify Inspector or the Construction Manager two (2) working days in advance of required inspection.

C. The District's project management system (ProjectSolve) shall be utilized for document controls for RFI, Submittals, Daily Logs, etc…

1.09 MISCELLANEOUS PROVISIONS

A. Contractor shall immediately refer to the Construction Manager any requirement shown or specified which Contractor in their experience and background finds or believes:

1. Is not equal to industry standards for achieving a first quality installation as intended;

2. Is excessive in cost or effort to effect the intended results;

3. Is below standard for proper enforcement of the guarantees required;

4. Or, is at variance with governing laws, regulations, codes or standards.

B. Work operations relative to any matter referred to Architect for consideration shall not proceed until receipt of appropriate instructions from Architect.

C. Inspection of Work and Materials: Contractor shall immediately make a close and thorough inspection of all materials as delivered and all work in progress; shall promptly reject and return all defective materials and re-do; and shall check and verify adequate performance or satisfactory results of all tests and inspections before allowing sub-work to proceed.

D. Warranty Period: During warranty periods, supervise investigation and correction of deficiencies found or occurring in the work.

E. Shop Fabricate and pre-assemble interrelated parts where possible.

F. Closing up of walls, partitions or furred spaces, backfilling and other covering up operations shall not proceed until all enclosed or covered work and inspections have been completed. Verify before proceeding.

G. Provide holes, slots, cutouts, blocking, screeds, nailers, chases and similar preparation as the work progresses, as required to receive or pass subsequent work without damage to previously completed work.

H. Exterior Work shall be made tight against direct or indirect entry of water into the concealed or interior spaces of the building. Seal joints or penetrations below grade or behind exterior trim and other conditions where water might enter the structure, as for exposed exterior work.

I. Structural Connections and Fasteners: Include as required for complete fabrication and installation of the work; of materials, types and sizes adequate for the purposes.

1. Place in concealed or obscured locations where possible.

2. Include suitable welding or brazing where required.

J. Powder Activated Fasteners: Limited to uses particularly shown, specified or approved by Architect. Operators shall be certified in accordance with California Industry Safety orders.

K. Ferrous Work permanently exposed to exterior or below grade shall be galvanized; related accessory members and fastening non-ferrous, galvanized or made rustproof by approved methods.

L. Galvanizing, prime painting and related touch-up and repair shall comply with requirements for metal fabricating and painting in Section 13125 - Relocatable Buildings.

M. Isolation: Provide between ferrous and non-ferrous or dissimilar metal components to protect the work against electrolysis, as follows:

1. For architectural work, provide cork fillers, asphaltic coatings, neoprene gaskets or similar separation as necessary; and use stainless steel fastenings only where interconnecting dissimilar parts.

2. For mechanical and electrical work, provide dielectric unions or similar separation. In particular, provide isolation as necessary between exterior underground systems and interior above-grade systems where they meet dissimilar metals.

N. Prior to starting a particular type or kind of work, examine for relevant information, all contract documents and subsequent data issued to the project.

1.10 DAMAGE AND RESTORATION

A. Damage to previously existing or newly placed facilities caused by movement of equipment or other operations, whether accidental or made necessary by reason of Contract requirements, shall be restored or replaced as specified or directed by Architect or Construction Manager.

B. Restoration shall be equal to the structural qualities or performance capacities of the original work, and finishes shall match the appearance of, as nearly as possible, like existing adjacent work. Restorations shall be subject to approval by Architect and shall be made as necessary at no added expense to Owner unless otherwise particularly provided for.

C. Work not properly restored or where not capable of being restored as intended under these Specifications shall be removed and replaced as directed by Architect at no added expense to Owner.

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

3.01 CUTTING AND PATCHING

A Employ skilled and experienced installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements, which affects:

1. Structural integrity of element.
2. Integrity of weather-exposed or moisture-resistant elements.
3. Efficiency, maintenance, or safety of element.
4. Visual qualities of sight-exposed elements.

C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:

1. Fit the several parts together, to integrate with other Work.
2. Uncover Work to install or correct ill-timed work.
3. Remove and replace defective and non-conforming Work.
4. Remove samples of installed Work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute work by methods, which will avoid damage to other Work, and provide proper surfaces to receive patching and finishing.

E. Cut rigid materials using masonry saw or core drill.

F. Restore Work with new products in accordance with requirements of Contract Document.

G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

J. Identify any hazardous substance or condition exposed during the Work to the Construction Manager for decision or remedy.

END OF SECTION

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SECTION 01 31 19

PROJECT MEETINGS

PART 1 – GENERAL

1.01 SUMMARY

A. This section describes the required meetings for this work. These meetings include:

1. Pre-construction Conference
2. Scheduling Meetings
3. Progress Meetings
4. Special Meetings

B. Related Sections

1. Section 01 11 00: Summary of Work
3. Section 01 32 00: Progress Schedules and Reports
4. Section 01 33 00: Submittals

1.02 PRECONSTRUCTION CONFERENCE

A. Construction Manager will call for and administer Pre-construction Conference at time and place to be announced. Conference will occur as soon after award as can be reasonably scheduled.

B. Contractor, all subcontractors, and major suppliers shall attend Pre-construction Conference.

C. Agenda will include, but not be limited to, the following items:

1. Schedules
2. Personnel
3. Use of the Site
4. Temporary Utilities
5. Location of Contractor's on-site facilities
6. Project access
7. Employee parking
8. Security/Safety
9. Housekeeping
10. Submittals
11. Inspection and testing procedures, on-site and off-site
12. Utility shutdown procedures
13. Control and reference point survey procedures

14. Injury and Illness Prevention Program

15. Contractor's Initial CPM Schedule

16. Contractor Invoicing, Schedule of Values, Approval Procedures

D. Construction Manager will distribute copies of minutes to attendees. Attendees shall have five (5) working days to submit comments or additions to minutes. Minutes will constitute final memorialization of results of the Pre-construction Conference.

1.03 SCHEDULING MEETINGS

A. Meet with Construction Manager and Architect on Start Date of Contract and conduct initial review of Contractor's draft Shop Drawing and Sample Submittal Schedule, and draft Schedule of Values and Initial Construction Schedule ("Schedule Review Meeting").

B. Authorized representative in Contractor's organization, designated in writing, who will be responsible for working and coordinating with Construction Manager's representative(s) and Architect relative to preparation and maintenance of Progress Schedule shall attend initial Schedule Review Meeting.

C. Contractor shall, within thirty (30) days from the Notice to Proceed date, meet with Construction Manager and Architect to review the Original CPM Schedule submittal.

1. Contractor shall have its manager, superintendent, scheduler, and key subcontractor representatives, as required by CLPCCD, in attendance. The meeting will take place over a continuous one-day period.

2. CLPCCD's review of Schedule Submittals will be limited to conformance to Contract requirements, including, but not limited to, coordination requirements. However, review may also include:

   a. Clarifications of Contract Requirements

   b. Directions to include activities and information missing from submittal

   c. Requests to Contractor to clarify its schedule

3. Within five (5) days of the initial Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by CLPCCD at the meeting.

D. Construction Manager will administer scheduling meetings and shall distribute minutes of scheduling meetings to attendees. Attendees shall have five (5) working days to submit comments or additions to minutes. Minutes will constitute final memorialization of results of the scheduling meetings.

1.04 PROGRESS MEETINGS

A. Construction Manager and Architect will schedule and administer Progress Meetings throughout duration of Work. Progress meetings will be held weekly unless otherwise directed by Construction Manager.

1. Meetings shall be held at Construction Manager's on-site office unless otherwise directed by Construction Manager.
2. Construction Manager will prepare agenda and distribute to Contractor, Inspector and Architect/Engineer 24 hours in advance of meeting.
3. Construction Manager will preside at meeting.
4. Architect will record and distribute minutes to Contractor, Inspector, Construction Manager, all other participants, and those affected by decisions made at meeting, within three (3) working days after meeting. Attendees shall have five (5) working days to submit comments or additions to minutes. Minutes will constitute final memorialization of results of progress meetings.

B. Progress Meetings shall be attended by Contractor's job superintendent, major subcontractors and suppliers, when requested by Construction Manager or as appropriate, Construction Manager, Architect/Engineer, Inspector and others as appropriate to agenda topics for each meeting.

C. Agenda will contain the following items as appropriate:

1. Review of work progress
2. Status of Construction Schedule, adjustments
3. Submittals
4. Delivery schedules
5. Utility shutdowns, traffic disruptions, and interferences with public scheduled during the subsequent 2 weeks
6. Quality control
7. Pending changes
8. Substitutions
9. Review of Contractor's safety program activities and results, including report on all serious injury and/or damage accidents
10. Safety
11. Other items affecting progress of work

D. A separate meeting will be held on approximately the 25th of each month to review the schedule update submittal and progress payment application.

1. At this meeting, at a minimum, the following items will be reviewed:
   a. percent complete of each activity
   b. time impact evaluations for Change Orders and Time Extension Request
   c.actual and anticipated activity sequence changes
   d. actual and anticipated duration changes
   e. actual and anticipated contractor delays
2. These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, these meetings shall

be attended by Contractor's General Superintendent and Scheduler.

3. Contractor shall plan on progress meetings taking no less than four (4) hours.

1.05 SPECIAL MEETINGS

A. Special meetings may be called by any party by notifying all desired participants, Construction Manager, Architect, and Inspector four (4) working days in advance, giving reason for meeting. Special Meetings may be held without advance notice in emergency situations.

B. At any time during the progress of the Work, CLPCCD shall have authority to require Contractor to attend conference of any or all of the contractors engaged in the Work or in other work, and notice of such conference shall be duly observed and complied with by Contractor.

C. Contractor shall schedule and conduct coordination meetings as necessary to discharge coordination responsibilities in the General Conditions. Construction Manager shall be given five (5) days written notice of coordination meetings. Contractors shall maintain minutes of coordination meetings. Attendees shall have five (5) working days to submit comments or additions to minutes. Minutes will constitute final memorialization of results of the meetings.

D. Pre-installation meetings of manufactures' warranty scope of work, i.e., roofing, water-proofing, curtain wall, etc.

E. LEED kick-off meeting.

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 01 32 00

PROJECT SCHEDULES AND REPORTS

PART 1 – GENERAL

1.01 SUMMARY

A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of this Section.

1. Development of schedule, cost and manpower loading of the schedule and schedule updates, monthly payment requests and project status reporting requirements of the Contract shall employ computerized Critical Path Method (CPM) scheduling.

2. Submit schedules and reports as specified in General Conditions.

B. Upon Award of Contract, Contractor shall immediately commence development of Initial and Original CPM Schedules to ensure compliance with CPM schedule submittal requirements.

C. Related Sections:

1. Section 01 11 00: Summary of Work

2. Section 01 33 00: Submittals

D. Definitions: The following definitions apply to this section:

ACTIVITY:	A task, event or other project element on a schedule that contributes to completing the project. Activities have a description, start date, finish date, duration and one or more logic ties.
BASELINE SCHEDULE:	The initial schedule representing the Contractor's work plan on the first day of the project.
CRITICAL PATH:	The longest continuous chain of activities for the project that has the least amount of total float of all chains. In general, a delay on the critical path will extend the scheduled completion date.
CRITICAL PATH METHOD (CPM):	A network based planning technique using activity durations and the relationships between activities to mathematically calculate a schedule for the entire project.

DATA DATE: The day after the date through which a schedule is current. Everything occurring earlier than the data date is “as-built” and everything on or after the data date is “planned”.

EARLY COMPLETION TIME: The difference in time between an early scheduled completion date and the contract completion date.

FLOAT: The difference between the earliest and latest start or finish times for an activity.

MILESTONE: An event activity that has zero duration and is typically used to represent the beginning or end of a certain stage of the project.

NARRATIVE REPORT: A document submitted with each schedule that discusses topics related to project progress and scheduling.

NEAR CRITICAL PATH: A chain of activities with total float exceeding that of the critical path but having no more than 14 calendar days of total float.

SCHEDULED COMPLETION DATE: The planned project finish date shown on the current accepted schedule.

SUBSTANTIAL COMPLETION: The stage in the progress of the work when the work is complete in accordance with the Contract Documents, so that District can occupy or use the work for its intended purpose.

TIME IMPACT ANALYSIS: A schedule and narrative report developed specifically to demonstrate what effect a proposed change or delay has on the current scheduled completion date.

TIME-SCALED NETWORK DIAGRAM: A graphic depiction of a CPM schedule comprised of activity bars with relationships for each activity represented by arrows. The tail of each arrow connects to the activity bar for the predecessor and points to the successor.

TOTAL FLOAT: The amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.

UPDATED SCHEDULE: A current schedule developed from the baseline or subsequent schedule through regular monthly review to incorporate as-built progress and any planned changes.

1.02 QUALIFICATIONS

A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of Primavera Project Planner or Microsoft Project scheduling software. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose. After bid opening, the apparent successful low bidder shall provide CLPCCD a written verification that Contractor has the required personnel under its employ or that Contractor will employ the required CPM scheduling consultant.

1. The written statement shall identify individual who will perform CPM scheduling.
2. Capability and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.
3. Required level of experience shall include at least two projects of similar nature, scope and value not less than three-fourths the Total Bid Price of this Project. The written statement shall provide contact persons for referenced projects with current telephone and address information.

B. CLPCCD reserves right to approve Contractor's scheduler, or consultant, and right to reject them at any time. CLPCCD also reserves right to refuse replacement of Contractor's scheduler or consultant, if it believes such replacement will negatively affect Contract.

1.03 GENERAL

A. Progress Schedule shall be based on and incorporate milestones and completion dates specified in Contract Documents. Submit to the Owner baseline, monthly updated, and final updated schedules, each consistent in all respects with the time and order of work requirements of the contract. Work must be executed in the sequence indicated on the current accepted schedule. Schedules must show the order in which you propose to execute the work with logical links between time-scaled work activities and calculations made using the critical path method to determine the controlling activities. You are responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

B. Overall time of completion and time of completion for each milestone shown on Progress Schedule shall adhere to times as stated in Contract Agreement, unless an earlier (advanced) time of completion is requested by Contractor and agreed to by CLPCCD. Any such agreement shall be formalized by a Change Order.

1. CLPCCD is not required to accept an earlier (advanced) schedule, i.e., one that shows early completion dates for the Contract Times.

2. Contractor shall not be entitled to extra compensation in the event agreement is reached on an earlier (advanced) schedule and Contractor completes its Work, for whatever reason (excepting approved changes with added time components) beyond completion date shown in earlier (advanced) schedule but within the Contract Times.

3. A schedule showing the work completed in less than the Contract Times, which has been accepted by CLPCCD, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the work and Contract Substantial Completion. Project Float is a resource available to both CLPCCD and the Contractor.

C. Float Ownership: Neither CLPCCD nor Contractor owns float. The Project owns the float. As such, liability for delay of the Substantial Completion Date rests with the party whose actions, last in time, actually cause delay to the Substantial Completion Date.

1. For example, if Party A uses some, but not all of the float and Party B later uses remainder of the float as well as additional time beyond the float, Party B shall be liable for the time that represents a delay to the Substantial Completion Date.

2. Party A would not be responsible for the time since it did not consume the entire float and additional float remained; therefore, the Substantial Completion Date was unaffected.

D. Progress Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests associated with the changes. Responsibility for developing Contract CPM schedule and monitoring actual progress as compared to Progress Schedule rests with Contractor.

E. The Owner's review and acceptance of schedules does not waive any contract requirements and does not relieve Contractor of any obligation or responsibility for submitting complete and accurate information. Correct rejected schedules and resubmit corrected schedules to the Owner within seven (7) days of notification by the Owner, at which time a new review period of seven (7) days will begin.

Errors or omissions on schedules do not relieve Contractor from finishing all work within the time limit specified for completion of the contract. If, after a schedule has been accepted by the Owner, either the Contractor or the Owner discovers that any aspect of the schedule has an error or omission, it must be corrected on the next updated schedule.

F. Use Microsoft Project for Windows or Primavera P6. Such software shall be compatible with Windows operating system. Contractor shall transmit contract schedule files to CLPCCD on CD-ROM or flash drive at times requested by CLPCCD.

G. Transmit each item under form approved by CLPCCD.

1. Identify Project with CLPCCD Contract number and name of Contractor and file by date, project, and update number.

2. Provide space for Contractor's approval stamp and CLPCCD's review stamps.

3. Submittals received from sources other than Contractor will be returned to the Contractor without CLPCCD's review.

1.04 INITIAL CRITICAL PATH METHOD (CPM) SCHEDULE

A. Initial CPM Schedule submitted for review at the pre-construction conference shall serve as Contractor's schedule for up to ninety (90) calendar days after the Notice to Proceed.

B. Indicate detailed plan for the Work to be completed in first sixty (60) days of the Contract; details of planned mobilization of plant and equipment; sequence of early operations; and procurement of materials and equipment. Show Work beyond sixty (60) calendar days in summary form.

C. Initial CPM Schedule shall be time-scaled.

D. Initial CPM Schedule shall be cost and manpower loaded. Accepted cost and manpower-loaded schedule will be used as basis for monthly progress payments until acceptance of the Original CPM Schedule. Use of Initial CPM Schedule for progress payments shall not exceed sixty (60) calendar days.

E. CLPCCD and Contractor shall meet to review and discuss the Initial CPM Schedule within seven (7) calendar days after it has been submitted to CLPCCD.

1. CLPCCD's review and comment on the schedule shall be limited to Contract conformance (with sequencing, coordination, and milestone requirements) and accepted CPM principals.

2. Contractor shall make corrections to schedule necessary to comply with Contract requirements and shall adjust schedule to incorporate any missing information requested by CLPCCD. Contractor shall resubmit Initial CPM Schedule if requested by CLPCCD.

F. If, during the first sixty (60) days after Notice-to-Proceed, the Contractor is of the opinion that any of the Work included on its Initial CPM Schedule has been impacted, the Contractor shall submit to CLPCCD a written Time Impact Evaluation (TIE) in accordance with Article 1.09 of this Section. The TIE shall be based on the most current update of the Initial CPM Schedule.

1.05 ORIGINAL CRITICAL PATH METHOD (CPM) SCHEDULE

A. Submit a detailed proposed Original CPM Schedule presenting an orderly and realistic plan for completion of the Work, in conformance with requirements as specified herein.

B. The baseline schedule must not extend beyond the number of contract days. The baseline schedule must have a data date of the first working day of the contract and not include any completed work to date. The baseline schedule must not attribute negative float or negative lag to any activity.

C. Progress Schedule shall include or comply with following requirements:

1. Time scaled, cost and manpower loaded CPM schedule.

2. No activity on schedule shall have duration longer than twenty-one (21) calendar days, with exception of submittal, approval, fabrication and procurement activities, unless otherwise approved by CLPCCD.

   a. Activity durations shall be total number of actual days required to perform that activity.

   b. Activity coding capabilities to sort by responsibility, location, phase and CSI division.

3. The start and completion dates of all items of Work, their major components, and milestone completion dates, if any.

4. CLPCCD-furnished materials and equipment, if any, identified as separate activities.

5. Completion of the last activity in the schedule shall be constrained by the contract completion date. Schedule calculations shall result in a negative float when the calculated early finish date of the last activity is later than the contract completion date. The Contractor shall include as the last activity in the project schedule an activity called “Final Completion”. The “Final Completion” activity shall have an “LF” constraint date equal to the contract completion date for the project, and with a zero day duration or by using the “project must finish by” date in the scheduling software. The schedule shall have no constrained dates other than those specified in the contract. The use of artificial float constraints such as “zero free float” or “zero total float” are typically prohibited. There shall only be two (2) open ended activities: Start Project (or NTP) with no predecessor logic and Final Completion with no successor logic.

6. Processing/approval of submittals and shop drawings for all Contract-required material and equipment. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.

   a. Include time for submittals, resubmittals, and reviews by CLPCCD. Coordinate with accepted schedule for submission of shop drawings, samples and other submittals.

   b. Contractor shall be responsible for all impacts resulting from resubmittal of shop drawings and submittals.

7. Procurement of all contract required material and equipment, identified as separate activity.

a. Include time for fabrication and delivery of manufactured products for the Work.

b. Show dependencies between procurement and construction.

8. Complete activity description; what Work is to be accomplished and where.

9. The total cost of performing each activity shall be total of labor, material, equipment, excluding overhead and profit of Contractor. Total overhead and profit of the General Contractor shall be shown on a separate activity in the schedule. Sum of cost for all activities shall equal total Contract value.

10. Resources required (labor) to perform each activity.

11. Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.

12. Identify the activities, which constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to ten (10) days.

13. At least twenty-eight (28) calendar days for developing punch list(s), completion of punch list items and final clean-up for the Work or any designated portion thereof. No other activities shall be scheduled during this period.

14. Interface with the work of other contractors, CLPCCD, and agencies such as, but not limited to, utility companies.

15. Show detailed Subcontractor Work activities. In addition, furnish copies of Subcontractor schedules upon which CPM was built.

    a. Also furnish for each Subcontractor, as determined by CLPCCD, submitted on Subcontractor letterhead a statement certifying that Subcontractor concurs with Contractor's Original CPM Schedule and that Subcontractor's related schedules have been incorporated, including activity duration, cost and resource loading.

    b. Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.

    c. In addition to Contractor's schedule and resource loading, obtain from electrical, mechanical and plumbing Subcontractors, and other Subcontractors as required by CLPCCD, productivity calculations common to their trades, such as units per person day, feet of pipe per day per person, feet of wiring per day per person, and similar information.

    d. Furnish schedule for Contractor/Subcontractor CPM Schedule meetings which shall be held prior to submission of Original CPM Schedule to CLPCCD. CLPCCD shall be permitted to attend scheduled meetings as an observer.

16. Activity durations shall be in calendar days.

17. Submit with the schedule a list of anticipated non-Work days, such as weekends and holidays.

D. Original CPM Schedule Review Meeting: Contractor shall, within thirty (30) calendar days from the Notice to Proceed date, meet with CLPCCD to review the Original CPM Schedule submittal.

1. Contractor shall have its Construction Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by CLPCCD, in attendance. The meeting will take place over a continuous one-day period.

2. CLPCCD's review will be limited to submittal's conformance to Contract requirements, including, but not limited to, coordination requirements. However, review may also include:

a. Accepted critical path method principles and tenets.

b. Clarifications of Contract Requirements.

c. Directions to include activities and information missing from submittal.

d. Requests to Contractor to clarify its schedule.

3. Within five (5) days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by CLPCCD at the Meeting.

1.06 ADJUSTMENTS TO CRITICAL PATH METHOD (CPM) SCHEDULEx

A. Adjustments to Original CPM Schedule: Contractor shall have adjusted the Original CPM Schedule submittal to address all review comments from original CPM Schedule review meeting and resubmit network diagrams and reports for CLPCCD's review.

1. CLPCCD, within fourteen (14) days from date that Contractor submitted the revised schedule, will either:

a. accept schedule and cost and resource loaded activities as submitted, or

b. advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for CLPCCD to monitor Project's progress, resources and status or evaluate monthly payment request by Contractor.

2. CLPCCD may accept schedule with conditions that the first monthly CPM schedule update be revised to correct deficiencies identified.

3. When schedule is accepted, it shall be considered as the "Original CPM Schedule" which will then be immediately updated to reflect the current status of the work.

4. CLPCCD reserves the right to require Contractor to adjust, add to, or clarify any portion of schedule which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.

B. Acceptance of Contractor's schedule by CLPCCD will be based upon schedule's compliance with Contract requirements and accepted CPM principles.

1. By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.

2. Upon submittal of schedule update, updated schedule shall be considered "current" CPM schedule.

3. Submission of Contractor's schedule to CLPCCD shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply with requirements of Contract Documents, including adverse effects such as delays resulting from ill-timed work.

C. Submittal of Original CPM Schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the Schedule meets requirements of Contract Documents and that Work shall be executed in sequence indicated on the schedule.

D. Contractor shall distribute Original CPM Schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterhead to Contractor and transmitted to CLPCCD for the record.

1.07 MONTHLY CPM SCHEDULE UPDATE SUBMITTALS

A. Following acceptance of Contractor's Original CPM Schedule, Contractor shall monitor progress of Work and adjust schedule each month to reflect actual progress and any pre-approved changes to planned activities or logic.

1. Each schedule update submitted shall be complete, including all information requested for the Original CPM Schedule submittal.

2. Each update shall continue to show all work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed.

B. A meeting will be held on approximately the twenty-fifth (25th) of each month to review the schedule update submittal and progress payment application.

1. At this meeting, at a minimum, the following items will be reviewed: Percent complete of each activity; time impact evaluations for Change Orders and Time Extension Request; anticipated activity sequence changes; anticipated duration changes; actual and anticipated contractor delays.

2. These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, these meetings shall be attended by Contractor's General Superintendent and Scheduler.

3. Contractor shall plan on the meeting taking no less than four (4) hours.

C. Within seven (7) calendar days after monthly schedule update meeting, Contractor shall submit the updated CPM Schedule update.

D. Within seven (7) calendar days of receipt of above noted revised submittals, CLPCCD will either accept or reject monthly schedule update submittal.

1. If accepted, percent complete shown in monthly update will be basis for Application for Payment by the Contractor. The schedule update shall be submitted as part of the Contractor's Application for Payment.

2. If rejected, update shall be corrected and resubmitted by Contractor before the Application for Payment is submitted.

E. Updating, changing or revising of any report, curve, schedule or narrative submitted to CLPCCD by Contractor under this Contract, nor CLPCCD's review or acceptance of any such report, curve, schedule or narrative shall not have the effect of amending or modifying, in any way, the Contract Substantial Completion date or milestone dates or of modifying or limiting, in any way, Contractor's obligations under this Contract.

F. Final Updated Schedule. Submit final updated, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. Provide a written certificate with this submittal signed by your Project Manager or an officer of the company stating, “To my knowledge and belief, the enclosed final update schedule reflects that actual start date and finish dates of the actual activities for the project contained herein”. An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager.

1.08 SCHEDULE REVISIONS

A. Updating the Schedule to reflect actual progress shall not be considered revisions to the Schedule. Since scheduling is a dynamic process, revisions to activity durations and sequences are expected on a monthly basis.

B. To reflect revisions to the schedule, the Contractor shall provide CLPCCD with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram which compares the original sequence to the revised sequence of work. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.

C. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by CLPCCD. CLPCCD may request further information and justification for schedule revisions and Contractor shall, within

three (3) days, provide CLPCCD with a complete written narrative response to CLPCCD's request.

D. If the Contractor's revision is still not accepted by CLPCCD, and the Contractor disagrees with CLPCCD's position, the Contractor has seven (7) calendar days from receipt of CLPCCD's letter rejecting the revision, to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of CLPCCD's written rejection of a schedule revision shall be contractually interpreted as acceptance of CLPCCD's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding CLPCCD's position.

E. At CLPCCD's discretion, the Contractor can be required to provide subcontractor certifications of performance regarding proposed schedule revisions affecting said subcontractors.

1.09 RECOVERY SCHEDULE

A. If the Schedule Update shows a substantial completion date fourteen (14) calendar days beyond the Contract Substantial Completion date, or individual milestone completion dates, the Contractor shall submit to CLPCCD the proposed revisions to recover the lost time within seven (7) calendar days. As part of this submittal, the Contractor shall provide a written narrative for each revision made to recapture the lost time. If the revisions include sequence changes, the Contractor shall provide a schedule diagram comparing the original sequence to the revised sequence of work.

B. The revisions shall not be incorporated into any schedule update until the revisions have been reviewed by CLPCCD.

C. If the Contractor's revisions are not accepted by CLPCCD, CLPCCD and the Contractor shall follow the procedures in paragraph 1.08.C, 1.08.D and 1.08.E above.

D. At CLPCCD's discretion, the Contractor can be required to provide subcontractor certifications for revisions affecting said subcontractors.

1.10 TIME IMPACTS EVALUATION (TIE) FOR CHANGE ORDERS, AND OTHER DELAYS

A. Time Impact Analysis (TIA). Submit a written TIA to the Owner with each request for adjustment of contract time, or when the Contractor or the Owner considers that an approved or anticipated change may impact the critical path or contract progress. The TIA must illustrate the impacts of each change or delay on the current scheduled completiondate or internal milestone, as appropriate. The analysis must use the accepted schedule that has a data date closest to and before the event. If the Owner determines that the accepted schedule used does not appropriately represent the conditions before the event, the accepted schedule must be updated to the day before the event being analyzed. The TIA must include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities. If the impact schedule shows that

incorporating the event modifies the critical path and scheduled completion date of the accepted schedule, the difference between scheduled completion dates of the two schedules must be equal to the adjustment of contract time. The Owner may construct and use an appropriate project schedule or other recognized method to determine adjustments in contract time until the Contractor provide the TIA.

B. Contractor shall be required to comply with the requirements of Paragraph 1.09.A for all types of delays such as, but not limited to, Contractor/Subcontractor delays, adverse weather delays, strikes, procurement delays, fabrication delays, etc.

C. Contractor shall be responsible for all costs associated with the preparation of Time Impact Evaluations, and the process of incorporating them into the current schedule update. The Contractor shall provide CLPCCD with 4 copies of each TIE.

D. Once agreement has been reached on a TIE, the Contract Times will be adjusted accordingly. If agreement is not reached on a TIE, the Contract Times may be extended in an amount CLPCCD allows, and the Contractor may submit a claim for additional time claimed by Contractor.

1.11 TIME EXTENSIONS

A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current schedule update. Notice of time impacts shall be given in accord with Articles 1.12 and 1.15 of Contract Document General Conditions.

B. Where an event for which CLPCCD is responsible impacts the projected Substantial Completion date, the Contractor shall provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor; equipment and material the Contractor would expend to mitigate CLPCCD caused time impact. The Contractor shall submit its mitigation plan to CLPCCD within fourteen (14) calendar days from the date of discovery of said impact. The Contractor is responsible for the cost to prepare the mitigation plan.

C. Failure to request time, provides TIE, or provides the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.

D. No time will be granted under this Contract for cumulative effect of changes.

E. CLPCCD will not be obligated to consider any time extension request unless requirements of Contract Documents are complied with.

F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.

G. If the Contractor does not submit a TIE within the required fourteen (14) calendar days for any issue, it is mutually agreed that the Contractor does not require a time extension for said issue.

1.12 SCHEDULE REPORTS

A. Submit four (4) copies of the following reports with the Initial CPM Schedule, the Original CPM Schedule, and each monthly update.

B. Required Reports:

1. Two (2) activity-listing reports: one sorted by activity number and one by total float. These reports shall also include each activity's early/late and actual start and finish dates, original and remaining duration, float, responsibility code and the logic relationship of activities.

2. Cost report sorted by activity number including each activity's associated cost, percentage of Work accomplished, earned value to-date, previous payments and amount earned for current update period.

3. Schedule plots presenting time scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.

4. Cash flow report calculated by early start, late start and indicating actual progress. Provide an exhibit depicting this information in graphic form.

C. Furnish CLPCCD with report files in CD ROM and containing all Microsoft Project .mpp or Primavera .xer schedule files along with report files.

1.13 PROJECT STATUS REPORTING

A. In addition to submittal requirements for CPM scheduling identified in this Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each CPM Schedule as specified herein. Status reporting shall be in form specified below.

B. Contractor shall prepare monthly written narrative reports of status of Project for submission to CLPCCD. Written status reports shall include:

1. Transmittal letter

2. Work completed during the period, percent complete of activities

3. Identification of unusual conditions or restrictions regarding labor, equipment or material: including multiple shifts, 6-day work weeks, specified overtime or work at times other than regular days or hours

4. Description of the current critical path

5. Changes to the critical path and scheduled completion date since the last schedule submittal

6. Description of problem areas

7. Current and anticipated delays:
   7.1 Cause of delay
   7.2 Impact of delay on other activities, milestones and completion dates

7.3 Corrective action and schedule adjustments to correct the delay

8. Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by CLPCCD at no additional cost.
9. Status reports, and the information contained therein, shall not be construed by the Contractor as claims, notice of claims, notice of delay, or requests for changes or compensation.

1.14 WEEKLY SCHEDULE REPORT

At the Weekly Progress Meeting, the Contractor shall provide and present a time scaled four (4) week schedule one (1) week behind and three (3) week look ahead schedule that is based and correlated by activity number to the current schedule (i.e., Initial, Original CPM, or Schedule Update).

1.15 DAILY CONSTRUCTION REPORTS

On a daily basis, Contractor shall submit a daily activity report to CLPCCD for each workday, including weekends and holidays, when worked. Contractor shall develop the daily construction reports on a computer generated database capable of sorting daily Work, manpower and man-hours by Contractor, Subcontractor, area, sub area, and change order work. Upon request of CLPCCD, furnish computer disk of this database. Obtain CLPCCD's written approval of daily construction report database format prior to implementation. Include in report:

A. Project name and Project number.

B. Contractor's name and address.

C. Weather, temperature and any unusual site conditions.

D. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work of Subcontractors. Descriptions shall be referenced to CPM scheduled activities.

E. Worker quantities for its own Work force and for Subcontractors of any tier.

F. Equipment, other than hand tools, utilized by Contractor and Subcontractors.

1.16 PERIODIC VERIFIED REPORTS

The Contractor shall complete and submit the Final Verified Report required by DSA. In addition to other conditions precedent to Final Payment, the Contractor's completion and submission of the Final Verified Report is an express condition precedent to the District's obligation to make the Final Payment. In addition to completion and submission of the Final Verified Report, as a material obligation under the Contract Documents, the Contractor shall comply all DSA requests for reports or other data relating to the Work, the status thereof or conformity of the Work to the Contract Documents.

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

Not applicable to this section.

END OF SECTION

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SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals including:
   1. Procedures
   2. Schedule of Shop Drawing and Sample Submittals
   3. Safety Plan
   4. Progress Schedule
   5. Product Data
   6. Shop Drawings
   7. Samples
   8. Quality Control Submittals
   9. Design Data
   10. Test Reports
   11. Certificates
   12. Manufacturers' Instructions
   13. Machine Inventory Sheets Operations and Maintenance Manuals Computer Programs
   14. Project Record Documents
   15. LEED Submittals

1.3 RELATED SECTIONS

A. Section 01 11 00: Summary of Work.

B. Section 01 26 00: Contract Modification Procedures.

C. Section 01 32 00: "Progress Schedules and Reports" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.

D. Section 01 70 00: Contract Closeout

E. Section 01 78 00: Project Record Documents.

1.4 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.5 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings are always through Architect for Contractor's use in preparing submittals. Files are used as background use only.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Construction Manager's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 work days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
2. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

E. Submit at own expense, a minimum of two (2) printed sets or copies and one (1) electronic PDF set- Schedule of Shop Drawing and Sample Submittals, Safety Plans, Progress Schedule, Product Data, Shop Drawings, Samples, Quality Control Data, Machine Inventory Sheets, Operations and Maintenance Manuals, Computer Programs, and Project Record Documents required by the Contract Documents.

F. Transmit each item with a standard letter of transmittal in form approved by Construction Manager.

G. Identify project, Contractor, subcontractor, major supplier, pertinent drawing sheet and detail number, and specification section number as appropriate. Provide space for Contractor, Construction Manager and Architect/Engineer review stamps.

H. Where manufacturer's standard drawings or data sheets are used, they shall be marked clearly to show those portions of the data, which are applicable to this project.

I. Submit Shop Drawings, Samples and other submittals to Construction Manager for review and approval by Architect/Engineer in accordance with accepted schedule of Shop Drawings and Samples submittals. If no such schedule is agreed upon, then all Shop Drawing, Samples and product data submittals shall be completed within ninety (90) days after receipt of Notice to Proceed from CLPCCD.

J. The data shown on the Shop Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to show Architect/Engineer the materials and equipment Contractor proposes to provide and to enable Architect/Engineer to review the information for the limited purposes specified below. Samples shall be identified clearly as to material, supplier, pertinent data such as catalog numbers and the use for which it is intended and otherwise as Architect/Engineer may require enabling Architect/Engineer to review the submittal. The number of each Sample to be submitted will be as specified in the Specifications.

K. At the time of each submission, Contractor shall give Construction Manager, Architect/Engineer, and Inspector specific written notice of all variations, if any; that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, and the reasons therefore. This written notice shall be in a written communication separate from the submittal. In addition, Contractor shall cause a specific notation to be made on each Shop Drawing and Sample submitted to Construction Manager for review and approval of each such variation by Architect/Engineer. The Architect/Engineer may make adjustments to submittals that may result in changes to the contract. The appropriate change order request should be prepared by the Contractor within ten (10) days of receipt of submittals.

L. If CLPCCD accepts deviation, CLPCCD shall issue appropriate Contract Modification.

M. Submittal coordination and verification is responsibility of Contractor; this responsibility shall not be delegated in whole or in part to subcontractors or suppliers. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:

1. All field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto;
2. All materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the Work; and
3. All information relative to Contractor's sole responsibilities and of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

N. Contractor shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

O. Contractor's submission to Construction Manager of a Shop Drawing or Sample submittal will constitute Contractor's representation that it has satisfied its obligations under the Contract Documents, and as set forth immediately above, with respect to Contractor's review and approval of that submittal.

P. Designation of work "by others", if shown in submittals, shall mean that work will be responsibility of Contractor rather than subcontractor or supplier who has prepared submittals.

Q. After review by Architect/Engineer of each of Contractor's submittals, one electronic set will be returned to Contractor with actions defined as follows:

1. NO ACTION TAKEN – Submittal is unreviewed.
2. NO EXCEPTIONS TAKEN - Accepted subject to its compatibility with future submittals and additional partial submittals for portions of the work not covered in this submittal. Does not constitute approval or deletion of specified or required items not shown on the submittal.
3. MAKE CORRECTIONS NOTED (NO RESUBMISSIONS REQUIRED) - Same as 2. above, except that minor corrections as noted shall be made by Contractor.
4. REVISE AND RESUBMIT - Rejected because of major inconsistencies or errors which shall be resolved or corrected by Contractor prior to subsequent review by Architect/Engineer.
5. REJECTED (RESUBMIT) - Submitted material does not conform to Plans and Specifications in major respect, i.e.: wrong size, model, capacity, or material.

R. It is considered reasonable that Contractor shall make a complete and acceptable submittal at least by second submission.

1. CLPCCD reserves the right to deduct monies from payments due Contractor to cover additional costs of Architect's/Engineer's review beyond the second submission. Illegible submittals will be rejected and returned to Contractor for resubmission.

S. Favorable review will not constitute acceptance by CLPCCD or Architect/Engineer of any responsibility for the accuracy, coordination and completeness of the submittals. Accuracy, coordination, and completeness of Submittals shall be sole responsibility of Contractor, including responsibility to back check comments, corrections, and modifications from CLPCCD's or

Architect's/Engineer's review before fabrications. Submittals may be prepared by Contractor, subcontractors, or suppliers, but Contractor shall ascertain that submittals meet requirements of Contract Documents, while conforming to structural space and access conditions at point of installation. Architect/Engineer's review will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Favorable review of submittal, method of work, or information regarding materials and equipment Contractor proposes to furnish shall not relieve Contractor of responsibility for errors therein and shall not be regarded as assumption of risks or liability by Architect/Engineer or CLPCCD, or any officer or employee thereof, and Contractor shall have no claim under Contract on account of failure or partial failure or inefficiency or insufficiency of any plan or method of work or material and equipment so accepted. Favorable review shall be considered to mean merely that Architect/Engineer or CLPCCD has no objection to Contractor using, upon his own full responsibility, plan or method of work proposed, or furnishing materials and equipment proposed.

T. Architect's/Engineer's review will not extend the means, methods, techniques, sequences or procedures of construction or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

U. Submit complete initial submittal for those items where required by individual specification Sections. Complete submittal shall contain sufficient data to demonstrate that items comply with Specifications, shall meet minimum requirements for submissions cited in technical specifications, shall include motor data and seismic anchorage certifications, where required, and shall include necessary revisions required for equipment other than first named. If Contractor submits incomplete initial submittal, when complete submittal is required, submittal may be returned to Contractor without review.

V. It shall be Contractor's responsibility to copy, conform and distribute reviewed submittals in sufficient numbers for Contractor's files, subcontractors and vendors.

W. After Architect/Engineer review of submittal, revise and resubmit as required. Identify changes made since previous submittal.

1. Begin no fabrication or work, which require submittals until return of submittals not requiring resubmittal.
2. Normally, submittals will be processed and returned to Construction Manager within fifteen (15) working days of receipt by Architect. The processing time spent to review submittals by Construction Manager shall be in addition to the fifteen (15) days.
3. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.6 SCHEDULE OF SHOP DRAWING, DSA DEFERRED APPROVAL SUBMITTALS AND SAMPLE SUBMITTALS

A. Submit preliminary Schedule of Shop Drawing and Sample Submittals as required by General Conditions. Submit two (2) copies and one (1) electronic PDF of final and accepted schedule of submittals of shop drawings and samples as required by General Conditions, and in no event later than thirty (30) days following Notice of Award.

B. Schedule of Shop Drawing and Sample Submittals will be used by Architect/Engineer to schedule their activities relating to review of submittals. Schedule of submittals shall indicate a spreading out of submittals and early submittals of long lead-time items and of items, which require extensive review.

C. Schedule of Shop Drawing and Sample Submittals shall be reviewed by Construction Manager and shall be revised and resubmitted until accepted by Construction Manager.

D. DSA Deferred Approval Submittals shall be prepared for review by the Architect/Engineer within 30 days of receipt of Notice to Proceed. Contractor shall promptly make corrections to documents for Architect to submit to DSA for approval. Contractor shall have the sole responsibility for obtaining DSA approval via the Architect's office for all deferred approval submittals in a timely manner. There will be no time extensions granted for delay in obtaining such approval.

1.7 SAFETY PLAN

A. Submit one (1) copies and one (1) electronic PDF of Safety Plan specific to this Contract to Construction Manager within fifteen (15) calendar days after Start Date of the Contract Time.

B. No on-site work shall be started until Safety Plan has been reviewed and accepted by CLPCCD. Acceptance of Safety Plan shall not affect Contractor's responsibility for maintaining a safe working place and instituting safety programs in connection with project in full compliance with local, state and federal regulations.

1.8 PROGRESS SCHEDULE

A. Schedule all items requiring Architect action for submission during first 25 percent of construction period.

B. See Section 01 32 00 "Progress Schedules and Reports" for schedule and report requirements.

C. Submit (3) print copies, one (1) electronic report file in PDF format, and either Microsoft Project .mpp or Primavera .xer schedule program files:

1. Initial CPM Schedule at the Pre-construction Conference.
2. Original CPM Schedule within thirty (30) days of Notice to Proceed (NTP).
3. Adjustments to the CPM Schedule as required.
4. CPM Schedule updates monthly, five (5) days prior to monthly progress meeting.

D. Submit three (3) copies and one (1) electronic PDF copy of the reports listed in Section 01 32 00 "Progress Schedules and Reports" with:

1. Initial CPM Schedule
2. Original CPM Schedule
3. Each monthly Schedule update
4. Each weekly three (3) week look ahead Schedule

E. Progress Schedules and Reports shall be submitted electronically, in addition to hard copies as specified above.

1.9 QUALITY CONTROL SUBMITTALS

A. Design Data: Not applicable.

B. Test Reports: Three (3) copies minimum. One (1) copy will be marked with Architect's/Engineer's review comments and returned to Contractor.

1. Indicate that material or product conforms to or exceeds specified requirements.
2. Reports may be from recent or previous tests on material or product, but must be acceptable to Construction Manager. Comply with requirements of each individual specification Section.

C. Certificates: Three (3) copies minimum. One (1) copy will be marked with Architect's/Engineer's review comments and returned to Contractor.

1. Indicate that material or product conforms to or exceeds specified requirements.
2. Submit supporting reference data, affidavits, and certifications as appropriate.

3. Certificates may be recent or from previous test results on material or product, but must be acceptable to Construction Manager.

D. Manufacturers' Instructions: Three (3) copies minimum. One (1) copy will be marked with Architect's/Engineer's review comments and returned to Contractor.
   1. Include manufacturer's printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing.
   2. Identify conflicts between manufacturer's instructions and Contract Documents.

1.10 COMPUTER PROGRAMS

A. When any equipment requires operation by computer programs, submit copy of program on CD(s) plus all user manuals and guides for operating the programs and making changes in the programs for upgrading and expanding the databases. Provide required licenses to CLPCCD at no additional cost.
   1. Include at least three (3) years prepaid software license renewals, which includes software upgrades and updates.

1.11 PROJECT RECORD DOCUMENTS

A. Submit one copy of each of the Project Record Documents listed in Section 01 70 00 Contract Closeout.

1.12 DELAY OF SUBMITTALS

A. Delay of submittals by Contractor is considered avoidable delay. Liquidated damages incurred because of late submittals will be assessed to the Contractor.

PART 2 - PRODUCTS

2.1 SUBMITTALS

A. Within fifteen (15) calendar days after Start Date of the Contract Time submit two (2) copies and one (1) electronic PDF of complete list of substitutions of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. Contractor shall be responsible for and make all submissions.
   1. Submit items specified herein to Architect and Construction Manager.
   2. Submit all submittals through the Construction Manager’s Electronic Submittal Program.
   3. Identify each transmittal using the 6-digit specification number, i.e., metal handrails might be numbered 05 5000, along with an individual submittal number for each section number. Submittal numbers shall be sequential. If returning submittal “12” for re-submission, second submission would be identified as “12A”. Should submittal be rejected multiple times (12b, 12c, etc), the Contractor may be required to reimburse the Owner/Architect for labor to review subsequent submissions.
   4. Develop, for maintenance by the Construction Manager, a schedule of all submittals and their status. Refer to Paragraph 1.3 below. The schedule will be reviewed each week at the project meeting.

C. Transmittals, shop drawings, or samples submitted to Architect shall have the Contractor's stamp on it with his signature and be marked "approved." Contractor's stamp on these items indicates that Contractor has performed the following:
   1. Verified field dimensions and quantities.

2. Verified field construction criteria, materials, catalog numbers and similar data.
3. Reviewed and coordinated submittal data with requirements of the Work and the Contract Documents.
4. ITEMS NOT STAMPED BY THE CONTRACTOR WILL BE RETURNED UNREVIEWED.

D. Indicate any item, component, material or portion of Work, which deviates from Contract Documents. Unless such departures are accepted as indicated in paragraph "Review" below, such departures will not be permitted.

E. Make submittals sufficiently in advance of data required to allow Architect reasonable time for review and additional resubmission and review cycles if necessary.
1. Items submitted without Contractor's review stamp will be returned, without action, for resubmission.
2. Items not submitted in accordance with provisions of this Section will be returned, without action, for resubmission.
3. Submissions on items not approved for use by specifications or addenda will be rejected.
4. Drawings transmitted by other than the Prime Contractor will be returned to the Prime Contractor without action of any kind. Drawings will not be returned to subcontractors.

2.2 SUBMITTALS – PRODUCT DATA

A. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

B. Tabulate products by specification section number.

C. Supplemental Data:
1. Submit number of copies, which Contractor requires, plus three (3) copies, which will be retained by Construction Manager.
2. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to Project.

D. Provide copies for Project Record Documents described in Section 01 70 00 Contract Closeout.

2.3 SUBMITTALS - SHOP DRAWINGS

A. Identify drawings with manufacturer, item, use, type, project designation, specification section or drawing detail reference.

B. Minimum Sheet Size: 8-1/2 inches by 11 inches. All others: Multiples of 8-1/2 inches by 11 inches, 34 inches by 44 inches maximum.

C. For 8-1/2 inch by 11 inch and 11 inch by 17-inch sheets, submit number of copies, which contractor requires plus three (3) copies, which will be retained by Construction Manager.

D. For 17 inch by 22 inch through 34 inch by 44-inch sheets, submit one [1] electronic and a minimum of three [3] prints. After review, reproduce and distribute.

E. Original sheet or reproducible transparency will be marked with Architect's/Engineer's review comments and returned to Contractor.

F. Each sheet/copy must include project name and project number and bid number on all sheets.

G. Mark each copy to identify applicable Products, models, options, and other data; supplement manufacturers' standard data to provide information unique to Work.

H. Include manufacturers' installation instructions when required by specification section.

I. Submit a copy of the Shop Drawing Transmittal Form with each submittal and resubmittal.

2.4 SUBMITTALS - SAMPLES

A. Identify samples with manufacturer's name, item, use, type, project designation, specification section or drawing detail reference, color, range, texture, finish and other pertinent data.
   1. Submit samples to illustrate functional and aesthetic characteristics of Product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.

B. Submit full range of manufacturers' standard colors, textures, and patterns for Construction Manager's selection.

C. Submit a minimum of three (3) samples unless otherwise specified in the construction documents.

D. Sizes: Unless otherwise specified, provide the following:
   1. Paint Chips: Manufacturers' standard
   2. Flat or Sheet Products: Minimum 6 inches square, maximum 12 inches square
   3. Linear Products: Minimum 6 inches, maximum 12 inches long
   4. Bulk Products: Minimum 1 pint, maximum 1 gallon

E. Full size samples may be used in Work upon approval.

F. Mock-ups:
   1. Erect field samples and mock-ups at Project site in accordance with requirements of Specification sections.
   2. Modify or make additional field samples and mock-ups as required to provide appearance and finishes approved by Construction Manager.
   3. Approved field samples and mock-ups may be used in Work upon approval.

G. Architect may, at his option, retain samples for comparison purposes until completion of Work.
   1. Samples will be returned or may be used in the Work unless the technical section specifically indicates otherwise.
   2. Remove samples when directed.
   3. Pay all costs of furnishing or constructing, and removing samples.

H. Resubmit samples of rejected items.

I. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

J. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT REVIEW

A. General: Architect and Construction Manager will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

C. Reproduce and distribute submittals that the Architect reviews and stamps as follows, to indicate the action taken:

1. Reviewed: Where submittal is marked "Reviewed," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
2. Reviewed -- Additional Information Required: Where submittal is marked "Reviewed -- Additional Information Required," the information submitted has been reviewed and approved as noted. However, additional information as noted and/or required by Contract Documents needs to be submitted.
3. Make Corrections As Noted: When submittal is marked "Furnish As Corrected," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
4. Submit Specified Item: When submittal is marked "Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
    a. Do not permit submittals marked "Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.
5. Rejected: When submittal is marked "Rejected," information submitted is not in compliance with Contract Documents. Resubmit submittal as required by Contract Documents.

D. Contractor shall retain 1 copy of each "Reviewed," "Reviewed -- Additional Information Required" or "Furnish as Corrected" submittal on file at the job site.

E. Architect shall retain 1 copy of each "Reviewed," "Reviewed -- Additional Information Required" or "Furnish as Corrected" submittal in the project file.

F. Contractor shall resubmit items stamped "Revise and Resubmit" or "Rejected" by Architect.

1. Provide a print of previous drawing with resubmission for comparison.
2. Add letter suffix to previous transmittal number, to indicate resubmission.
3. It shall be the Contractor's responsibility to assure that previously approved documents are destroyed when they are superseded by a resubmittal.

G. Architect review is general and does not:

1. Permit departure from Contract Documents.
2. Relieve Contractor from responsibility for errors in detail, in dimensions or related items.
3. Approve departure from previous instructions or details.
4. Relieve Contractor of the responsibility to provide all components, wiring, etc., required to make item operable or usable.
5. Imply acceptance of items for which no data is submitted.

H. For items constituting a departure from Contract Documents see Section 01 2500.

I. Reviewed samples submitted or constructed and approved by Architect constitute criterion for judging completed work. Finish work or items not equal to samples will be rejected.

J. Start of work which requires submittals, prior to return of submittals with Architect or Owner's stamp indicating review and approval is at Contractor's risk.

3.3 DISTRIBUTION

A. Contractor shall copy and distribute all "Reviewed," "Reviewed -- Additional Information Required" or "Furnish as Corrected" submittals, including one copy to the Owner.

END OF SECTION

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

This section includes regulatory requirements applicable to Contract.

1.02 REFERENCES TO REGULATORY REQUIREMENTS

A. Codes, laws, ordinances, rules and regulations referred to shall have full force and effect as though printed in full in these specifications.

B. Conform to referenced codes, laws, ordinances, rules and regulations, which are in effect on date of receipt of bids.

1.03 CODES

Codes, which apply to Contract, include, but are not limited to, the following:

A. 2007 California Building Code (Part 2, Title 24, C.C.R.)

B. 2007 California Electrical Code (Part 3, Title 24, C.C.R.)

C. 2007 California Mechanical Code (Part 4, Title 24, C.C.R.)

D. 2007 California Plumbing Code (Part 5, Title 24, C.C.R),

E. 2007 State Elevator Safety Regulations (Part 7, Title 24, C.C.R.)

F. 2007 California Fire Code (Part 9, Title 24, C.C.R.)

G. 2007 California Energy Code (Part 6, Title 24, C.C.R.)

1.04 LAWS, ORDINANCES, RULES AND REGULATIONS

A. During prosecution of Work to be done under Contract, comply with applicable laws, ordinances, rules and regulations, including, but not limited to, the following:

B. Federal

1. Americans With Disabilities Act
2. 29 CFR, Section 1910.1001, Asbestos
3. 40 CFR, Subpart M, National Emission Standards for Asbestos
4. Executive Order 11246

C. State of California

1. California Code of Regulations, Titles 5, 8, 19, 21, 24
2. California Education Code
3. California Public Contract Code
4. California Health and Safety Code
5. California Government Code
6. California Labor Code
7. California Civil Code

8. California Code of Civil Procedure
9. CPUC General Order 95, Rules for Overhead Electric Line Construction
10. CPUC General Order 128, Rules for Construction of Underground Electric Supply and Communications Systems

D. State of California Agencies

Bay Area Air Quality Management District (BAAQMD / www.baaqmd.gov)

State and Consumer Services Agency

Department of General Services

Division of the State Architect Office of the State Fire Marshall Office of Public School Construction

E. Local Agencies:

City of Hayward, California (www.ci.hayward.ca.us)

1.06 COMPLIANCE WITH AMERICANS WITH DISABILITIES ACT

A. Contractor acknowledges that, pursuant to the Americans with Disabilities Act (ADA), programs, services and other activities provided by a public entity to the public, whether directly or through a contractor, must be accessible to the disabled public. Contractor shall provide the services specified in this Agreement in a manner that complies with the ADA and any and all other applicable federal, state and local disability rights legislation. Contractor agrees not to discriminate against disabled persons in the provision of services, benefits or activities provided under this Agreement and further agrees that any violation of this prohibition on the part of Contractor, its employees, agents or assigns shall constitute a material breach of this Agreement.

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 01 41 10

REGULATORY REQUIREMENTS- HAZARDOUS WASTE

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes regulatory requirements applicable to Contract work in connection with hazardous waste abatement and disposal, including, but not limited to, asbestos and asbestos containing materials, lead based paint, polychlorinated biphenyls, petroleum contaminated soils and materials, construction and demolition debris and any other hazardous substance or hazardous waste.

B. This section supplements Section 01 41 00 and the work specific listings of applicable regulatory requirements elsewhere in the specifications.

C. Related Sections.

1. Section 01 41 00: Regulatory Requirements.

1.02 REFERENCES TO REGULATORY REQUIREMENTS

A. Codes, laws, ordinances, rules and regulations applicable to the Work shall have full force and effect as though printed in full in these specifications. Codes, laws, ordinances, rules and regulations are not furnished to Contractor, since Contractor is assumed to be familiar with their requirements. The listing herein of applicable codes, laws and regulations for hazardous waste abatement work is supplied to Contractor as a courtesy and shall not limit Contractor's responsibility for complying with all applicable laws, regulations or ordinances having application to the Work. Where conflict among the requirements or with these specifications exists, the most stringent requirements shall be used.

B. Contractor's work shall conform to all applicable codes, laws, ordinances, rules and regulations that are in effect on date of receipt of bids.

1.03 LAWS, ORDINANCES, RULES AND REGULATIONS

A. During prosecution of Work under Contract, Contractor shall comply with applicable laws, ordinances, rules and regulations, including, but not limited to, those listed below.

B. Federal:

1. Statutory Requirements:

a. Resource Conservation and Recovery Act, 42 U.S.C.. 6901 et seq.

b. Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986,42 U.S. *C"* 9601 et seq.

c. Toxic Substances Control Act of 1976,15 U.S.C.. 2601 et seq.

d. Hazardous Materials Transportation Act of 1975, 49 U.S. *C"* 1801 et seq.

e. Clean Water Act, 33 U.S.C.. 1251 et seq.

f. Safe Drinking Water Act, 42 U.S. C.. 3001 et seq.

g. Clean Air Act, section 112, 42 U.S. C.. 7412

h. Occupational Safety and Health Act of 1970, 29 U.S.C.. 651 et seq.

i. Underground Storage Tank Law, 42 U.S. C.. 6991 et seq.

j. The Emergency Planning and Community Right to Know Act of 1986,42 U.S.C.. 11001 et seq. j.

2. Environmental Protection Agency (EPA):

a. 40 C.F.R. Parts. 260, 264, 265, 268, 270

b. 40 C.F.R. Parts 258 et seq.

c. 40 C.F.R. Part 761

d. 40 C.F.R. Parts 122-124

3. Occupational Safety and Health Administration (OSHA):

a. OSHA Worker Protection Standards, Title 29 CFR Part 1926.58, Construction Standards and 29 CFR 1910.1001 General Industry Standard

b. OSHA, 29 C. F. R. Part 1926.1101, Construction Standards for Asbestos

c. OSHA, Lead Exposure in Construction: Interim Final Rule, 29 C.F.R. 1926.62

d. National Emission Standard for Hazardous Air Pollutants, Title 40 CFR Part 61

e. Asbestos Hazardous Emergency Response Act, Title 40 C.F.R. 763

4. Department of Transportation:

a. Title 49 C.F.R. 173.1090

b. Title 49 C.F.R.172

c. Title 49 C.F.R. 173

d. DOT, HM 181 and MH126f

C. State of California Requirements:

1. Statutory Law:

a. The Carpenter-Presley-Tanner Hazardous Substance Account Act, Cal. Health & Saf. Cod~ 25300 et seq.

b. Health and Safety Cod~ 25359.4

c. Hazardous Waste Control Law, Health & Safety Code. 25100 § seq.

d. Porter Cologne Water Quality Control Act, Cal. Water Cod~ 13000 et seq.

e. Health and Safety Cod~ 25915-25924

f. Cal. Labor Code Chapter 6, including, without limitation,. 6382, 6501.5-6501.9,6503.5, 9021.5, 9080

g. Cal. Bus. and Prof. Code, including without limitation,. 7058.5, 7065.01, 7118.5. Underground Storage of Hazardous Substance Act,

h. Cal. Health & Saf. Cod~ 25280 § seq.

i. Petroleum Underground Storage Tank Cleanup, Health and Safety Cod~ 25299.10 et seq.

j. Safe Drinking Water and Toxic Enforcement Act of 1986, Health & Saf. Cod~ 25249.5 et seq. (Proposition 65)

k. Above Ground Petroleum Storage Act, Health and Safety Code. 25270 et seq.

2. Hazardous Materials Release Response Plans and Inventory, California Health and Safety Code Chapter 6.95.

3. Administrative Code and Regulations:

a. 22 C.C.R.. 6600 et seq.

b. Title 22 C.C.R.. Standards for Management of Hazardous and Extremely Hazardous Waste

c. DTSC Treatment Standard for PCB Wastes, Title 22 C.C.R.,. 66268.110

d. Cal OSHA Worker Protection Standards, Title 8 C.C.R.. 1529, 5208

e. Title 8 C. C. R.. 1532.1, Lead in Construction

f. 22 C.C.R.. 66999(b)

g. Title 23 C.C.R.. 2610 et seq.

4. Local Agency Requirements:

a. Bay Area Air Quality Management District, Fugitive Dust Rules

b. Bay Area Air Quality Management District Regulation 11-2-303

c. State Water Resource Control Board, General Construction Activity Stormwater Permit Requirements (Order 92-0S DWQ)

5. City Requirements:

a. Hayward Fire Department (www.haywardcal.us/fire_dept/fd.htm)

b. Ordinances

1.04 PERMITS

A. Contractor shall comply with, implement or acknowledge effectiveness of all CLPCCD held permits, and initiate and cooperate in securing all required notifications or approvals therefore, including but not limited to permits affecting environmental work and the following:

1. BAAQMD, Permit to Excavate or Treat Contaminated Soil;

2. State Water Resources Control Board, General Construction Activity Stormwater Permit

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

Not applicable to this section.

END OF SECTION

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SECTION 01 41 13

ADDITIONAL REQUIREMENTS FOR DSA REVIEWED PROJECTS

PART 1 – GENERAL

1.01 DSA DEFERRED APPROVALS

A. Refer to Contract Drawings.

1.02 INSPECTION AND SUPERVISION

A. Supervision by DSA shall be in accordance with Section 4-334 of Part 1, Title 24, CCR.

B. District shall employ a full-time Project Inspector approved by DSA. The Project Inspector shall observe construction in accordance with Section 4-333(b) and 4-342 of Part 1, Title 24, CCR.

C. Reports: Project Inspector shall submit the following in accordance with DSA IR A-7.

1. Start of Project Report: Notify DSA of start of construction in accordance with Section 4-331 of Part 1, Title 24, CCR.
2. Semi-Monthly Reports: Comply with Section 4-337 of Part 1, Title 24, CCR.
3. Verified Reports: Comply with Section 4-336 of Part 1, Title 24, CCR.

D. Special Inspection Requirements:

1. Comply with Section 4-333(c) of Part 1, Title 24, CCR.
2. Special inspection costs are to be paid by the Owner.
3. Conduct special inspection as per DSA Structural Tests and Inspections Sheet (SSS 103-1).

1.03 TESTING LABORATORY REQUIREMENTS

A. Comply with Section 4-335 of Part 1, Title 24, CCR.

B. The Owner shall select the testing Laboratory approved by DSA, Architect, and Structural Engineer.

C. Sampling and testing shall be performed by properly qualified persons in accordance with American Society for Testing and Materials (ASTM) standards.

D. Conduct tests as per DSA Structural Tests and Inspections Sheet (SSS 103-1).

E. Submit one copy of test reports to DSA.

1.04 ADDENDA AND CHANGE ORDERS

A. Comply with Section 4-338 of Part 1, Title 24, CCR.

B. Comply with DSA IR A-6.

C. Obtain DSA approval for changes to code-regulated construction and inspection/testing functions prior to start of that work. Code-regulated construction refers to work that is regulated by code provisions applicable to public school construction, including those adopted by DSA Structural Safety (DSA/SS), DSA Access Compliance (DSA/AC) and State Fire Marshal (SFM).

D. Changes can be approved through either the change order *(CO)* process or preliminary change order (PCO) process. Comply with DSA IR A-6, Sub-paragraph 2.2 - Change Order Process and DSA IR A-6, Sub-paragraph 2.1 - Preliminary Change Order Process.

E. Do not begin any work under addendum or change order until required DSA written approval is obtained.

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 01 42 00

REFERENCES AND DEFINTIONS

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes reference standards, abbreviations, symbols and definitions used in Contract Documents.

B. Full titles and edition dates are given in this section for standards cited in other sections of Specifications.

C. Material and workmanship specified by reference to number, symbol, or title of specific standard such as state standard, commercial standard, federal specifications, technical society, or trade association standard, or other similar standard shall comply with requirements of standards except when more rigid requirements are specified or required by applicable codes.

D. Standards referred to, except as modified herein, shall have full force and effect as though printed in the Contract Documents. Standards are not furnished to Contractor, since manufacturers and trades involved are assumed to be familiar with their requirements.

1.02 REFERENCE TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES; REPORTING AND RESOLVING DISCREPANCIES:

A. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code or laws or regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated in the Contract Documents.

B. If during the performance of the Work, Contractor discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such law or regulation applicable to the performance of the Work or of any such standard, specification, manual or code or of any instruction of any supplier, Contractor shall report it in writing at once to Inspector, with copies to Construction Manager and Architect, and Contractor shall not proceed with the Work affected thereby until consent to do so is given by the Construction Manager.

C. Except as otherwise specifically stated in the Contract Documents or as may be provided by Change Order, or supplemental instruction, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity or discrepancy between the Contract Documents and:

1. The provisions of any such standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

2. The provisions of any such laws or regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such law or regulation).

No provision of any such standard, specification, manual, code or instruction shall be effective to change the duties and responsibilities of CLPCCD, Contractor, Construction Manager, or Architect/Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents, nor shall it be effective to assign to CLPCCD, Architect/Engineer, Construction Manager, or any of their consultants, agents or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

1.03 STANDARDS

A. ACI (American Concrete Institute)

Standard 318, Building Code Requirements for Reinforced Concrete

B. AISC (American Institute of Steel Construction

Specifications and Code of Standard Practice for Steel Buildings and Bridges

C. ANSI (American National Standards Institute, formerly American Standards Association)

Standard *C2,* NESC (National Electrical Safety Code)

D. ASTM (American Society for Testing and Materials)

1. *C31,* Making and Curing Concrete Test Specimens in the Field
2. *C42,* Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
3. *C143,* Test Method for Slump of Portland Cement Concrete

E. IAPMO (International Association of Plumbing and Mechanical Officials)

F. ICC (International Code Council)

1. Refer to Section 01 41 00 – Regulatory Requirements

G. NEMA (National Electric Manufacturer's Association)

H. NFPA (National Fire Protection Association)

1. Pamphlet 1, Fire Prevention Code
2. Pamphlet 13, Sprinkler Systems, Installation
3. Pamphlet 24, Private Fire Service Mains
4. Pamphlet 70, NEC (National Electric Code)
5. Pamphlet 71, Signaling Systems, Central Station
6. Pamphlet 80, Fire Doors and Windows
7. Pamphlet 101, Life Safety Code

I. UL (Underwriters' Laboratories, Inc.)

1.04 ABBREVIATIONS

A. Following abbreviations may be used in Contract Documents:

AAP	Affirmative Action Program
ACI	American Concrete Institute
ADA	American Disabled Act
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute (formerly American Standards Association)
ASI	Architect's Supplemental Instructions
ASTM	American Society for Testing and Materials
BIL	Basic Insulation Level
Cal/OSHA	California Occupational Safety and Health Administration
CCD	Construction Change Directive
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CO	Change Order
CPUC	California Public Utilities Commission
CPM	Critical Path Method
DSA	Division of State Architect
HVAC	Heating, Ventilating and Air Conditioning
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
I.D.	Identification
JATC	Joint Apprenticeship Training Committee
JV	Joint Venture
Kw	Kilowatt
LBE	Local Business Enterprise
MBE	Minority Business Enterprise
M/WBE	Minority and Woman-Owned Business Enterprise
ml	milliliter
mm	millimeter
NEC	National Electric Code
NEMA	National Electric Manufacturer's Association National Electrical Safety Code
NFPA	National Fire Protection Association
PM	Preventive Maintenance
PR	Proposal Request
RFI	Request for Information
RFS	Request for Substitution
SFM	State of California, Office of State Fire Marshal
CBC	California Building Code
CFC	California Fire Code
UL	Underwriters' Laboratories, Inc.
CMC	California Mechanical Code
CPC	California Plumbing Code
WOBE	Woman-Owned Business Enterprise
WMBE	Woman/Minority Business Enterprise

B. Additional abbreviations, used only on drawings, are listed thereon.

1.05 SYMBOLS

Symbols, used only on Drawings, are shown thereon.

1.06 DEFINITIONS

A. Wherever any of the words or phrases defined below, or a pronoun used in place thereof, is used in any part of the Contract Documents, it shall have the meaning here set forth:

ADDENDA: Written or graphic instruments issued prior to the opening of Bids, which clarify, correct or change the bidding requirements or the Contract Documents. Addenda shall not include the minutes of the Pre-bid Conference and Site Visit.

ADDITIVE BID: The sum to be added to the Base Bid if the change in scope of work as described in Additive Bid is accepted by CLPCCD.

AGREEMENT: Agreement is the basic contract document that binds the parties to construction Work. Agreement defines relationships and obligations between CLPCCD and Contractor and by reference incorporates Conditions of Contract, Drawings, and Specifications and contains Addenda and all Modifications subsequent to execution of Contract.

ALTERNATE: Work added to or deducted from the Base Bid, if accepted by CLPCCD.

APPROVED EQUAL: Approved in writing by CLPCCD as being of equivalent quality, utility and appearance.

ARCHITECT or ARCHITECT/ENGINEER: The person holding a valid California State Architect's license, whose firm has been designated within the Contract Documents as the Architect to provide architectural services on the project. Refer to Section 341, Part 1, Title 24, C. C. R.

When the Architect is referred to within the Contract Documents and no Architect has in fact been designated, then the matter shall be referred to CLPCCD. The term Architect shall be construed to include all its consultants retained for the project, as well as employees of the Architect. When the designated Architect is an employee of CLPCCD, his authorized representations on the project within the district will be included under the term Architect.

BID: The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

BIDDER: One who submits a Bid.

CLPCCD: Chabot-Las Positas Community College District. Unless otherwise expressly indicated or required by the context of usage, the terms "District" and "Owner" as used in the Contract Documents shall be deemed references to CLPCCD.

CLPCCD-**FURNISHED**, **CONTRACTOR**-**INSTALLED**: Items furnished by CLPCCD at its cost for installation by Contractor at its cost under this Contract.

CLPCCD REPRESENTATIVE(S): The person or persons assigned by CLPCCD to be CLPCCD's representatives or, if so designated, agent(s) at the site.

BY CLPCCD: Work that will be performed by CLPCCD or its agents at the CLPCCD's expense.

BY OTHERS: Work that is outside scope of Work to be performed by Contractor under this Contract, which will be performed by CLPCCD, other contractors, or other means.

CHANGE ORDER: A written instrument prepared by CLPCCD and signed by CLPCCD and Contractor, stating their agreement upon all of the following:

a. a change in the Work,

b. the amount of the adjustment in the Contract Sum, if any, and

c. the amount of the adjustment in the Contract Time, if any.

As appropriate, change orders are subject to approval by the Division of the State Architect. Refer to section 4-338, Part 1, Title 24, California Code of Regulations.

CONCEALED: Work not exposed to view in the finished Work, including within or behind various construction elements.

CONTRACT CONDITIONS: Conditions of Contract define basic rights, responsibilities and relationships of Contractor and CLPCCD and consists of two parts: General Conditions and Supplementary Conditions.

a. General Conditions are general clauses, which are common to the CLPCCD Contracts.

b. Supplementary conditions modify or supplement General Conditions to meet specific requirements for this Contract.

CONSTRUCTION MANAGER: CLPCCD's authorized representative, who shall represent CLPCCD in all matters relative to this Contract. Construction Manager may authorize agents and representatives to act in carrying out Construction Manager's duties, including a "Project Manager", to act under the authority of the Construction Manager. As CLPCCD's agent, the Construction Manager is the beneficiary of all contract obligations of Contractor to CLPCCD, including without limitation, all releases and indemnities. Construction Manager shall not have any personal liability arising from this Contract or any activity there under and Contractor releases Construction Manager fully from all loss, cost, damage, expense or liability arising out of or connected with this Project, whether arising from contract, negligence or tort claims of all kinds.

CONTRACT DOCUMENTS: Contract Documents shall consist of the documents identified as the Contract Documents in Contract Agreement, plus all changes, addenda and modifications thereto.

CONTRACT MODIFICATION: Either:

a. a written amendment to Contract signed by Contractor and CLPCCD; or
b. a Change Order; or
c. a written directive for a minor change in the Work issued by CLPCCD.

CONTRACT SUM: The sum stated in the Agreement and, including authorized adjustments, the total amount payable by CLPCCD to Contractor for performance of the Work and the Contract Documents. (Also referred to as the CONTRACT PRICE.)

CONTRACT TIMES: The number or numbers of days or the dates stated in the Agreement (i) to achieve substantial completion of the Work or designated milestones and/or (ii) to complete the Work so that it is ready for final payment and is accepted.

CONTRACTOR: The person or entity identified as such in the Agreement and referred to throughout the Contract Documents as if singular in number and neuter in gender. The term "Contractor" means the Contractor or its authorized representative.

CONTRACTOR'S EMPLOYEES: Persons engaged in execution of Work under Contract as direct employees of Contractor, as subcontractors, or as employees of subcontractors.

DATE OF SUBSTANTIAL COMPLETION: Date of Substantial Completion of Work or designated portion thereof is date certified by Construction Manager when construction is sufficiently complete in accordance with Contract Documents for CLPCCD to occupy Work or designated portion thereof for its use for which it is intended.

DAY: One calendar day, unless the word "day" is specifically modified to the contrary.

DEDUCTIVE BID: The sum to be subtracting to the Base Bid if the change in scope of work as described in Deductive Bid is accepted by CLPCCD.

DEFECTIVE: An adjective which, when modifying the word "Work", refers to Work that is unsatisfactory or unsuited for the use intended, faulty, or deficient, that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents (including but not limited to approval of samples and "or equal" items), or has been damaged prior to final payment (unless responsibility for the protection thereof has been assumed by CLPCCD). Construction Manager is the judge of whether Work is defective.

DRAWINGS: The graphic and pictorial portions of Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

ENGINEER: Where referenced in the Contract Documents, the person holding a valid California State Engineer's license, whose firm has been designated (if any designated) within the Contract Documents as the Engineer to provide engineering services on the project. Refer to section 4-341, Part 1, Title 24, C.C.R.

EQUAL: Equal in opinion of Architect. Burden of proof of equality is responsibility of Contractor.

EXPOSED: Work exposed to view in the finished Work, including behind louvers, grilles, registers and various other construction elements.

FINAL ACCEPTANCE or FINAL COMPLETION: All Work satisfactorily completed in accordance with Contract Documents. It includes, but is not limited to:

a. All Systems having been tested and accepted as having met requirements of Contract Documents.

b. All required instructions and training sessions having been given by Contractor.

c. All as-built drawings and operations and maintenance manuals and Machine Inventory Sheets having been submitted by Contractor, reviewed by Architect/Engineer and accepted by CLPCCD.

d. All punch list work, as directed by CLPCCD, having been completed by Contractor.

e. Generally all work, except Contractor maintenance after Final Acceptance, having been completed to satisfaction of CLPCCD.

FORCE-ACCOUNT: Work directed to be performed without prior agreement as to lump sum or unit price cost thereof, and which is to be billed at cost for labor, materials, equipment, taxes, and other costs, plus a specified percentage for overhead and profit.

FURNISH: Supply only, do not install.

INDICATED: Shown or noted on the Drawings.

INSPECTOR: The person engaged by CLPCCD to inspect the workmanship, materials, or manner of construction of buildings or portions of buildings, to determine if such construction complies with the Contract Documents and applicable codes. The inspector is subject to approval by the Architect, CLPCCD and, as appropriate, Division of the State Architect, and he will report to CLPCCD. Refer to section 4-333 and section 4-342, Part 1, Title 24, California Code of Regulations. The terms "Inspector" and "Project Inspector" are used interchangeably in the Contract Documents.

INSTALL: Install or apply only, do not furnish.

LATENT: Not apparent by reasonable inspection, including but not limited to, the inspections and research required as a condition to bidding under the General Conditions.

MATERIAL OR MATERIALS: These words shall be construed to embrace machinery, manufactured articles, materials of construction (fabricated or otherwise), and any other classes of material to be furnished in connection with Contract, except where a more limited meaning is indicated by context.

MILESTONE: A principal event specified in Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all Work.

MODIFICATION: Same as Contract Modification.

NOT IN CONTRACT: Work that is outside the scope of work to be performed by Contractor under this Contract.

NOTICE OF AWARD: A written notice given by CLPCCD to lowest responsive, responsible bidder advising that Bidder's bid and other qualifying information is acceptable to CLPCCD, requiring Bidder to fulfill the requirements of Article 1.03 of Document 00600 General Conditions.

NOTICE TO PROCEED: A written notice given by CLPCCD to Contractor fixing the date on which the Contract Time will commence to run and on which contractor shall start to perform Contractor's obligations under the Contract Documents.

OFF SITE: Outside geographical location of the Project.

OWNER: Chabot Las Positas Community College District (CLPCCD).

PROGRESS REPORT: a periodic report submitted by Contractor to CLPCCD with progress payment invoices accompanying actual work accomplished to the Project Schedule. See Section 01310 Progress Schedules and Reports, Document 00600 General Conditions.

PROJECT: Total construction of which Work performed under this Contract may be whole or part.

PROJECT MANUAL: Project Manual consists of Bidding Requirements, Agreement, Bonds, Certificates, Contract Conditions, and Specifications. The Project Manual is deemed to include and incorporate all matters noted in any Addenda issued by or on behalf of the District during the bidding for the Work.

PROJECT STABILIZATION AGREEMENT: The Contractor or Subcontractor (CONTRACTOR) on this project accepts and agrees to be bound by the terms and conditions of the “Chabot-Las Positas Project Stabilization Agreement”, together with any and all amendments and supplements now existing or which are later made by executing the Letter of Assent.

PROVIDE: Furnish and install.

REQUEST FOR INFORMATION (RFI): A document prepared by Contractor, CLPCCD or Architect/Engineer requesting information from one of the parties regarding the Project or Contract Documents. The RFI system is also a means for CLPCCD and Architect to submit Contract Document clarifications or supplements to Contractor.

RFI-REPLY: A document consisting of supplementary details, instructions or information issued by the Architect/Engineer, which clarifies or supplements Contract Documents and with which Contractor shall comply. RFI-Replies do not constitute changes in Contract Sum or Contract Times except as otherwise agreed in writing by CLPCCD. RFI-Replies will be issued through the RFI administrative system.

SAMPLES: Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

SHOP DRAWINGS: All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the work.

SHOWN: As indicated on Drawings.

SITE: The particular geographical location of Work performed pursuant to Contract, including staging areas, work areas, storage and lay down areas, access and parking.

SPECIFICATIONS: The written portion of the Contract Documents consisting of requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services; and are contained in Divisions 1 through 32.

SPECIFIED: As written in Specifications.

SUBCONTRACTOR: A person or entity who has a direct contract with Contractor to perform a portion of the Work at the site. The term "subcontractor" is referred to throughout the Contract Documents as if singular in number and neuter in gender and means a subcontractor or an authorized representative of the subcontractor. The term "subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

SUBSTANTIAL COMPLETION: The Work (or a specified part thereof) has progressed to the point where, in the opinion of the Construction Manager and the Architect/Engineer as evidenced by a Certificate of Substantial Completion, it is sufficiently complete, in accordance with Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when the Work is complete and ready for final payment is evidenced by written recommendation of the Construction Manager and the Architect/Engineer for final payment. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

SUPPLEMENTAL INSTRUCTION: A written work change directive to Contractor from Architect/Engineer, approved by Construction Manager, ordering alterations or modifications which do not result in change in Contract Sum or Contract Times, and do not substantially change Drawings or Specifications.

UNDERGROUND FACILITIES: All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: Electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

VERIFIED REPORT: A periodic verified report submitted to DSA. Refer to sections 4-336, 4-337 and 4-343, Part 1, Title 24, California Code of Regulations.

WORK: The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all is required by the Contract Documents. Wherever the word "work" is used, rather than the word "Work", it shall be understood to have its ordinary and customary meaning.

A. Wherever words "as directed", "as required", "as permitted", or words of like effect are used, it shall be understood that direction, requirements, or permission of CLPCCD or Construction Manager is intended. Words "sufficient", "necessary", "proper", and the like shall mean sufficient, necessary or proper in judgment of CLPCCD or Construction Manager. Words "approved", "acceptable", "satisfactory", "favorably reviewed" or words of like import, shall mean approved by, or acceptable to, or satisfactory to, or favorably reviewed by CLPCCD or Construction Manager.

B. Wherever the word "may" is used, the action to which it refers is discretionary. Wherever the word "shall" is used, the action to which it refers is mandatory.

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Quality assurance and control of installation.

B. References.

C. Mock-Up.

D. Inspection and testing laboratory services.

E. Manufacturer's field services.

1.02 RELATED SECTIONS

A. Submission of manufacturers' instructions and

B. Sections requiring Laboratory Testing:

1. Section 01 33 00 - Submittals: certificates
2. Section 31 00 00 - Earthwork
3. Section 32 12 16 - Asphalt Concrete Paving
4. Section 32 13 13 - Portland Cement Concrete Paving Section xx xx - Concrete Reinforcement
5. Section 03 30 00 - Cast-in-Place Concrete
6. Section 04 22 00 - Concrete Unit Masonry
7. Section 05 12 00 - Structural Steel
8. Section 05 50 10 - Metal Fabrications

1.03 QUALITY ASSURANCE AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. If manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.04 REFERENCES

A. Conform to reference standard by date of issue current on date specified in product sections.

B. Should specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 MOCK-UP

A. Mock-up and sample panels will be performed under various sections and identified as sample panels or mock-ups.

B. Assemble and erect specified items with specified attachments, anchorage, flashing, seals and finishes.

C. Where mock-up has been accepted by Architect/Engineer and is specified in product specification section to be removed, remove mock-up and clear area as directed.

D. Whereas, mock-up submittals will be submitted until the acceptance by Architect/Engineer and Construction Manager.

1.06 INSPECTION AND TESTING LABORATORY SERVICES

A. CLPCCD will appoint, employ and pay for services of an independent firm to perform inspection and testing.

B. The independent firm will perform inspections, tests, and other services specified in individual specification sections and as required by the Architect/Engineer. Promptly notify Construction Manager, Architect/Engineer, DSA, Project Inspector, and Contractor of observed irregularities or deficiencies of work or products.

C. Reports will be submitted by the independent firm, one copy each, to the Construction Manager, Architect, Engineer, Division of the State Architect, Contractor and Project Inspector. Indicate observations and results of tests and indicate compliance or non-compliance with Contract Documents and Title 24, C.C.R. specifically, each report will include the following:

   1. Date issued; date and time of sampling or inspection; date of test.

   2. Project title and number; testing laboratory name, address and telephone number; name and signature of laboratory inspector.

   3. Location of sampling or test; temperature and weather condition.

   4. Type of inspection or test; identification of product and specification section; results of test and compliance with Contract Documents and Title 24, C.C.R.

   5. Perform additional tests as required by Architect/Engineer and/or Project Inspector; interpret test results, when requested by Architect/Engineer.

   6. Special Inspections: as shown on attached Tests & Inspections (T&I) list for each section.

D. Contractor shall cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.

1. Notify Architect/Engineer 72 hours in advance and/or independent firm 24 hours prior to expected time for operations requiring services.
2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
3. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the work of the contract.

E. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Architect/Engineer and/or Project Inspector. Payment for retesting will be paid by the Contractor by deducting inspection or testing charges from the Contract Sum on the next scheduled payment.

1.07 MANUFACTURER'S FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Construction Manager thirty (30) calendar days in advance of required observations. Observer shall be subject to approval of Construction Manager and Architect/Engineer.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Refer to Section 01 33 00 - Submittals: Manufacturers' Instructions.

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

Not applicable to this section.

END OF SECTION

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SECTION 01 50 00

TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 SUMMARY

This section describes the temporary facilities required for the Project site. The Project site shall be maintained by Contractor as set forth in this section.

1.02 TEMPORARY FACILITIES

A Contractor shall obtain permits for, install and maintain in safe condition, whatever scaffolds, hoisting equipment, barricades, walkways, or other temporary structures, which may be required to accomplish the work on the Project. Contractor shall enclose and secure Project Site, including lay down area with a temporary chain link fence. Such structures shall be adequate for the intended use and capable of safely accepting all loads that may be imposed upon them. They shall be installed and maintained in accordance with all applicable State and local codes and regulations.

B. Contractor shall provide and maintain temporary heat from an approved source whenever in the course of the Work it may become necessary for curing and drying of materials or to warm spaces as may be required for the installation of materials or finishes.

C. Contractor shall provide and maintain any and all facilities that may be required for dewatering in order that work may proceed on the Project. If it is necessary for dewatering to occur continually, Contractor shall have on hand whatever spare parts or equipment that may be required to prevent interruption of dewatering.

D. Contractor shall provide and maintain all utility services necessary to perform the work under this Contract. These may include, but are not limited to, temporary electricity, water, gas, sewer and telephone, including charges and installation fees. Contractor shall furnish and maintain all means of distribution of utility services required within the site to properly complete the Project.

E. Materials, tools, accessories, etc., shall be stored only where directed by CLPCCD. Storage area shall be kept neat and clean. Security of stored items shall be Contractor's responsibility.

F. When flammable materials are stored on site, extra precautions, including clear identification, shall be the responsibility of Contractor.

G. Contractor shall provide and maintain temporary toilets in quantities and locations as required by CAL/OSHA and other local codes and regulations. They shall be maintained and supplied in a usable and sanitary condition at all times.

H. If water at construction site is determined to be non-potable by Inspector, Contractor shall provide and maintain adequate potable water stations at site until final completion of the Project.

I. Contractor shall maintain an office at the Project site, which will be his headquarters for the Project. Any communications delivered to this office shall be considered as delivered to Contractor. Location and size of office shall be such that it will adequately serve the needs of Contractor's superintendent and assistants in the performance of their duties.

J. Contractor shall also provide and maintain the following temporary facilities for the duration of the project. Contractor shall obtain approval of the plans and specifications for all the following temporary facilities from Construction Manager prior to delivery to job site. Construction Manager shall have the option to reject said facilities if they do not meet Construction Manager's needs.

K. Contractor shall promptly remove all such Temporary Facilities when they are no longer needed for the work or for completion of the Project, mutually agreed upon by Contractor and CLPCCD.

L. Contractor shall provide and maintain in the Temporary Facilities a copy of the California Code of Regulations Title 24 (latest edition) Parts I & II.

1.03 SIGNS

No signs may be displayed on or about CLPCCD's property (except those required by law) without CLPCCD's specific approval; the size, content, and location to be as specified by CLPCCD.

1.04 USE OF ROADWAYS AND WALKWAYS

Contractor shall never block or interfere with use of any existing roadway, walkway or other facility for vehicular or pedestrian traffic, from any party entitled to use it. Wherever and whenever such interference becomes necessary for the proper and convenient performance of the Work, and no satisfactory detour route exists, Contractor shall, before beginning the interference, provide a satisfactory detour, including temporary bridge if necessary, or other proper facility for traffic to pass around or over the interference. Contractor shall maintain the detour in a safe and satisfactory condition as long as the interference continues, all without extra payment unless otherwise expressly stipulated in the Specifications.

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 01 61 00

MATERIAL AND EQUIPMENT

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Products

B. Transportation and handling.

C. Storage and protection.

1.02 RELATED SECTIONS

A. Section 01 11 00 - Summary of Work.

B. Section 01 45 00 - Quality Control: Product Quality Monitoring.

1.03 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.

B. Provide interchangeable components of the same manufacturer, for similar components.

1.04 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's instructions and construction schedules. Coordinate to avoid conflict with work and conditions at the site.

B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.05 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated products, place on sloped supports, above ground, to prevent soiling and staining.

C. Provide off-site storage and protection when site does not permit on-site storage or protection.

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

H. Provide substantial covering and protection after installation of products from damage due to traffic and subsequent construction operations. Remove when no longer needed.

PART 2–PRODUCTS

Not applicable to this section.

PART 3–EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 01 62 00

PRODUCT OPTIONS & SUBSTITUTIONS

PART 1 – GENERAL

1.01 SUMMARY

A. Procedures are described for selecting products and requesting substitutions of unlisted materials in lieu of materials named in the specifications or approved for use in addenda.

B. Related Sections

1. Section 01 26 00: Contract Modification Procedures
2. Section 01 33 00: Submittals

1.02 CONTRACTOR'S OPTIONS

A. For products specified only by reference standard: Select any product meeting that standard.

B. For products specified by naming one or more products or manufacturers:

1. Select products of any named manufacturer meeting specifications.
2. For any product or manufacturer, which is not specifically named, submit Request for Substitution (RFS).

C. For products indicated or specified by naming only one product and manufacturer, followed by the words “no substitution allowed”, there is no option.

1.03 SUBSTITUTIONS

A. No substitutions shall be allowed for District standard systems, products, and/or materials unless approved in writing from the Architect’s office five (5) days prior to bid. The entire District Standard systems, products, and/or materials can be found on the District’s website at:

http://www.clpccd.org/facilities/DistrictStandardsandGuidelines-ChabotCollege.php

B. Within a period of thirty-five (35) days after Award of Contract, Construction Manager and Architect/Engineer will consider RFS from Contractor. After that period, requests will be considered only when product becomes unavailable due to no fault of Contractor. Requests for review of proposed substitute items will not be accepted from anyone other than Contractor. The RFS will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will prejudice Contractor's achievement of substantial completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with CLPCCD for work on the Project).

C. Submit separate RFS for each product and support each request with:

1. Product identification
2. Manufacturer's literature
3. Samples, as applicable
4. Name and address of similar projects on which product has been used, and date of installation
5. Name, address and telephone number of manufacturer's representative or sales engineer
6. Where DSA approval is required, product shall be reviewed and approved by DSA

D. Itemize a comparison of the proposed substitution with product specified and list significant variations. If variation from product specified is not pointed out in submittal, variation will be rejected even though submittal was favorably reviewed.

E. State whether the substitute will require a change in any of the Contract documents (or provisions of any other direct contract with CLPCCD for work on the Project) to adapt the design of the proposed substitute, and whether or not incorporation or use of the substitute in connection with Work is subject to payment of any license fee or royalty. Submit data relating to changes in construction schedule.

F. All variations of the proposed substitute from that specified will be identified in the RFS and available maintenance, repair and replacement service will be indicated.

G. Include accurate cost data comparing proposed substitution with product and amount of net change in Contract price, including but not limited to, an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors effected by the resulting change, all of which will be considered by Construction Manager and Architect/Engineer in evaluating the proposed substitute. Construction Manager and Architect/Engineer may require Contractor to furnish additional data about the proposed substitute.

H. Substitutions will not be considered for acceptance when:

1. They will result in delay meeting construction milestones or completion dates.
2. They are indicated or implied on submittals without formal request from Contractor.
3. They are requested directly by subcontractor or supplier.
4. Acceptance will require substantial revision of Contract Documents.
5. They disrupt Contractor's job rhythm or ability to perform efficiently.

I. Substitute products shall not be ordered without written acceptance of Construction Manager and Architect/Engineer.

J. Construction Manager and Architect/Engineer will determine acceptability of proposed substitutions and reserve right to reject proposals due to insufficient information.

K. Accepted substitutions will be evidenced by a change order or Supplemental Instruction. All Contract requirements apply to Work involving substitutions.

1.04 CONTRACTOR'S REPRESENTATION AND WARRANTY

A. Requests constitute a representation and warranty that Contractor:

1. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product
2. Will provide the same warranty for substitution as for specified product
3. Will coordinate installation and make other changes, which may be required for Work to be complete in all respects
4. Waives claims for additional costs, which may subsequently become apparent
5. Will compensate CLPCCD for additional redesign costs associated with substitution, if required
6. Will be responsible for Construction Schedule slippage due to substitution
7. Will be responsible for Construction Schedule delay due to late ordering of available specified products caused by requests for substitution, which is subsequently rejected by Construction Manager
8. Will compensate CLPCCD for all costs; including extra costs of Contract, extra cost to other contractors, and any claims brought against CLPCCD, caused by late requests for substitutions or late ordering of products.

1.05 CONSTRUCTION MANAGER'S AND ARCHITECT/ENGINEER'S DUTIES

A. Review Contractor's RFS within seven (7) working days.

B. Notify Contractor in writing of decision to accept or reject requested substitution within seven (7) working days.

1.06 COST OF REVIEW

A. Construction Manager and Engineer will record time required in evaluating substitutes proposed or submitted by Contractor. Whether or not Construction Manager or Architect/Engineer accepts the substitute item so proposed or submitted by Contractor, Contractor shall reimburse CLPCCD for the charges of Architect/Engineer and Construction Manager for evaluating each such proposed substitute item.

B. The CLPCCD reserves the right to waive the requirement of paragraph A above.

PART 2–PRODUCTS

Not applicable to this section.

PART 3–EXECUTION

Not applicable to this section.

.

END OF SECTION

SECTION 01 70 00

CONTRACT CLOSEOUT

PART 1 – GENERAL

1.01 SUMMARY

This section describes contract closeout procedures including:

1. Removal of temporary construction facilities
2. Substantial completion
3. Final completion
4. Final cleaning
5. Project record documents
6. Material, equipment and finish data
7. Project guarantee
8. Warranties
9. Turn-in
10. Release of claims
11. Guaranty and Maintenance Bonds

1.02 REMOVAL OF TEMPORARY CONSTRUCTION FACILITIES

A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion Inspection.

B. Clean and repair damage caused by installation or use of temporary facilities.

C. Restore permanent facilities used during construction to specified condition.

1.03 SUBSTANTIAL COMPLETION

A. When Contractor considers Work or designated portion thereof as substantially complete, submit written notice, with list of items to be completed or corrected to Construction Manager.

B. Within reasonable time, Construction Manager and Architect/Engineer will inspect to determine status of completion.

C. Should Construction Manager or Architect/Engineer determine that Work is not substantially complete; Construction Manager will promptly notify Contractor in writing, listing all defects and omissions.

D. Remedy deficiencies and send a second written notice of substantial completion. Architect/Engineer will reinspect the Work. If deficiencies previously noted are not corrected on reinspection, then Contractor shall pay the cost of the reinspection.

E. When Architect/Engineer determines that Work is substantially complete, Construction Manager will issue a Certificate of Substantial Completion.

F. Manufactured units, equipment and systems, which require startup, must have been started up and run for periods prescribed by Construction Manager, Architect/Engineer, or Owner before a Certificate of Substantial Completion will be issued.

1.04 FINAL COMPLETION

A. When Contractor considers Work is complete, submit written certification that:

1. Contractor has inspected Work for compliance with Contract Documents.
2. Work, except for Contractor maintenance after Final Acceptance, has been completed in accordance with Contract Documents and deficiencies listed with Certificate of Substantial Completion have been corrected.
3. Work is complete and ready for final inspection.
4. Contractor has achieved all requirements for Final Acceptance as that term is defined in Section 01 41 00 – Regulatory Requirements.

B. In addition to submittals required by conditions of Contract, provide submittals required by governing authorities and submit final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.

C. When Architect/Engineer finds Work is acceptable and final submittal is complete, Construction Manager will issue final change order reflecting approved adjustments to Contract Sum not previously made by Change Order.

1.05 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

1. Clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment operated during construction, clean ducts, blowers and coils of units operated without filters during construction.
2. Employ skilled workers for final cleaning.

C. Clean Site; mechanically sweep-paved areas.

D. Remove waste and surplus materials, rubbish, and construction facilities from Site.

1.06 PROJECT RECORD DOCUMENTS

A. General

1. Project Record Documents required include:
    a. Marked-up copies of Contract Drawings
    b. Marked-up copies of Shop Drawings
    c. Newly prepared Drawings
    d. Marked-up copies of Specifications, Addenda and Change Orders
    e. Marked-up Project Data submittals
    f. Record Samples
    g. Field records for variable and concealed conditions
    h. Record information on Work that is recorded only schematically

i. Comments to all required DSA documentation

j. All approved change orders

2. Specific Project Record Documents requirements that expand requirements of this Section are included in the individual Sections of Divisions 2 through 33.

3. Maintenance of Documents and Samples:

a. Store Project Record Documents and samples in the field office apart from Contract Documents used for construction.

b. Do not permit Project Record Documents to be used for construction purposes.

c. Maintain Project Record Documents in good order, and in a clean, dry, legible condition.

d. Make documents and samples available at all times for inspection by Architect/Engineer.

4. CLPCCD will provide one set of sepias and one blueline set of the construction drawings and one-project manuals for the Contractor's use and copying during construction.

B. Project Record Drawings

1. Mark-up Procedure: During the construction period, maintain a set of blueline or blackline prints of Contract Drawings and Shop Drawings for Project Record Document purposes.

2. Mark these Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to information on concealed elements, which would be difficult to identify or measure and record later. Items required to be marked include, but are not limited to:

a. Dimensional changes to the building

b. Drawings Revisions to details shown on the Contract Drawings

c. Drawings Depths of foundations below the first floor

d. Locations and depths of underground utilities

e. Revisions to routing of piping and conduits

f. Revisions to electrical circuitry

g. Actual equipment locations

h. Duct size and routing

i. Locations of concealed internal utilities

j. Changes made by Change Order

k. Details not on original Contract Drawings

3. Mark completely and accurately Project Record Drawing prints of Contract Drawings or Shop Drawings, whichever is the most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.

4. Mark Project Record Drawing sets with red erasable colored pencil; use other colors to distinguish between changes for different categories of the Work at the same location.

5. Mark important additional information, which was either shown schematically or omitted from original Drawings.

6. Note construction change directive numbers; alternate numbers; Change Order numbers and similar identification.

7. Responsibility for Mark-up: Where feasible, the individual or entity who obtained Project Record Drawing data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on Project Record Drawings.

    a. Accurately record information in an understandable and legible drawing technique.

    b. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.

8. At time of Substantial Completion, submit Project Record Drawings to Construction Manager for CLPCCD's records. Organize into sets, bind and label sets for CLPCCD's continued use.

9. All record documents shall be submitted in an electronic format and hard copy.

C. Preparation of Documents: Immediately prior to inspection for Certification of Substantial Completion, review completed marked-up Project Record Drawings with the Architect/Engineer. When authorized, prepare a full set of correct Contract Drawings and Shop Drawings.

1. Incorporate changes and additional information previously marked on print sets. Erase, redraw, and add details and notations where applicable. Identify and date each Drawing; include the printed designation "PROJECT RECORD DRAWINGS" in a prominent location on each Drawing.

2. Refer instances of uncertainty to the Architect/Engineer for resolution.

3. Review of Documents: Before copying and distributing, submit corrected drawings and the original marked-up prints to the Architect/Engineer for review. When acceptable, the Architect/Engineer will initial and date each document, indicating acceptance of general scope of changes and additional information recorded, and of the quality of drafting.

    a. Documents and the original marked-up prints will be returned to the Contractor for organizing into sets, printing, binding, and final submittal.

D. Copies and Distribution: After completing the preparation of Project Record Drawings, print three (3) blue-line or black-line prints of each Drawing, whether or not changes and additional information were recorded. Organize the copies into manageable sets. Bind each set with durable paper cover sheets, with appropriate identification, including titles, dates and other information on cover sheets.

1. Organize and bind original marked-up set of prints that were maintained during the construction period in the same manner.

2. Organize Project Record Drawings into sets matching the print sets. Place these sets in durable tube-type drawing containers with end caps. Mark the end cap of each container with suitable identification.

3. Submit the marked-up Project Record Drawings set and three (3) copy sets to the Construction Manager for CLPCCD's records; the Architect/Engineer will retain one copy set.

E. PROJECT RECORD SPECIFICATIONS

During the construction period, maintain one copy of the Project Specifications, including addenda and modifications issued, for Project Record Document purposes.

1. Mark the Project Record Specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications and Modifications issued. Note related Project Record Drawing information, where applicable. Give particular attention to substitutions, selection of product options, and information on concealed installation that would be difficult to identify or measure and record later.

a. In each Specification Section where products, materials or units of equipment are specified or scheduled, mark the copy with the proprietary name and model number of the product furnished.

b. Record the name of the manufacturer, supplier and installer, and other information necessary to provide a record of selections made and to document coordination with Project Record Product Data submittals and maintenance manuals.

c. Note related Project Record Product Data, where applicable, for each principal product specified, indicate whether Project Record Product Data has been submitted in maintenance manual instead of submitted as Project Record Product Data.

2. Upon completion of mark-up, submit Project Record Specifications to the Construction Manager for CLPCCD's records.

F. PROJECT RECORD PRODUCT DATA. During the construction period, maintain one copy of each Project Record Product Data submittal for Project Record Document purposes.

1. Mark Project Record Product Data to indicate the actual product installation where the installation varies substantially from that indicated in Project Record Product Data submitted. Include significant changes in the product delivered to the site, and changes in manufacturer's instructions and recommendations for installation.

2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

3. Note related Change Orders and mark-up of Project Record Drawings, where applicable.

4. Upon completion of mark-up, submit a complete set of Project Record Product Data to the Construction Manager for CLPCCD's records.

5. Where Project Record Product Data is required as part of maintenance manuals, submit marked-up Project Record Product Data as an insert in the manual, instead of submittal as Project Record Product Data.

6. Each prime Contractor is responsible for mark-up and submittal of record Project Record Product Data for its own Work.

G. MATERIAL, EQUIPMENT AND FINISH DATA.

1. Provide data for primary materials, equipment and finishes as required under each specification section.

2. Submit two (2) sets prior to final inspection, bound in 8-1/2 inches by 11 inches three-ring binders with durable plastic covers; provide typewritten table of contents for each volume.

3. Arrange by Specification division and give names, addresses, and telephone numbers of subcontractors and suppliers. List:

a. Trade names

b. Model or type numbers

c. Assembly diagrams

d. Operating instructions

e. Cleaning instructions

f. Maintenance instructions

g. Recommended spare parts

h. Product data

H. FINAL AS-BUILT DRAWINGS, SPECIFICATIONS.

1. As-Built Drawings and Specifications are the official record drawing that documents what was constructed

2. These drawings shall be available to the Architect and shall be provided to the District upon completion of the of the work.

3. Requirements:

a. One hard copy set of full size (24x36) or (36x48) As-Built Plans, with DSA App #, and “AS BUILT” stamped on each sheet in red.

b. One hard copy set of half size As-Built Plans, with DSA App #, and “AS BUILT” stamped on each sheet in red.

c. One hard copy set of specifications with “AS BUILT” stamped on the cover page in red.

d. A CD/DVD in PDF and CAD formats (CAD format to be compatible with AutoCAD 2016) with the following naming convention for the CD/DVD cover:

i. College Name

ii. Project Name

iii. DSA Application #

iv. Do not check the “read only” option

v. Do not password protect any files

1.08 MISCELLANEOUS PROJECT RECORD SUBMITTALS

Refer to other Specification Sections for miscellaneous record keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Construction Manager for CLPCCD's records.

Categories of requirements resulting in miscellaneous records include, but are not limited to the following:

a. Field records on excavations and foundations

b. Field records on underground construction and similar work

c. Survey showing locations and elevations of underground lines

d. Invert elevations of drainage piping

e. Surveys establishing building lines and levels

f. Authorized measurements utilizing unit prices or allowances

g. Records of plant treatment

h. Ambient and substrate condition tests

i. Certifications received in lieu of labels on bulk products

j. Batch mixing and bulk delivery records

k. Testing and qualification of tradespersons

l. Documented qualification of installation firms

m. load and performance testing

n. Inspections and certifications by governing authorities leakage and water-penetration tests

o. Fire resistance and flame spread test results

p. Final inspection and correction procedures

1.09 PROJECT GUARANTEE

A. Neither recordation of final acceptance nor final certificate for neither payment nor provision of the Contract nor partial or entire use or occupancy of the Site by CLPCCD shall constitute acceptance of Work not done in accordance with Contract Documents nor relieve Contractor of liability in respect to express warranties or responsibility for faulty materials or workmanship.

B. Requirements for Contractor's guarantee of completed Work are included in General Conditions, Article 1.09. Contractor shall guarantee Work done under Contract against failures, leaks or breaks or other unsatisfactory conditions due to defective equipment, materials or workmanship, and perform repair work or replacement required, at Contractor's sole expense, for period of 2 years from date of Final Acceptance, as required by paragraph 13.2 of General Conditions.

C. CLPCCD may make repairs to defective Work as set forth in paragraph 12.6 of General Conditions, if, within 5 working days after mailing of written notice of defective work to Contractor or authorized agent, Contractor shall neglect to make or undertake with due diligence repairs; provided, however, that in case of leak or emergency where, in opinion of CLPCCD, delay would cause hazard to health or serious loss or damage, repairs may be made without notice being sent to Contractor, and Contractor shall pay cost thereof.

D. If, after installation, operation or use of materials or equipment to be furnished under Contract proves to be unsatisfactory to Construction Manager, CLPCCD shall have right to operate and use materials or equipment until it can, without damage to CLPCCD, be taken out of service for correction or replacement. Period of use of defective materials or equipment pending correction or replacement shall in no way decrease guarantee period required for acceptable corrected or replaced items of materials or equipment.

E. Nothing in this Section shall be construed to limit, relieve or release Contractor's, subcontractors' and equipment suppliers' liability to CLPCCD for damages sustained as result of latent defects in equipment caused by negligence of suppliers' agents, employees or subcontractors. Stated in another manner, warranty contained in the Contract Documents shall not amount to, nor shall it be deemed to be, waiver by CLPCCD of any rights or remedies (or time limits in which to enforce such rights or remedies) it may have for defective workmanship or defective materials under laws of this State pertaining to acts of negligence.

1.10 WARRANTIES AND BONDS

A. Execute Contractor's submittals and assemble documents executed by subcontractors, suppliers, and manufacturers.

1. Provide table of contents and assemble in 8-1/2 inches by 11 inches three-ring binder with durable plastic cover.

2. Assemble in Specification Section order.

3. Provide an electronic copy of all warranties on thumb drive in PDF format

B. Submit material prior to final application for payment.

1. For equipment put into use with CLPCCD's permission during construction, submit within ten (10) working days after first operation.

2. For items of Work delayed materially beyond Date of Substantial Completion, provide updated submittal within ten (10) working days after acceptance, listing date of acceptance as start of warranty period.

C. Warranties are intended to protect CLPCCD against failure of work and against deficient, defective and faulty materials and workmanship, regardless of sources.

D. Limitations: Warranties are not intended to cover failures, which result from the following:

1. Unusual or abnormal phenomena of the elements

2. Vandalism after substantial completion

3. Insurrection or acts of aggression including war

E. Related Damages and Losses: Remove and replace Work which is damaged as result of defective Work, or which must be removed and replaced to provide access for correction of warranted Work.

F. Warranty Reinstatement: After correction of warranted Work, reinstate warranty for corrected Work to date of original warranty expiration or to a date not less than 365 days after corrected Work was done, whichever is later.

G. Replacement Cost: Replace or restore failing warranted items without regard to anticipated useful service lives.

H. Warranty Forms: Submit drafts to Construction Manager for approval prior to execution. Forms shall not detract from or confuse requirements or interpretations of Contract Documents.

1. Warranty shall be countersigned by manufacturers.

2. Where specified, warranty shall be countersigned by subcontractors and installers.

I. Rejection of Warranties: CLPCCD reserves right to reject unsolicited and coincidental product warranties, which detract from or confuse requirements or interpretations of Contract Documents.

J. Term of Warranties: For materials, equipment, systems and workmanship warranty period shall be two (2) years minimum from date of substantial completion of entire Work except where:

1. Detailed specifications for certain materials, equipment or systems require longer warranty periods.

2. Materials, equipment or systems are put into beneficial use of CLPCCD prior to Substantial Completion as agreed to in writing by Construction Manager.

K. Warranty of Title: No material, supplies, or equipment for Work under Contract shall be purchased subject to any chattel mortgage, security agreement, or under a conditional sale or other agreement by which an interest therein or any part thereof is retained by seller or supplier. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all work to deliver the Site, together with improvements and appurtenances constructed or placed thereon by Contractor, to CLPCCD free from any claim, liens, security interest, or charges, and further agrees that neither Contractor nor any person, firm, or corporation furnishing any materials or labor for any Work covered by Contract shall have right to lien upon the Site or improvement or appurtenances thereon. Nothing contained in this Paragraph, however, shall defeat or impair right of persons furnishing materials or labor under bond given by Contractor for their protection or any rights under law permitting persons to look to funds due Contractor in hands of CLPCCD.

1.11 TURN-IN

Contract will not be closed out and final payment will not be made until all personnel Identification Media, vehicle permits and keys issued to Contractor during prosecution of Work are turned in to CLPCCD.

1.12 RELEASE OF CLAIMS

Contract will not be closed out and final payment will not be made until Contract Agreement and Release of Any and All Claims, is completed and executed by Contractor and CLPCCD.

1.13 FIRE INSPECTION COORDINATION

Contractor shall coordinate fire inspection and secure sufficient notice to CLPCCD to permit convenient scheduling.

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

Not applicable to this section.

END OF SECTION

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SECTION 01 73 29

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Work Included: This Section establishes general requirements pertaining to cutting, fitting, and patching of the work required to:

1. Make the several parts fit properly.
2. Uncover work to provide for installation, inspection, or both of ill-timed work.
3. Remove and replace work not conforming to requirements of the Contract Documents.
4. Remove and replace defective work.

1.3 QUALITY ASSURANCE

A. Perform all cutting and patching in accordance with pertinent requirements of the specifications and in the event no such requirements are determined, in conformance with the Architect's written direction. In the absence of either of the previous, the work shall be completed as a minimum to industry standards for the given scope and project.

B. In all cases, exercise extreme care in cutting operations and perform such operations under adequate supervision by competent mechanics skilled in the applicable trade. Openings shall be neatly cut and shall be kept as small as possible to avoid unnecessary damage. Careless and/or avoidable cutting damage, etc., will not be tolerated, and the Contractor will be held responsible for such avoidable or willful damage.

C. All replacing, patching, and repairing of materials and surfaces cut or damaged in the execution of the work shall be performed by experienced mechanics of the several trades involved. Such replacing, repairing, and/or patching shall be done with the applicable materials, in such a manner that all surfaces so replaced, etc., will upon completion of the work, match the surrounding similar surfaces.

1.4 SUBMITTALS

A. Request for the Architect's Consent:

1. Prior to cutting which affects structural safety, submit a written request to the Architect for permission to proceed with cutting.
2. Should conditions of the work, or schedule, indicate a required change of materials or methods for cutting and patching, notify the Architect and secure his written permission prior to proceeding.

B. Notices to the Architect:
   1. Submit written notice to the Architect and Construction Manager designating the time the work will be uncovered, therefore providing a time for the Architect's observation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. For replacement of work removed, use materials which comply with the pertinent Section of these specifications. If materials are not covered within these documents, products and methods shall be provided and installed to match existing conditions.

2.2 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements, which affects:
   1. Structural integrity of element.
   2. Integrity of weather-exposed or moisture-resistant elements.
   3. Efficiency, maintenance, or safety of element.
   4. Visual qualities of sight-exposed elements.

C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
   1. Fit the several parts together, to integrate with other Work.
   2. Uncover Work to install or correct ill-timed work.
   3. Remove and replace defective and non-conforming Work.
   4. Remove samples of installed Work for testing.
   5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute work by methods, which will avoid damage to other Work, and provide proper surfaces to receive patching and finishing.

E. Cut rigid materials using masonry saw or core drill.

F. Restore Work with new products in accordance with requirements of Contract Document.

G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

J. Identify any hazardous substance or condition exposed during the Work to the Architect for decision or remedy.

PART 3 - EXECUTION

3.1 CONDITIONS

A. Inspect existing conditions, including elements subject to movement or damage during cutting and patching.

B. After uncovering the work, inspect conditions affecting installation of new work.

3.2 DISCREPANCIES

A. If uncovered conditions are not as anticipated, immediately notify the Architect through the Construction Manager and secure needed directions.

B. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.3 PREPARATION PRIOR TO CUTTING

A. Provide all required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the work.

3.4 PERFORMANCE

A. Perform cutting and demolition by methods which will prevent damage to other portions of the work and will provide a proper surface to receive new installation or repair and new work. Perform fitting and adjustment of products to provide finished installation complying with the specified tolerance and finishes.

END OF SECTION

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SECTION 01 78 00

PROJECT RECORDS DOCUMENT

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Administrative and procedural requirements for Project Record Documents.
B. Project Record Documents required include:
   1. Marked-up copies of Drawings
   2. Marked-up copies of Shop Drawings
   3. Newly prepared Drawings
   4. Marked-up copies of Specifications, Addenda, Change Orders and CCDs
   5. Marked-up Product Data submittals
   6. Record Samples
   7. Field records for variable and concealed conditions
   8. Record information on Work that is recorded only schematically
   9. Maintenance forms for major equipment
C. Specific Project Record Documents requirements that expand requirements of this Section are included in the individual Sections of Divisions 2 through 33.
D. General Project closeout requirements are included in Section 01 70 00 (Contract Closeout).
E. Maintenance of Documents and Samples:
   1. Store Project Record Documents and Samples in the field office apart from Contract Documents used for construction.
   2. Do not permit Project Record Documents to be used for construction purposes.
   3. Maintain Project Record Documents in good order and in a clean, dry, legible condition.
   4. Make Documents and Samples available at all times for inspection by District.
F. District will provide one full size blueline set of the Drawings and one Project Manual for Contractor's use for recording as-built conditions.

1.02 PROJECT RECORD DRAWINGS

A. Mark-up Procedure: During the construction period, maintain a set of blueline or blackline prints of Contract Drawings and Shop Drawings for Project Record Documents purposes. Label each document (on first sheet or format page) "PROJECT RECORD" in 2-inch high printed letters. Keep record documents current. Note: A reference by number to a Change Order, CCD, RFI, RFQ, RFP, Field Order or other such document is not acceptable as sufficient record information on any record document. Do not permanently conceal any Work until required information has been recorded.
   1. Mark these Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include but are not limited to:
      a. Dimensional changes to the Drawings
      b. Revisions to details shown on the Drawings
      c. Depths of various elements of foundation in relation to main floor level or survey datum

d. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements
e. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure
f. Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stub outs, invert elevations, and similar items
g. Actual numbering of each electrical circuit
h. Field changes of dimension and detail
i. Revisions to routing of piping and conduits
j. Revisions to electrical circuitry
k. Actual equipment locations
l. Duct size and routing
m. Changes made by Change Order or CCD
n. Details not on original Contract Drawings

2. Mark completely and accurately Project Record Drawing prints of Contract Drawings or Shop Drawings, whichever is the most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.
3. Mark Project Record Drawing sets with red, erasable colored pencil; use other colors to distinguish between changes for different categories of the Work at the same location.
4. Mark important additional information that was either shown schematically or omitted from original Drawings.
5. Note CCD numbers; alternate numbers, Change Order numbers, and similar identification.
6. Responsibility for Mark-up: Where feasible, the individual or entity who obtained Project Record Drawing data, whether the individual or entity is the installer, Subcontractor, or similar entity, is required to prepare the mark-up on Project Record Drawings.
   a. Accurately record information in an understandable and legible drawing technique.
   b. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.

B. Preparation of Record Drawings: Immediately prior to inspection for Certification of Substantial Completion, review completed marked-up Project Record Drawings with District. When authorized, prepare a full set of correct transparencies of Contract Drawings and Shop Drawings.
   1. Incorporate changes and additional information previously marked on print sets. Erase, redraw, and add details and notations where applicable. Identify and date each Drawing; include the printed designation “PROJECT RECORD DRAWING” in a prominent location on each Drawing.
   2. Refer instances of uncertainty to District for resolution.
   3. Distribution: Whether or not changes and additional information were recorded, organize and bind original marked-up set of prints that were maintained during the construction period into manageable sets. Bind the set with durable paper cover sheets, with appropriate identification, including titles, dates, and other information on cover sheets.

C. Distribution of Marked-Up Drawings: Submit three full, bound sets and one digital set in AutoCAD 2000 format, the marked-up Project Record Drawings set to District for District’s records.

D. Shop Drawings and Samples: Maintain as record documents; legibly annotate Shop Drawings and Samples to record changes made after review.

E. In addition to requirements of this Section, comply with supplemental requirements of Divisions 15 and 16.
   1. Divisions 15 and 16 of the Specifications require the preparation of large scale, detailed layout drawings of the Work of those Divisions. These layout drawings are not Shop Drawings as defined by General Conditions, but together with Shop Drawings or layout drawings of all other affected Sections are used to check, coordinate, and integrate the work of the various Sections.
   2. Include these layout drawings as part of the Project Record Documents.

1.03 PROJECT RECORD SPECIFICATIONS

A. During the construction period, maintain one copy of the Project Specifications, including addenda and modifications issued, for Project Record Documents purposes.
B. Mark the Project Record Specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications and Modifications issued. Note related Project Record Drawing information, where applicable. Give particular attention to substitutions, selection of product options, Change Order and Construction Change Directive work, and information on concealed installation that would be difficult to identify or measure and record later.
   1. In each Specification Section where products, materials or units of equipment are specified or scheduled, mark the copy with the proprietary name and model number of the product furnished.
   2. Record the name of the manufacturer, catalog number, supplier and installer, and other information necessary to provide a record of selections made and to document coordination with Project Record Product Data submittals and maintenance manuals.
   3. Note related Project Record Product Data, where applicable, for each principal product specified, indicate whether Project Record Product Data has been submitted in maintenance manual instead of submitted as Project Record Product Data.
   4. Upon completion of mark-up, submit Project Record Specifications to District for District's records.

1.04 ADDITIONAL REQUIREMENTS FOR FINAL PROJECT RECORD DOCUMENTS

A. Prior to Substantial Completion of the Work, District will make available to Contractor originals of the Drawings and Specifications, as Microsoft® Word 2000 for Windows, and AutoCAD 2000 Land Development Desktop for Windows in drawing format (.DWG) files. Note all changes thereon for the final Project Record Documents and provide one set of mylar reproducibles, one set of revised Specifications and one set of disks or CDs to be submitted to District.
B. After Substantial Completion and before Final Completion, carefully transfer all data shown on the job set of Record Drawings to the corresponding computer files, coordinating the information as required.
C. Clearly indicate at each affected detail and other drawings a full description of changes made during construction, and the actual location of items as previously specified.
D. "Cloud" all affected areas.
E. Stamp each Record Drawing with the following information:
   1. Project Record Document.
   2. Prepared by: Contractor's name, permanent address.
   3. Date prepared.
   4. Contractor's signature.
   5. District Contract Number.

1.05 PROJECT RECORD PRODUCT DATA

A. During the construction period, maintain one copy of each Project Record Product Data submittal for Project Record Document purposes.
   1. Mark Project Record Product Data to indicate the actual product installation where the installation varies substantially from that indicated in Project Record Product Data submitted. Include significant changes in the product delivered to the Site, and changes in manufacturer's instructions and recommendations for installation.
   2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   3. Note related Change Orders and mark-up of Project Record Drawings, where applicable.
   4. Upon completion of mark-up, submit a complete set of Project Record Product Data to District for District's records.
   5. Where Project Record Product Data is required as part of maintenance manuals, submit marked-up Project Record Product Data as an insert in the manual, instead of submittal as Project Record Product Data.
   6. Contractor is responsible for mark-up and submittal of Project Record Product Data for its own Work.

B. Material, Equipment, and Finish Data:
   1. Provide data for primary materials, equipment and finishes as required under each Specification Section.
   2. Submit three (3) hard copy sets and one (1) digital copy, on compact disc (CD) prior to final inspection, bound in 8-1/2 inches by 11 inches three-ring binders with durable plastic covers; provide typewritten table of contents for each volume.
   3. Arrange by Specification Section number and give names, addresses, and telephone numbers of Subcontractors and suppliers. List:
      a. Trade names.
      b. Model or type numbers.
      c. Assembly diagrams.
      d. Operating instructions.
      e. Cleaning instructions.
      f. Maintenance instructions.
      g. Recommended spare parts.
      h. Product data.

1.06 MISCELLANEOUS PROJECT RECORD SUBMITTALS

A. Refer to other Specification Sections for miscellaneous record keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the District for District's records. Categories of requirements resulting in miscellaneous records include, but are not limited to, the following:
   1. Field records on excavations and foundations
   2. Field records on underground construction and similar work
   3. Survey showing locations and elevations of underground lines
   4. Invert elevations of drainage piping
   5. Surveys establishing building lines and levels
   6. Authorized measurements utilizing unit prices or allowances
   7. Records of plant treatment
   8. Ambient and substrate condition tests
   9. Certifications received in lieu of labels on bulk products

10. Batch mixing and bulk delivery records
11. Testing and qualification of tradespersons
12. Documented qualification of installation firms
13. Load and performance testing
14. Inspections and certifications by governing authorities
15. Leakage and water-penetration tests
16. Fire resistance and flame spread test results
17. Final inspection and correction procedures
18. Final As-Built Construction Schedule

PART 2 – PRODUCTS

Not applicable to this section.

PART 3 – EXECUTION

3.01 RECORDING

Post changes and modifications to the Contract Documents as they occur. Do not wait until the end of the Project. District may periodically review Project Record Documents to assure compliance with this requirement.

3.02 SUBMITTAL

A. At completion of Project, deliver Project Record Documents to District.
B. Accompany submittal with transmittal letter containing:
   1. Date
   2. Project title and number
   3. Contractor's name and address
   4. Number and title of each Project Record Document
   5. Certification that each document as submitted is complete and accurate, and signature of Contractor or Contractor's authorized representative.

END OF SECTION

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SECTION 02 4100

DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Work included: All labor, materials, and equipment required removal of building miscellaneous items as indicated and disposition of debris legally off-site.

1.02 SUBMITTALS

A. Demolition Schedule: Include detailed schedule showing start and completion dates for demolition and for completion of demolition work. Submit method of demolition and plan of removing work within seven days after receiving notice to proceed.

B. Certification: Submit copy of demolition firm's current license to operate in Alameda County, California.

1.03 QUALITY ASSURANCE

A. Demolition and transportation of debris shall comply with Federal, State and Local applicable codes and regulation governing these operations.

B. Demolition and removal operations shall be conducted in an expedient manner, with precautions taken to prevent demolition site from being an "attractive nuisance".

C. Notify the District and Architect of any conditions capable of affecting the safety of occupants of adjacent buildings, the normal use of these facilities, or the physical condition of the structures.

1. In case of accidental disruption of utilities or the discovery of previously unknown utilities, stop work immediately and notify the District and Architect.
2. Do not continue work until the District, Architect and Contractor agree on a plan to correct the situation or identify utility service line.

1.04 SEQUENCING AND SCHEDULING

A. Scheduling: Areas next to demolition and removal work may be occupied and their activities cannot be interrupted or disturbed during normal working hours. Demolition schedule shall be accepted by the District.

B. Coordinate with applicable utility companies and the Board for utility line removal, capping and utility shutdowns required by removal work.

1.05 PROJECT CONDITIONS

A. Provide barriers and warning devices to protect the public and users of adjacent facilities.

B. Environmental Protection:

1. Control amount of dust resulting from construction or demolition to prevent spread of dust to other buildings and to avoid creation of a nuisance in surrounding areas. Use of water to control dust will not be allowed when it will result in flooding or other objectionable or hazardous conditions.
2. Use of explosives is not allowed.
3. Disposition of demolished materials by burning is not allowed.

C. Traffic Maintenance:

1. Conduct removal operations to maintain traffic along existing streets and walks.
2. Keep paved streets and walkways free of debris.
3. Remove material and other matter tracked or fallen onto traffic surfaces.
4. If it should become necessary to close any traffic lanes, it shall be the Contractor's responsibility to acquire the necessary obstruction permits and to place adequate barricades and warning signs as required by the jurisdiction.
5. Street or lane closures shall be coordinated with the appropriate Jurisdiction.

E. Disposition of Materials:

1. Title and responsibility to materials and equipment to be removed, excepting salvageable equipment to be retained by the District, is vested in the Contractor upon receipt of Notice to Proceed.
2. The District will not be responsible for the condition, the loss, or damage to such materials and equipment after the Notice to Proceed.

F. Site utilities:

1. Coordinate removal of HPG line with PG&E.

G. Permits and Fees:
The Contractor shall obtain all the necessary permits and pay all permit fees that are required by the Jurisdiction in conjunction with the demolition work.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 DEMOLITION

A. Perform removal and demolition according to Demolition Schedule and take necessary precautions to protect existing adjacent buildings, furnishings, and equipments.

B Removal:

1. Remove demolished construction materials and related debris from the site on a daily regular basis.
2. Accumulation of debris on the site will not be allowed.
3. Selling of salvageable building materials or equipment or furnishings is not allowed at the site.

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3.03 EXISTING ITEMS TO BE SALVAGED

A Tiles with figures at Administration building are to be removed carefully without damaging the tiles. After removal hand over the tiles to District.

B. Reuse of Items and Materials: Carefully remove and store materials and equipment indicated to be reused to prevent damage, and reinstall as the work progresses.

C. District does not intend to salvage any item and materials of the buildings except stated above.

3.04 HAZARDOUS MATERIAL

A. Hazardous materials are identified in the report provided by the Distict.

B. The handling of asbestos and lead material is subject to all applicable local, state and federal mandates. Asbestos will be removed by a licensed abatement contractor. In the event that asbestos is discovered during demolition, the Contractor shall notify the District and the asbestos shall be removed by a licensed abatement contractor by contract or in accordance with the applicable provisions.

3.05 CLEAN UP

A. Daily Cleaning: Remove rubbish and debris from the site daily.

B. Debris and Rubbish: Transport and dispose of debris and rubbish in a manner that will comply with applicable regulations. Clean sidewalks, streets and private property of any debris caused by the demolition work.

C. Cleanup will include vacuuming and other cleaning methods for complete removal of all building debris and dust from the air and at all exposed surfaces.

D. Level and compact the sub grade after removing the demolished material. Sub grade must be free of any debris.

END OF SECTION

SECTION 03 1100

CONCRETE FORMING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: Furnish, install and remove forms for cast-in-place concrete including shoring and form supports.

B. Related Sections:
1. Section 03 2000 Concrete Reinforcing
2. Section 03 3000 Cast-in-Place Concrete
3. Section 03 3500 Concrete Finishing

1.02 REFERENCES

A. The following references, codes and standards are hereby made a part of this Section and formwork shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.
1. "Recommended Practice for Concrete Formwork", ACI 301,318 & 347 latest editions.
2. California Building Code 2016.

1.03 QUALITY ASSURANCE

A. Allowable Tolerances: Design, construct, set and maintain the formwork so as to insure complete work within the suggested tolerance limits specified in ACI 347-78, Section 3.3.1. See Concrete Finishing Section 03 35 00 for slab tolerances.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Earth Forms: Unless otherwise indicated or required by the Structural Drawings, concrete for footings may be placed directly against vertical excavated surfaces provided the material will stand without caving and provided that minimum reinforcing steel clearances indicated on Drawings are maintained and suitable provisions are taken to prevent raveling of top edges or sloughing of loose material from walls of excavation. Sides of excavation shall be made with a neat cut and the width made as detailed on Drawings. Concrete which is exposed to view on exterior shall be formed to a minimum depth of 0'-6" below finished grade.

B. Wood Forms:
1. Exposed Concrete Not Otherwise Noted or Specified: APA Plyform, Grade B-B, Class I or II (as per strength and tolerance requirements), Exterior Grade.
2. Unexposed Concrete Not Otherwise Specified: Of sufficient design and strength to hold concrete properly in place and alignment.
3. Framing: At Contractor option subject to meeting necessary strengths and surface tolerances.

C. Form Release Agents:
   1. Exposed Concrete Including Surfaces to Receive Paint and Other Coatings: Chemically active type producing water insoluble soaps. Form release agents shall be delivered in manufacturer's sealed and trademarked containers and shall be guaranteed to provide clean, stain-free concrete release and not to interfere with future applied coatings and finishes. Release agents shall contain no petroleum solvents such as creosote, paraffin, waxes or diesel oil.
   2. Unexposed Concrete: Contractor option except that release agents shall not interfere with bond of any applied finish.

D. Form Ties: Contractor option except that wire ties and wood spreaders are not allowed for exposed concrete. Wood spreaders shall not remain in concrete.

PART 3 - EXECUTION

3.01 PREPARATION

A. Vertical and Horizontal Controls: Establish and maintain necessary benchmarks, lines, or controls throughout construction.

B. Secure information and provide for openings, sleeves, chases, foundation vents, pipes, recesses, nailers, anchors, ties, inserts, and similar embedded items.
Coordinate with concrete work for requirements governing embedment and sleeving of pipes and conduit.

3.02 ERECTION

A. Formwork - General: Construct wood forms of sound lumber, straight and rigid, thoroughly braced, mortar tight, and of such strength that the pressure of concrete and the movement of workers and equipment will not displace them. Visible waves in exposed concrete surfaces after stripping of forms may result in rejection of that portion of the concrete. The design and engineering of formwork shall be the complete responsibility of the Contractor.

B. Plywood Forms for Exposed Concrete: Douglas fir plywood panels shall be clean, smooth, uniform in size, and free from damaged edges or faces (including holes other than those required for form ties). Make joints plumb. Block Douglas fir plywood edges which do not occur at bearing points in order to eliminate joint offsets.

C. Framing and Bracing: Framing, bracing and supporting members shall be of ample size and strength to safely carry, without excessive deflection (exceeding allowable tolerances), all dead and live loads to which formwork may be subjected, and shall be spaced sufficiently close to prevent any apparent bulging or sagging of forms.

D. Form Ties: Form ties shall be of sufficient strength and used in sufficient quantities to prevent spreading of the forms. Ties for exposed concrete surfaces shall be arranged symmetrically.

E. Arrange forms to allow proper erection sequence and to permit form removal without damage to concrete.

F. Form Release Agent: Thoroughly clean forms and coat with release agent prior to initial use and before each reuse. Apply release agent in strict accordance with manufacturer's directions and coverage recommendations avoiding starved areas or excessive applications. Apply release agents before reinforcing steel is placed.

G. Prior to placement of concrete, remove dirt, debris and foreign material from forms. Leave no wood in concrete except nailers or dividers.

H. Provide chamfer strips at all concrete edges; use 3/4 inch by 3/4 inch except as noted on drawings.

3.03 INSERTS, EMBEDDED PARTS AND OPENINGS:

A. Provide formed openings where required for work embedded in or passing through concrete.

B. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.04 FALSEWORK

A. Contractor shall be fully responsible for proper strength, safety and adequacy of falsework, supports and bearing surfaces therefor used on and in connection with the work. Falsework shall be designed to support imposed loads without deformation, deflection or settlement.

3.05 REMOVAL OF FORMS AND FALSEWORK

A. The removal of forms and falsework shall be carried out in such manner as to ensure the complete safety of the structure. Supports shall not be removed until members have sufficient strength to safely support their own weight and any superimposed loading with proper factor of safety.

B. After concrete is placed, the following minimum times shall elapse before the removal of forms:
1. Retaining walls: 21 days minimum.
2. Footings: 7 days minimum. If backfilled immediately, side forms may be removed 24 hours after concrete is placed.

C. Upon removal of forms, bolts, wires, clamps, rods, etc., not necessary to the work, shall be removed to a minimum of 1 inch from the surface. The Contractor shall so conduct his operations as to eliminate any danger of rust stains from form tie materials or other unprotected ferrous materials embedded in or adjacent to exposed concrete surfaces.

END OF SECTION

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SECTION 03 2000

CONCRETE REINFORCING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: Furnish and install reinforcing for cast-in-place concrete work.

B. Related Sections:
1. Section 03 1100 Concrete Forming
2. Section 03 3000 Cast-in-Place Concrete

1.02 REFERENCES

A. The following references, codes and standards are hereby made a part of this Section and all reinforcement shall conform to the applicable requirements therein except as otherwise specified herein or shown on the drawings. Nothing contained herein shall be construed as Permitting work that is contrary to code requirements.

B. American Concrete Institute, ACI:
1. ACI 301 – Specifications for Structural Concrete for Buildings.
2. ACI 315 – Details and Detailing of Concrete Reinforcement.

C. ANSI/AWS D1.4 – Structural Welding Code, Reinforcing Steel.

D. Concrete Reinforcing Steel Institute, CRSI:
1. CRSI – Manual of Standard Practice, 27th Edition.
2. CRSI –Placing Reinforcing Bars, 8th Edition.

E. American Society for Testing and Materials, ASTM:
1. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
2. ASTM A706 – Standard Specification for Low-alloy Steel Deformed Bars for Concrete Reinforcement.

F. California Building code (CBC 2016).

1.03 SUBMITTALS

A. Comply with requirements of Section 01 3300, Submittals.

B. Shop Drawings:
1. Fully detailed shop drawings, including bending schedules and bending diagrams, shall be submitted to the Engineer for review. Shop drawings shall show placing details and size and location of all reinforcing steel.
2. Shop drawing shall be of such detail and completeness that all fabrication and placement at the site can be accomplished without the use of project or contract drawings for reference.
3. Contractor shall check civil, landscape, architectural, structural, mechanical, plumbing, electrical and fire protection project or contract drawings for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, and any other items which are required to be cast in concrete, and shall make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

4. Reinforcing steel shall not be fabricated or placed before the shop drawings have been reviewed by the Architect and returned to the Contractor. Review of shop drawings by the Architect will not relieve the Contractor of responsibility for errors or for failure in accuracy and complete placing of the work.

C. Mill Test Reports: Certified mill test reports (tensile and bending) for each heat or melt of steel shall be submitted to the Architect before delivery of any material to the site. (See requirements above under "Source Quality Control".) Where reinforcing is required to be welded, mill test reports shall verify the weldability of the steel.

1.04 QUALITY ASSURANCE

A. Where certified mill test reports (required hereinafter under "Submittals") are not furnished, conform to the following:
1. Reinforcing bars shall be tested in tension and bending as per ASTM A 615. Testing shall be done by the Contractor's independent testing agency. Furnish one copy of test reports to Architect, Structural Engineer, Owner and Contractor.
2. Samples will be taken from bundles as delivered from the mill by the testing agency. Where bundles are identified by a heat number and a mill analysis accompanies to report, one tensile and one bending test specimen will be taken from each 10 tons or fraction thereof, of each size and kind of bar. Where positive identification of heat numbers cannot be made or where random samples are taken, one series of tests shall be made from each 2-1/2 tons or fraction thereof, of each size and kind of bar.
3. The cost of tests, sampling and handling of reinforcing steel shall be paid by the Contractor.
4. Include all material required to provide samples for testing.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcing to site properly bundled and tagged, and stored so as to prevent excessive rusting or fouling with grease or any coating that will interfere with bond. Segregate so as to maintain identification after bundles are broken. Do not use damaged, reworked, or deteriorated material.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing Bars:
1. New, free of loose rust.
2. Billet Steel Bars: ASTM A 615, including supplementary requirements S1. Grade 60 for all bars. Weldable (ASTM A706) where indicated or required.

B. Welded Wire Fabric: As indicated on drawings.
C. Tie Wire: #16 minimum, black and annealed
D. Reinforcement Splice Couplers: For use only where specified on the drawings. Submit other locations proposed for use to the Engineer for review. “L-series Bar Lock” Coupler Systems for Splicing Reinforcement Bars, ESR-2495, by Dayton-Superior Corporation.
E. Accessories: Metal or plastic spacers, supports, ties, etc., as required for spacing, assembling, and supporting reinforcing in place. Legs of accessories to be of type that will rest on forms without embedding into forms. Galvanize metal items where exposed to moisture, or use approved other non-corrodible, non-staining supports.

2.02 FABRICATION

A. Comply with details on Drawings.

B. Where specific details are not shown or noted, do all detailing and fabrication in conformance with, or superior to, requirements contained in the References, Codes and Standards Article and ACI 315.

C. Clean bars of loose rust, loose mill scale and any substance which may decrease bond. Bend bars cold and accurately to details on reviewed shop drawings.

D. Shop fabricate all reinforcement.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Reinforcing steel shall be placed in accord with the Drawings and viewed shop drawings and the applicable requirements of the References, Codes and Standards Article. Install reinforcement accurately and secure against movement, particularly under the weight of workmen and the placement of concrete.

B. Reinforcement Supports:
1. Reinforcement shall be accurately located in the forms and held in place by means of supports adequate to prevent displacement and to maintain reinforcement at proper distance from form face. Supports and their placement shall comply with CRSI "Placing Reinforcing Bars". The use of wood supports and spacers inside the forms is not permitted except as noted in Concrete Forms Section.
2. Support reinforcement for on-grade slabs by wiring to precast concrete blocks spaced 3'-0" o.c. (maximum) both ways, staggered. Size blocks so that reinforcing is maintained at the elevation shown in design drawings.

C. Obstructions: Wherever conduit, piping, inserts, sleeves, etc., interfere with placing of reinforcing steel, obtain approval of method of procedure before any concrete is placed. Bending of bars around openings or sleeves is not permitted.

D. Tying: All reinforcing shall be rigidly and securely tied with steel tie wire at all splices and at all crossing points and intersections in the position shown. All tie wires, after cutting, shall be bent in such a manner that concrete placement will not force the wire ends to surface of exposed concrete.

E. Dowels: Dowels shall be tied securely in place before concrete is deposited. In the event there are no bars in position to which dowels may be tied, No. 3 bars (minimum) shall be added to provide proper support and anchorage. Bending of dowels after placement of concrete will not be permitted.

F. A minimum class B lap splice as defined by ACI 318 is required for all cases not otherwise shown on Drawings. Stagger splices wherever possible.

G. Reinforcement Couplers: Install at all locations indicated and may be used as an alternate to lap splices in general. Install couplers in accordance with manufacturer's recommendations.

H. Welding: Do all welding by Cadweld T series for bars #10 and larger or as noted on Drawings. No welding of reinforcing steel or of attachments to reinforcing steel will be permitted unless the chemistry of the steel conforms to AWS D12.1 and is so established by the mill certificates. If welding is to be done, all welds shall be approved by the Structural Engineer and all welding shall comply with requirements and procedures established by AWS D12.1. All welding material, wire cuttings, and tramp metal shall be thoroughly cleaned from forms for exposed concrete before any concrete is placed.

I. Minimum covers for reinforcement:
   1. As shown on drawings.

J. Lap or spliced bars shall be a minimum of 48 bar diameters in concrete, but never less than 24" or as noted on design drawings.

3.02 CLEANING

A. Reinforcement, at time of placing concrete, shall be free of any coating that would impair bond.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Furnish and install cast-in-place concrete required for the project as shown on the Drawings and specified herein. This Section also includes:
   1. Concrete for work specified in Mechanical and Electrical Divisions unless specifically included therein.
   2. Grouting of bases and equipment not specified under other Sections.
   3. Coordination with other trades with regard to requirements for special bases, sleeves, chases, inserts, finishes or provisions, of any nature.
   4. Curing of formed concrete surfaces.
   5. Installation of anchor bolts, hangers, anchors, plates, inserts and miscellaneous metal or other materials embedded in concrete and which are furnished by other trades.
   6. Filling slab blockouts for columns.

B. Related Work Specified Elsewhere:
   1. Section 03 1100, Concrete Forming (including erection, stripping and removal).
   2. Section 03 2000, Concrete Reinforcing.
   3. Section 03 3500, Concrete Finishing: Finish for concrete surfaces including patching and curing of concrete, except curing of formed concrete.
   4. Division 26, Electrical: Duct encasement for underground electrical service lines, if required.
   5. Division 31 Earthwork: Aggregate base for slabs on grade.

1.02 REFERENCES

A. The following references, codes and standards are hereby made a part of this Section and concrete work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.

B. "Building Code Requirements for Reinforced Concrete", ACI 318, 2014 Edition.

C. California Building Code, CBC 2016.

1.03 QUALITY ASSURANCE

A. Tests and inspections shall be performed by qualified individuals, engineering companies or testing laboratories who shall perform those special inspections required by CBC, those tests and inspections specified below and such other tests and inspections as the Architect or Owner may require to establish the acceptability of the work.

B. Testing and inspection services shall be retained by the Owner at his expense except that when tests or inspections reveal failure of materials to meet the contract requirements, costs for subsequent tests and inspections will be deducted from monies due the Contractor. Excessive inspection time required by Contractor's failure to provide sufficient workmen or to properly pursue the progress of the work shall likewise be deducted.

C. Furnish material and handling for test cylinders and any other samples which testing

agency requires for analysis of concrete work.

D. Compression Tests: 3 compression test cylinders as per ASTM C 31. One cylinder will be broken at 7 days; one at 28 days; and one cylinder retained as a spare. Cylinders will be numbered in sets (1A, 1B, 1C; 2A, 2B, 2C; etc.) and a record kept of extent of pour represented by each set and type of concrete tested. Cylinders will be broken in accordance with ASTM C 39. If any test report indicates 28-day specimen below required strength (within standard of acceptability established by ACI 318), and if required by Architect, testing agency will take test cores of hardened concrete in accordance with ASTM C 42. Such concrete shown to be defective shall be removed and replaced. Cost of core tests, repairs and removal and replacement of defective concrete shall be paid by Contractor.

E. One (1) additional test cylinder: taken during cold weather concreting and cured on job site under same conditions as concrete it represents.

F. One (1) slump test: taken for each set of test cylinders taken.

G. Testing agencies will supervise preparation and selection of samples taken at job site.

H. The following is subject to Special Inspection as per CBC. Costs therefore will be paid by the Owner.
   1. Taking of compression test specimens.
   2. Placement of reinforced structural concrete.

1.04 SUBMITTALS

A. The General Contractor shall submit for review prior to fabrication.

B. Limitation of Review: Structural Engineers review will be for general conformance with the design intent as indicated in the Contract Documents and does not relieve contractor of full responsibility for conformance with the Contact Documents.

C. Product Data: Submit manufacturers' data on manufactured products and other concrete related materials such as bond breakers, cure/sealer, admixtures, etc. Demonstrate compliance with specified characteristics. Provide samples of items upon request. Submit material certificates for concrete aggregates and cementitious materials. Certificates shall show compliance to applicable ASTM’s, the CBC, and additional requirements stated herein.

D. Mix Designs: Submit Mix Designs for each structural concrete type required for work per requirements of articles MIXES and QUALITY ASSURANCE. Resubmit revised designs for review if original designs are adjusted or changed for any reason. Non-Structural mixes need not be submitted for review by Structural Engineer.

E. Shop Drawings: Proposed location of construction and cold joints. Proposed location of all slab construction/dowel joints, control joints, and blockouts.

F. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.

G. Batch Plant Certificates: Include with delivery of each load of concrete. Provide Certificates to the Testing Agency and the Architect/Engineer as separate submittals. Concrete delivered to the site without such certificate shall be rejected and returned to the plant.

H. Engineering Analysis: Prepared by a California-licensed Civil or Structural Engineer, justifying construction-imposed loads on slabs, beams, and walls which exceed those allowed by CBC for the specified use.
   1. 2000 lbs maximum allowable construction load without analysis.
   2. 10,000 lbs maximum allowable construction load with analysis.

I. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 PROJECT CONDITIONS

A. Cold Weather Requirements: Comply with "Recommended Practice for Cold Weather Concreting", ACI 306R, latest edition.

B. Hot Weather Requirements: Comply with "Recommended Practice for Hot Weather Concreting", ACI 305R, latest edition.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: ASTM C 150, Type I or II, Portland Type. Cement shall be of same brand, type and source throughout project. Where aggregates are potentially reactive, use low alkali cement.

B. Aggregates: ASTM C 33 and C 88 from sources with proven history of successful use. Source shall be constant unless 10 days' prior notice is given for approval after recheck of mix design.
   1. Fine Aggregate: Natural sand with sand equivalent of not less than 75 when tested as per Test Method Calif. 217-E.
   2. Coarse Aggregate: Fine grade, sound crushed stone, natural gravel or granite with cleanness value not less than 75 when tested as per Test Method Calif. 227.

C. Water: Clean and potable, free from impurities detrimental to concrete.

D. Admixtures: Air Entrainment Admixtures: ASTM C R60.

E. Expansion Joint Fillers (On-Grade Slabs, Walks, Curbs, Gutters and Similar Flatwork Where Joints Are Not Otherwise Noted or Specified): ASTM D 994-71, asphaltic compound strips, 1/4" thick unless otherwise noted, precut to proper size.

F. Non-Shrink Grout (Metallic): Master Builders "Embeco 636", Sonneborn-Contech "Ferrolith G", or approved equal, premixed metallic grout.

G. Non-Shrink Grout (Non-Metallic): Sauereisen No. F-100, Sonneborn Contech "Fondag", Upco "Upcon", 5-Star, Master Builders "Masterflow 713", or approved equal, nonmetallic, nonstaining, premixed grout having a compressive strength at 28 days of not less than 6800 psi.

H. Curing Compounds: Comply with the requirements of Concrete Finishes Section 33 3500.

I. Bonding Agent: ASTM C881, Type II Grade 2 Class B or C. Do not allow epoxy to set before placing fresh concrete.
   1. “MasterEmaco ADH 326” (formerly “Concresive Liquid LPL”) by BASF;
   2. “Rezi-Weld 1000” by W.R. Meadows.

J. Chemical Hardener: Fluorosilicate solution designed for densification of cured concrete slabs “MasterKure HD 310 WB” (formerly “Lapidolith”) by BASF, "LIQUI-HARD" W.R. Meadows Co, or equal.

K. Fly Ash: Fly ash which may be used to reduce cement content shall conform to ASTM C618, Class F. Fly ash may replace up to 15 percent of cement. Submit mix design and test reports verifying compliance.

2.02 MIXES

A. Mix and deliver concrete in accordance with ASTM C94 Alternative 4.

B. Provide concrete in the following strength:
1. 4000 psi (28 days) normal weight (145 pcf) concrete for spread footings, grade beams, and retaining walls.
2. 4000 psi normal weight (145 pcf) concrete for slab on grade.
3. 4000 PSI (28 Day) Normal Weight (145 PCF) for concrete equipment pad and curbs.
4. 4000 psi (28 day) normal weight 145 plf for miscellaneous concrete.

C. Select admixture proportions for normal weight concrete in accordance with ACI 318.

D. The water/cement ratio for concrete slabs/mats should be in the range of 0.45 to 0.50.

E. Add air entraining agent to concrete mix for work exposed to exterior.

F. Mix designs for concrete shall be Contractor-designed at his expense. Designs shall be prepared by a qualified agency approved by the Engineer. Proposed mix designs shall be submitted for Engineer's review prior to placing any concrete and shall indicate completely, brands, types and quantities of admixtures included. If concrete is to be placed by pumping, recommendations of ACI Committee 304 shall be followed and mix designs must include strengths and slumps. Concrete mix design shall be per Section 1905A.1 of CBC 2016.

PART 3 - EXECUTION

3.01 MIXING

A. Concrete shall be ready mixed as per ASTM C 94. Equipment shall be adequate for the purpose and kept in good mechanical condition at all times.

3.02 PLACING

A. Absorbent forms shall be thoroughly wetted before concrete is placed. Aggregate base for slabs on grade shall be moist but not saturated when concrete is placed.

B. Placing of concrete shall be done immediately after mixing. No concrete shall be placed or used after it has begun to set and no retempering will be allowed. The method used in placing shall be such that concrete is conveyed to place and deposited without separation of the ingredients. No concrete shall be placed with a free unconfined fall in excess of five (5) feet nor shall it be allowed to cascade through reinforcing steel in such manner as to promote segregation. Do not support runways on reinforcing steel.

C. Splash or accumulations of hardened or partially hardened concrete shall be removed. Contact faces of forms for exposed concrete shall be protected from splash during

placing of adjacent concrete. Concrete containing piping shall be placed in a manner that will prevent damage to pipes.

D. Deposit concrete in approximate horizontal layers not exceeding 18" in thickness, unless otherwise authorized. Placing of concrete shall be carried on in a continuous operation without interruption until placing of course, section, panel or monolith is completed.

E. Distribution of concrete shall be even and continuous and no pour joints shall show. Before a pour is started, make certain that adequate equipment, men and concrete will be available to pour in cycles which will permit proper and thorough integration of each layer of concrete. Upon stopping off a pour, the top surface shall be on a level. Points of deposit in walls shall be so spaced that it will not be necessary for concrete to flow laterally more than 24 inches.

F. No concrete shall be placed for any element until reinforcing for same is fastened in place nor until forms are complete. No concrete shall be placed before work that is to be embedded has been set. Notify other crafts so they may deliver anchors, inserts, etc., or other work to be embedded in ample time and also notify them when their assistance in setting is required. Reinforcing or other materials that have been set in place shall not be disturbed.

G. No pipes- except electrical conduits 1-1/4" and less in diameter shall be embedded in structural concrete. Before placing concrete, pipes and large conduits shall be sleeved providing 1/4" clearance (min.) all around Sleeves shall be positioned so as not to impair strength of surrounding elements. Sleeves and inserts will be provided and set under other sections of the work.

H. Remove debris, mud and water from places to receive concrete.

I. Install various inserts, anchorages, etc., required by public and private utility companies to accommodate miscellaneous metal items and equipment furnished by them.

J. Concrete splash and/or grout shall be removed from surfaces that will receive painter's finish.

K. Place no concrete in water unless written permission has been obtained from Structural Engineer.

L. Maintain continuous and accurate log of placing of concrete in structure.

M. Notify Architect 48 hours minimum prior to placing of any concrete.

N. Provide formed openings where required for work passing through or embedded in concrete members.

O. Place concrete continuously between expansion joints, control joints, and construction joints.

3.03 VIBRATION AND COMPACTION

A. Concrete shall be thoroughly compacted by means of internal mechanical vibrators. Such compaction shall be produced as will be obtained by placing the vibrator directly in concrete at 18"-30" intervals for a period of approximately 5 to 15 seconds and withdrawing slowly or as directed, depending on the consistency of concrete. One vibrator will be required for each location where simultaneous placing takes place, to ensure thorough vibrating of all sections. Provide sufficient spare vibrators on the job so as to have them readily available in case any vibrator in use should suddenly cease to

function properly. Where spare vibrators are employed, provide additional spares. Under no condition shall vibrator be placed against reinforcing steel or attached to forms. Use no vibrators to transport material.

B. Special care shall be taken to prevent voids under column baseplates; especially at keyway blockouts for shear lugs. Provide pour holes in anchor bolt templates as required.

C. Vibrator shall be of the flexible immersion type having a frequency of not less than 7,000 rpm.

D. Voids and rock pockets shall be eliminated.

3.04 CONSTRUCTION JOINTS

A. Placement of construction joints and the manner in which they are provided for shall be only as approved by Architect or as shown on the Drawings. Construction joints shall be as few as possible and will not be permitted simply to save forms. Submit shop drawings of construction joints showing proposed locations and details. Submit to Architect prior to forming or placing concrete.

B. Under no condition will construction joints be permitted in exposed concrete surfaces other than where specifically shown and specified.

C. Construction joints including keys shall be cleaned and roughened by removing entire surface and exposing clean aggregate solidly embedded by means of sandblasting or other approved methods. Forms and reinforcing shall be cleaned of drippings, debris, etc. Just before starting of new pour, horizontal surfaces shall be covered with 1/2"-1" thickness of grout composed of cement and fine aggregate of the same proportion as that used in concrete work, but omitting the 1-1/2" aggregate where 1-1/2" is the maximum size, or 1/2 of the 3/4" aggregate where 3/4" is the maximum size. Proportions will be determined by the testing agency.

3.05 CURING

A. Formed Concrete: Keep formed concrete surfaces continuously wet both in forms and after removal of forms for at least seven (7) days after placing. Wood forms shall be kept wet. If forms are permitted to be removed prior to expiration of curing period, exposed concrete surfaces shall be kept continuously wet. Application of curing compounds shall conform to requirements of Concrete Finishes Section.

3.06 EQUIPMENT BASES

A. Verify sizes and shapes required by items specified elsewhere. Concrete bases for special equipment shall be installed in strict accord with Drawing details and the specifications and recommendations of the equipment manufacturer.

3.07 EXPANSION JOINT FILLERS

A. Asphaltic Filler Joints: Place filler material so that top of surface is level and aligned uniformly 1/4" below adjacent concrete surface. Provide where slabs abut vertical surfaces, at not over 24 ft. centers horizontally in paving and at other locations so noted on Drawings. Follow Drawings for pattern where indicated; where not indicated, coordinate locations with Architect before proceeding.

3.08 GROUTING

A. Grout shall be metallic or non-metallic, non-shrink grout mixed and applied in strict accordance with manufacturer's directions, except use non-metallic only where grouting is exposed in the finished work.

3.09 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required lines, details and elevations, as directed by Architect.

END OF SECTION

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SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 – GENERAL

1.01 SUMMARY

A. Structural Steel as indicated on Structural Drawings. This section also includes anchor bolts.

1.02 REFERENCES

A. Comply with applicable provisions of the following; latest editions unless otherwise specified.
   1. American Institute of Steel Construction, AISC:
      a. 341-10, Seismic Provisions for Structural Steel Buildings..
      b. 358-10, Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications.
      c. 360-10, Specification for Structural Steel Buildings.
      d. Code of Standard Practice for Steel Buildings and Bridges. Delete the following sentence from paragraph 4.2.1: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings."
   2. American Welding Society, AWS: D1.8-09, Structural Welding Code: Steel, 2009 Edition.
   3. Research Council on Riveted and Bolted Structural Joints: Specifications for Structural Joints using ASTM A-325 or A-490 Bolts.
   4. California Building Code, CBC, 2016 Edition with Amendments.
   5. Steel Structure Painting Council, SSPC: Surface Preparation Specifications.

1.03 SUBMITTALS

A. Conform with requirements of Section 01 3300, Submittals.

B. Shop Drawings: Show fabrication, assembly, and erection details, sizes of members, fastenings, supports and anchors, patterns, clearances, and necessary connections to work of other trades. Obtain approval before beginning fabrication of delivery.

C. Certifications:
   1. Steel: Furnish certified mill analyses and test reports establishing conformity to this specification for each heat prior to fabrication. Include names and locations of mills and shops, and chemical analysis and physical properties of steel.
   2. High Strength Bolts: Furnish certified test reports for each lot of bolts in accordance with ASTM F3125.
   3. Paint Products: Furnish certificates of compliance from the paint manufacturer attesting that paint products meet the requirements of this specification.
   4. Welders: Furnish copies of welders certification.

D. Submit Welding Procedure Specifications.

1.04 QUALITY ASSURANCE

A. Testing Agency: An inspection and testing agency shall be retained by the Owner for testing and inspection as required by drawings and specifications. Selected agency will follow requirements of ASTM E329, “Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction”.

B. Tests and inspections shall be performed and paid for in accordance with requirements of Division 01.

C. Materials and work shall be subject to inspection at mill, fabricating plant, and building site. Material or workmanship not complying fully with drawings and specifications will not be accepted. Give laboratory reasonable notice when ready for inspection. No additional compensation will be paid for any work required to prepare for testing and inspection.

PART 2 - PRODUCTS

2.01 MATERIALS

A. In general, material shall be of exact sizes, shapes, weight, and kinds provided for on drawings and specifications. However, with written permission of Architect & DSA, members built up from plates may be substituted for rolled shapes, at no additional cost to Owner, provided physical properties of original member such as section modulus, moment of inertia, etc., are met, and provided welding inspection costs associated with substitute built-up member are furnished at no additional cost to Owner.

B. W Shapes: ASTM A992 Grade 50

C. Other Structural Steel, Plates, Shapes and Bars: Conforming to ASTM A36.

D. High Strength Bolts, Nuts and Washers ASTM F3125, Grade A325, ASTM A563 and ASTM F436 Respectively.

E. Machine Bolts: ASTM A307.

F. Arc-Welding Electrodes not part of the SLRS: Conforming to AWS D1.1 for filler metal requirements, and recommended by their manufacturers for position and other conditions of actual use.

G. Arc-Welding Electrodes part of the SLRS:
1. Non Demand Critical Welds: shall conform to AWS D1.8.
2. Demand Critical Welds: shall conform to AWS D1.8 DC.

H. Hollow Structural Steel (HSS): Cold formed, ASTM A500 Grade B.

I. Shear Connectors: ASTM A108. Grades 1015 thru 1020,Headed Stud Type Cold Finished, carbon steel; AWS D1.1/D1.1M, Type B

J. Paint: SSPC PS 2.03 or Federal Specification TT-P-86, Type II, (Tnemec #99).

K. Galvanizing: Hot dip process; ASTM A123, to average weight of 2.3 oz./sq/ft. and minimum weight of 2.0 oz.

2.02 FABRICATION

A. Structural Steel Fabrication: Comply with AISC “Specification for Structural Steel Buildings”, latest edition.

B. Drill or punch holes for bolts. Do not make or enlarge holes by burning.

C. Shop Connections: Made by bolting or welding, as detailed on drawings. If type of fasteners are not shown, use HS-A325 with washers.

D. Welding, Shop and Field: Weld by shielded arc method, submerged arc method, flux cored arc method, or other method approved by AWS. Perform welding in accordance with AWS Code. All welders, both manual and automatic, must be certified in accordance with AWS “Standard Qualification Procedure: for the work to be done. See paragraph “Welding” herein, for detailed requirements. If sizes of fillet welds are not shown on drawings, use AWS minimum weld size but not less than 3/16 inch fillet welds.

E. Shear Connectors: Prepare steal surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1 and manufacturers written instructions.

F. High Strength Bolts: Install in accordance with requirements of ASTM A3125. Connection shall be with threads excluded from the shear plane. If slip critical, indicate as SC and provide surface prep classification & requirements per RCSC specifications.

G. Prior to fabrication, straighten all material by methods which will not injure material. Prior to assembling component parts of a connection, thoroughly clean all contact surfaces of loose scale, rust, burrs, etc., and remove local twists and bends.

H. Surface Preparation:
   1. After fabrication, inspection, and acceptance; and before leaving shop, clean all steelwork to be encased in concrete or spray fireproofing by hand wire brushing, or by other means, elected by the fabricator, of loose mill scale, rust, weld slag or flux deposit, dirt and foreign matter in accordance with SSPC-SP-2. Remove oil and grease deposits by solvents.
   2. Steelwork to be left exposed and which will be painted shall be cleaned by blast cleaning in accordance with SSPC-SP-7. Remove oil and grease deposits by solvent, SSPC-SP-1.
   3. Clean and grind all areas subject to ultrasonic or radiographic inspection.
   4. Surfaces within two inches of any field weld location shall be free of materials that would prevent proper welding or produce objectionable fumes while welding is being done.

2.03 FINISHES

A. Shop prime paint any structural steel which will NOT be encased in concrete, covered with sprayed fireproofing or plaster, or receive composite beam welded studs, or specifically noted, with one coat of specified primer. Include all parts of braces, brackets, and similar items. Do not shop prime surfaces to be galvanized, machined surfaces, contact surfaces, and edges and surface areas adjacent to field welds. Apply two coats to parts inaccessible after assembly or erection.

B. Exterior Ferrous Metal and Interior Ferrous Metal Exposed to Continuing Moisture: Grind welds, burrs, and rough surfaces smooth after fabrication. Hot-dip galvanize completed assembly and provide one coat of shop prime paint.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Erect structural steel with proper equipment and qualified riggers.

B. Actively cooperate with other trades and provide incidental welding, connections, etc. for securement of work of others to structural steel framing.

C. Erect temporary flooring, planking, and scaffolding necessary in connection with erection of structural steel or support of erection machinery. Use of temporary floors shall be as required by municipal or state laws and governing safety regulations.

D. After erection, clean connections and abrasions to shop coat and spot paint with same primer used in shop.

3.02 ERECTION TOLERANCES

A. Erection tolerances for structural steel work shall be in accordance with latest AISC "Code of Standard Practice for Steel Buildings and Bridges".

3.03 BOLTING

A. High strength steel bolts shall be used where indicated. Fabrication and erection shall be in strict accordance with the latest edition of "Specifications for Assembly of Structural Joints Using High-Strength Steel Bolts", as approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation. Load indicator washers, or equivalent means of determining required tension, shall be used. Use beveled washers on sloping surfaces.

3.04 WELDING

A. Welding and welded joints shall be in accordance with AWS standards. Work shall be performed by operators who have been qualified by test in accordance with AWS D1.1, "Structural Welding Code – Steel", to perform type of work required for this project.

B. All methods, sequence, qualifications and procedures, including preheating, postheating, etc. shall be detailed in writing and submitted to Architect for review by the testing laboratory. Provisions shall be made in detailing of lengths of members for dimensional changes as a result of shrinkage stresses so as to provide specified finished dimensions.

C. Remove all runoff tabs, and bottom backing bars. Top backup bars to be removed or have continuous fillet weld to column.

3.05 ANCHOR BOLTS

A. Provide at site, for others to install, all anchor bolts, bearing plates, and templates to be embedded in concrete.

B. Provide necessary steel templates and diagrams for setting and securing of such anchor bolts in concrete forms. For large templates, provide pour holes to facilitate concrete consolidation below as required.

C. Be jointly responsible with others for proper locating and installing, and make good any deficiencies and errors.

D. Setting of anchor bolts in hardened concrete necessitates drilled holes solidly grouted in

place with epoxy grout. Submit materials and methods for review and approval.

END OF SECTION

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SECTION 07 1300

SHEET WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes
   1. Vertical application of sheet waterproofing at retaining walls and elevator pits.
   2. Vertical application of sheet waterproofing at metal composite panel columns.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

C. Related Sections
   1. Section 03 3000, Cast-In-Place Concrete: Provision of cast-in-place concrete.
   2. Section 07 4243, Metal Composite Panels
   3. Section 09 2900, Gypsum Board

1.02 REFERENCES

A. ASTM - American Society for Testing and Materials
   1. C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
   2. C836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
   3. D146 - Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing.
   4. D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
   5. D570 - Standard Test Method for Water Absorption of Plastics.
   6. D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting
   7. D4258 - Standard Practice for Surface Cleaning Concrete for Coating.
   8. D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
   9. D5385 - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.
   10. E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data, including manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is licensed or approved by waterproofing manufacturer as qualified to install manufacturer's waterproofing.

1.05 DELIVERY, STORAGE AND HANDLING

A. Acceptance at Site: Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture and directions for storage.

B. Storage and Protection
   1. Store materials in their original undamaged packages in clean, dry protected location and within temperature range required by waterproofing manufacturer.
   2. Protect stored materials from direct sunlight.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Apply waterproofing within range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
   1. Do not apply waterproofing in rain, fog, or mist.
   2. Do not exceed 30 days of UV exposure.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.07 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the District of other rights the District may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty signed by waterproofing manufacturer and installer agreeing to repair or replace waterproofing that does not meet requirements or that does not remain watertight during the specified warranty period.
   1. Warranty Period: 5 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers
   1. Grace Construction Products, “Bituthene 4000”, or approved equal for vertical application of sheet waterproofing at retaining walls and elevator pits.
   2. HardieWrap Weather Barrier or approved equal for vertical application of drainable weather barrier at metal composite panel columns (also referred as accent columns).

2.02 MATERIALS

A. Vertical Sheet Waterproofing: Self-adhering rubberized-asphalt composite sheet, 60-mil thick self-adhering sheet, consisting of 56 mils of rubberized asphalt laminated to a 4-mil thick polyethylene film, with release liner on adhesive side.
   1. Sheet Type: Composite sheet formulated for low temperature use when ambient and substrate temperatures range between 25 and 40 degrees Fahrenheit.
   2. Physical Properties
      a. Tensile Strength: 250 psi minimum; ASTM D412, Die C, modified.
      b. Ultimate Elongation: 300 percent minimum; ASTM D412, Die C, modified.
      c. Pliability: No cracks when bent 180 degrees over a 1 inch mandrel at minus 25 degrees Fahrenheit; ASTM D146.
      d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C836.

e. Puncture Resistance: 40 lbf minimum; ASTM E154.
f. Hydrostatic-Head Resistance: 150 feet minimum; ASTM D5385.
g. Water Absorption: 0.15 percent weight-gain maximum after 48 hour immersion at 70 degrees Fahrenheit; ASTM D570.

B. Vertical Drainable Weather Barrier: ASTM E1677; made from polyolefin fibers by HardieWrap as a coated external housewrap.
1. Composition: components of construction include epolymer, additives and ink.
2. Handling and Storage: keep away from heat, sources of ignition or incompatible materials and store in cool , dry and well ventilated space.
3. Physical Properties and Chemical Properties
a. Appearance and odor: White coated fabric with green ink and no oder.
b. Stability: stable under normal conditions of use, avoid high temperatures.

2.03 AUXILIARY MATERIALS

A. Primer: Liquid primer recommended by manufacturer of sheet waterproofing material for substrate.

B. Sheet Flashing: Sheet flashing of same material, construction, and thickness as sheet waterproofing.

C. Penetration Seal: Self-adhering reinforced membrane, 2-1/2 inches wide, with a tack-free protective adhesive coating on 1 side and a release film on self-adhering side.

D. Waterproofing and Sheet Flashing Accessories: Provide sealants, pourable sealers, cone and vent flashings, inside and outside corner flashings, termination reglets, discs, and other accessories recommended by waterproofing manufacturer for intended use.

E. Protection Course at Vertical Application: Extruded-polystyrene board insulation, unfaced, ASTM C578 Type X, 1/2-inch thick, as manufactured by Owens Corning, “Foamular Half-Inch”, or approved equal.

F. Tape
1. At Waterproofing: 2 sided, self-adhesive tape for adhering drainage sheets and protection board to waterproof membrane, as manufactured by Grace Construction Products, “Bitustik Tape”, or approved equal.
2. At Weather Barrier: Seam tape as recommended by weather barrier manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions under which waterproofing systems will be applied, with installer present, for compliance with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.
1. Do not proceed with installation until after minimum concrete curing period recommended by waterproofing manufacturer.
2. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
3. Notify the Architect in writing of anticipated problems using waterproofing over substrate.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Remove grease, oil, bitumen, form release agents, paints, and other penetrating contaminants from concrete.

C. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

D. Prepare, fill, prime, and treat joints and cracks in substrate. Remove dust and dirt from joints and cracks according to ASTM D4258.

E. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions.

3.03 SELF-ADHERING COMPOSITE SHEET APPLICATION - WATERPROOFING

A. General: Install self-adhering composite sheet according to waterproofing manufacturer's written instructions.

B. Apply primer to substrate at required rate and allow to dry. Limit priming to areas that will be covered by waterproofing membrane in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheet membrane over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2 inch minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 degrees Fahrenheit, install manufacturer's standard, low-temperature, rubberized-asphalt composite sheet.

D. Apply continuous sheet membrane over membrane strips bridging each type of joint to dimensions indicated or required by manufacturer.

E. Seal exposed edges of membrane terminations not concealed by metal counter flashings or ending in reglets with mastic or sealant.

F. Install sheet membrane and auxiliary materials to tie in adjacent waterproofing.

G. Repair tears, voids, and lapped seams in waterproofing not meeting requirements. Slit and flatten fishmouths and blisters. Patch with sheet membrane extending 6 inches beyond repaired areas in all directions. Comply with manufacturer's requirements.

H. Install protection course with butted joints over waterproofing membrane where indicated before starting subsequent construction operations.

3.04 DRAINABLE WEATHER BARRIER APPLICATION

A. General: Install drainable weather barrier according to manufacturer's written instructions.

B. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

C. Apply wrap with grooved surface pattern in vertical direction.

D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with grooved surface pattern in vertical position. Maintain weather barrier plumb and level.

E. Extend bottom roll edge over sill plate 2 in. to 3 in. Seal weather barrier with sealant or tape. Shingle weather barrier over back edge of weep screed. Seal weather barrier with sealant or tap to weep screed. Ensure weeps are not blocked.

F. Subsequent layers shall overlap layers a minimum of 6 in. horizontally in a shingling manner.

G. Window and Door Openings, where occurs: Extend weather barrier completely over openings.

H. Weather Barrier Attachment: Attach weather barrier to studs through exterior sheathing. Secure weather barrier manufacturer recommended fasteners, space 12-18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

I. Apply 4 inch by 7 inch piece of DuPont StraightFlash or weather Barrier manufacturer approved alternate to weather barrier membrane prior to the installation cladding anchors.

3.05 PROTECTING AND CLEANING

A. Protect waterproofing from damage and wear during application and remainder of construction period according to manufacturer's written instructions.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

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SECTION 07 2100

THERMAL INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included:
1. Provide glass fiber thermal insulation for exterior walls as indicated.

1.02 DELIVERY, STORAGE AND HANDLING:

A. Deliver insulation materials in labeled packages bearing manufacturer's name, 'R' value and fiber material.

B. Store all materials on the site in a dry area protected from the weather and moisture before, during and after installation.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM))

1. E84 Test Method for Surface Burning Characteristics of Building Materials.
2. E 96 Test Method for Water Vapor Transmission of Materials.
3. E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
4. C 177 Test Method for Steady-State Thermal Transmission Properties by means of the Guarded Hot Plate.
5. C 423 Test Method for Sound Absorption and the Sound Absorption Coefficient by the Reverberation Room Method.
6. C 518 Test Method for Steady-State Thermal Transmission Properties by means of the Heat Flow Meter.
7. C 553 Standard Specifications for Mineral Fiber Blanket and Felt Insulations.
8. C 612 Standard Specifications for Mineral Fiber Block and Board Thermal Insulation.
9. C 665 Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

B. Related Sections:
1. Section 09 2900 Gypsum Board.
2. Section 07 2110 Acoustical Insulation.
3. Section 08 1113 Hollow Metal Doors and Frames.

1.04 DELIVERY, STORAGE AND HANDLING:

A. Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer’s recommendations for handling, storage and protection during installation.

B. Label insulation packages to include material name, production date and/or product code.

1.05 SUBMITTALS:

A. Comply with pertinent provisions or Submittal Section 01 33 00.

106 LIMITATIONS:

A. Do not use unfaced insulation in exposed applications where there is potential for skin contact and irritation.

B. Kraft and standard foil facings will burn and must not be left exposed. The facing must be installed in substantial contact with the unexposed surface of the ceiling, wall or floor finish. Protect facing from any open flame or heat source.

PART 2 - PRODUCTS

2.01 Batt Thermal Insulation at Exterior Walls

A. R-value 21
When tested in accordance with ASTM C 518.

B. Vapor Retarder Perm Rating:
FRK facing Perms Maximum 0.10.
PSK facing Perms Maximum 0.10
When tested in accordance with ASTM E 96.

C. Surface Burning Characteristics:
Maximum flame spread: 25
Maximum smoke developed: 50
When tested in accordance with ASTM E 84.

D. Combustion Characteristics:
Classified non-combustible by model building codes.
Not required to be covered. May be left exposed.

E. Dimensional Stability:
Linear shrinkage less than 0.1%

F. Manufacturer:
Owens-Corning Corporation, www.owenscorning.com
Johns Manville International Inc., www.jm.com
CertainTeed Corporation, www.certainteed.com
Dow Chemical Co.: Great Stuff www.itsgreatstuff.dow.com

PART 3 – EXECUTION

3.01 Batt Thermal Insulation at Exterior Walls

INSPECTION AND PREPARATION:

A. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify mechanical and electrical services within wall have been tested and inspected.

B. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

INSTALLATION:

A. Comply with manufacturer's instruction for particular conditions of installation in each case.

B. Mechanical Fasteners
1. Apply insulation directly to the interior surface of the exterior wall with appropriate spindle or prong-type anchors.
a. Fasten anchors to wall by welding the pin to metal and then impale the insulation, or by using pre-attached heads and welding them through the insulation.
b. Fasten anchors to wall with adhesive. Follow manufacturer's recommendations for surface preparation and adhesive pattern.
c. Impale insulation on anchor and secure with washer. Select pin lengths to ensure tight fit. Protect pin tips where subject to human contact. See manufacturer's diagram for impaling pin pattern.
2 Friction-fit unfaced insulation between studs after cover material has been installed on one side of the cavity. When unfaced insulation is used, and in applications without a cover material, use wire or metal straps to hold insulation in place. When faced insulation is used staple attachment flanges to face or side of stud every 8 to 12 inches to prevent gaps along the edge of the vapor retarding facing.

D Vapor Retarders
1. Maintain vapor retarder integrity by tightly abutting adjacent insulation. Repair punctures or tears in vapor retarder facing by taping. Follow tape manufacturer's application recommendations.

E Material Storage and Protection
1. Protect insulation from damage and from becoming wet before, during and after installation.
2. Insulate non-standard width spaces by cutting insulation at least one inch wider than space to be filled.
a. Install friction fit (faced) insulation in stud framing with insulation extended fully into stud cavities. Staple to back of wallboard and/or stud where required to maintain position.

3.02 Batt Thermal Insulation at Roof and Ceiling

A. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify mechanical and electrical services within the above ceiling space have been tested and inspected.

B. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

INSTALLATION:

A. Comply with manufacturer's instructions for particular conditions of installation in each case.

B. Between Wood Roof Rafters
1. Staple insulation to the bottom face of the roof rafter at 8 to 12 inch intervals. Staple the first flange on inside face of roof rafter. Staple every 6-8" apart with a staple within 1" of each end of the batt. Position batt in cavity and staple the other flange to the adjoining rafter.

C. Cathedral Ceiling

1. Where Gypsum Board is attached directly to joists, provide high performance insulation with 8-1/4" thickness (R30C) with an integral kraft paper flanged vapor retarder. Maintain a 1 inch minimum air space at the top of the insulation and shave insulation as required adjacent vent holes through blocking to allow free flow of air. If required, use vent baffle to assure proper clearance.

Over Suspended Ceilings

1. Install insulation over ceiling panels. Butt insulation together tightly to prevent thermal leaks.

D. Vapor Retarders

1. Maintain vapor retarder integrity by tightly abutting adjacent insulation. Repair punctures or tears in vapor retarder facing by taping. Follow tape manufacturers application recommendations.

END OF SECTION

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included: All sheet metal work as indicated and specified except those items included in other Sections. This Section also includes but is not limited to:
   1. Sheet metal for maintaining weather and water resistance of building enclosure, edge metal, flashing and trim.
   2. Gutters
   3. Manufactured sheet metal accessories
   4. Flashings at pedestrian bridge.
   5. Sealant work related to sheet metal flashing and trim.

B. Related Work Specified Elsewhere:
   1. Section 03 3000 – Cast-In-Place Concrete
   2. Section 05 3000 – Metal Decking
   3. Section 05 5000 - Metal Fabrications for steel pipe rain water leaders and brackets
   4. Section 07 1110 – Pre-formed Roof Panels
   5. Section 07 4113 – Pre-formed Metal Roofing
   6. Section 07 5200 – Modified Bitumen Roofing
   7. Section 07 6500 - Flexible Flashing
   8. Section 07 9200 – Joint Sealants
   9. Section 09 9000 - Painting.
   10. See Mechanical and Electrical Divisions for ductwork and flashing and counter flashing of all pipe, conduits and other penetrations of mechanical and electrical equipment.

1.02 REFERENCES AND STANDARDS: The following references and standards are hereby made a part of this Section and all sheet metal work shall conform to the applicable requirements and recommendations therein except as otherwise specified herein or shown on the Drawings.

A. "Architectural Sheet Metal Manual", Latest Edition, and "Architectural Sheet Metal Specifications", latest Edition, both published by Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA).

1.03 ACTION SUBMITTALS: Comply with requirements of Submittal Section 01 3300.

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 3300 Submittal Procedures.
   2. Closeout Submittals shall be submitted in accordance with Section 01 7700 Closeout Procedures and Section 01 7836 Warranties.

B. Pre-installation Meeting: Prior to installation of sheet metal associated work, Contractor, Architect, and Fabricator’s field and office representatives responsible for work under this Section shall meet at the Project site to coordinate and discuss sheet metal practices applicable to this Project.
   1. Notify participants at least 5 working days before conducting meeting.
   2. Record discussions of conference and any conflict, incompatibility, or inadequacy. Furnish a copy of record to each participant.
   3. At Contractor’s option, agenda for sheet metal discussion may be included as part of pre-installation conferences required for other building assemblies and specified under other Sections.

C. Coordinate with shop drawing, mockup, and warranty requirements of other Sections installed in conjunction with work of this Section.

1.04 ACTION SUBMITTALS: Comply with requirements of Submittal Section 01 3300.

A. Shop Drawings:
1. Fully detailed large-scale drawings for fabrication and installation of flashing at existing openings to receive custom or unique sheet metal flashing and trim conditions when requested by Architect.
2. Include plans, elevations and keyed details. Distinguish between shop and field assembled work.
3. Show manner of forming, jointing and securing to adjacent work
4. Detail all waterproof connections including penetrations
5. Indicate all materials, thicknesses and dimensions, fastening and anchoring methods, details and locations of all seams, joints and other provisions necessary for thermal expansion and contraction.

B. Products Data: Manufacturer's literature describing self-adhesive flashing and other manufactured items.

C. Samples: 6 inch by 12 inch section of typical exposed flashing with shop-applied finish.

D. Sustainable Design: Information necessary to establish and document compliance with the California Green Building Standards Code (CALGreen) goals for this Project.

1.05 INFORMATION SUBMITTALS

A. Record of pre-installation meeting if not submitted under other Sections.

B. Sample of manufacturer's warranty for coping system.

C. Qualification of fabricator.

1.06 CLOSEOUT SUBMITTALS

A. Extended warranty and guarantee.

1.07 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: At least 5 years documented experience in fabrication and installation of custom flashing and sheet metal of type and scope similar to that required for this Project.
1. Workers shall be skilled and experienced in installing the type of sheet metal specified.
2. Installer shall maintain a full-time supervisor/foreman, fluent in English, at the jobsite during times that sheet metal work is in progress.

1.08 DELIVERY, STORAGE AND HANDLING:

A. Deliver all items to site undamaged and unpainted, except where indicated, and in sufficient time to enable incorporation into work of other trades.

B. Store all galvanized metal under dry conditions and protect from moisture until installation commences.

C. Comply with additional requirements specified in Section 01 6500 Delivery, Storage and Handling.

1.09 FIELD CONDITIONS

A. Verify existing dimensions and details prior to installation of material. Notify Architect of conditions found to be difference from those indicated on the Drawings. Architect will review situation and will inform Contractor and Installer of changes.

B. Comply with District's limitations and restrictions for site use and accessibility.

C. Install materials in strict accordance with safety requirements of material manufacturer, Material Safety Data Sheets, and local, state, and federal rules and regulations.

1.10 GUARANTEE AND WARRANTY

A. Contractor: Furnish District with an extended written 2-year guarantee agreeing to repair or replace work that leaks and otherwise fails due to defects in workmanship.

B. Manufacturer: Furnish District with the following written manufacturer warranties:
1. Coping System: Extended 20 year, 110 mph wind warranty.
2. Factory-Applied Coating: 30 year warranty for manufacturer for PVDF finish covering color fade, chalk and film integrity.
3. Kynar Coatings: 20 year warranty

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Quickflash Weatherproofing Products Inc: www.quickflashproducts.com

2.02 MATERIALS:

A. Galvanized Sheet Steel: ASTM A 525 G90 BS 2989.75 and A 526, 1.25 oz. galvanized coating, 24 gage unless otherwise noted, except 22 ga. or heavier at caps and parapets. Where exposed and to be painted, use mill-phosphatized material. Use lock-forming quality (ASTM A 527) where so required by nature of fabrication. Rainwater leaders from gutters to wall to be 20 gauge.

B. Solder: ASTM B 32, half lead and half tin (Alloy 50A).

C. Flux: Muriatic acid cut with zinc or non-corrosive, as recommended for use with parent metals.

D. Fastenings: Tinned or galvanized for galvanized metal; hard copper for lead. All nails into wood shall be annular ring type with large heads.

E. Insulating Materials:
1. Asphalt Saturated Felt: ASTM D 226, No. 30 type.
2. Bituminous Coating (Sheet Lead): F.S. TT-C-494 or MIL-C-18480.

F. Caulking and Sealing:
1. For all concealed metal to metal contact, use polyisobutylene type, non-skinning, non-drying sealant, bulk or tape, as required by installation conditions (tape: 1" minimum width, 1/16" minimum thickness); Presstite "579 Series", PPG "Duribbon 1072", or approved equal.
2. At all other areas requiring calking and sealing, conform to silicone sealant material requirements of Caulking and Sealants Section.

G. Plywood soffit vent: Fry DCS-625-V-300, 3" Aluminum

H. Plywood soffit vent: 2” diameter open screen vents, Vent Master RS-100-2”, Aluminum.

I. Coping:

J. Gutters:
1. Aluminum Coil Stock formed and coated aluminum
2. 0.032 in. thickness
3. Gutter Length: 20 feet, slip soldered joints (crimping not accepted)
4. Gutter Corner Fabrication: mitered corners, soldered
5. Gutter Size and Profile fabricated as shown on drawings.
6. Manufacturer’s standard hidden gutter hanger to match gutter finish.
7. Install expansion joints on all gutters exceeding 50’-0” long or a minimum of 1 per 12 units. SMACNA Figure 1-7- Butt Type gutter expansion joint.
8. Factory Finished Exterior Coating; Kynar 500 or Hylar 5000 applied to exposed sides. Color as selected by Owner from manufacturer’s standard color line.
9. Interior coating with Tank Clad HS NSF Coating by Sherwin Williams.

PART 3 - EXECUTION

3.01 CONDITION OF SURFACES:

A. Surfaces to receive sheet metal work shall be smooth, clean, and dry and free of rough or sharp ridges and projections. Nails shall be driven flush without projecting heads.

B. Commencing installation implies acceptance of surfaces.

3.02 COORDINATION:

A. Coordinate and schedule sheet metal work with installation of roofing, drains, piping, blocking, nailers, framed openings, curbs, parapets and other adjoining or substrate work where it is integral or contiguous therewith.

B. Instruct other trades concerning location and placement of nailers, blocking, cleats, etc.

3.03 PREPARATION:

A. Remove all grease, dirt and surface coatings from surfaces to be soldered.

B. Apply all galvanized sheet metal over wood, over one layer of saturated felt; or, alternately, the metal may be back painted with a heavy coat of bituminous paint.

3.04 INSTALLATION:

A. Where work is not otherwise shown or specified, conform to details and requirements set forth in the Reference Standards.

B. Where materials or construction systems are specified with reference to a particular manufacturer (such as reglets, gravity ventilators and calking and sealants, make all installations in strict accord with the approved manufacturer's installation instructions.

C. Except where otherwise noted or specified, all sheet metal work shall be galvanized sheet steel. Make all cleats and edge strips of the same metal as items with which they are used.

D. Accurately reproduce profiles and bends; make intersections sharp, even and true. Make plain surfaces free from buckles and waves with as few joints as possible. Reinforce all

work as required for strength and appearance.

E. Bend all metals to minimum radius recommended by manufacturer for thickness used. (In general, the radius shall be not less than the thickness of metal.)

F. Provide for proper expansion and contraction in all systems. Make all joints tight. Conceal all nails and other fastenings where possible. Face nailing through exposed surfaces is not permitted unless specifically shown. Secure exposed edges to underlying materials with clips or tabs (edge strips).

G. Make all seams in direction of flow.

H. Hem all exposed edges of sheet metal work ½ inch.

I. Do all cutting, fitting, punching, etc., in sheet metal to accommodate work specified elsewhere and provide all necessary accessory items.

J. Properly apply caulking and sealants to sheet metal items to permit movement between surfaces and to make entire installation watertight. Conform to requirements of Caulking and Sealants Section.

K. Soldering: Roughen smooth surfaces with clean emery cloth or sandpaper; do not use steel wool. Use torch or well headed irons for all soldering. Solder slowly throughly heating seams and completely sweating solder through full width with at least 1" of solder evenly flowed along seams. Wherever possible, solder in a flat position. Solder seams on slopes greater than 45^{o} a second time. Solder immediately after application of flux; after soldering, immediately neutralize any corrosive flux with 5% soda solution and flush with clean water. Soldering of exposed surfaces shall be neatly done. Exposed solder shall be dressed and finished. Soldering shall be employed only to seal or fill seams. Where structural strength is required, do not rely on solder alone but use supplementary mechanical fasteners.

L. Flashings:
1. Install all flashings required to provide watertight protection. Except where composition flashings are used, flash intersections of decks and roofs or other horizontal surfaces with vertical surfaces of every kind. Make flashings base and counter type or cap type unless otherwise shown.
2. Assemble and install flashings at roofing and conditions to conform to approved manufacturer's recommendations and the requirements of the Built-Up Roofing Section.
3. Carry all flashings around corners 4" minimum; metal soldered or otherwise joined at the angle is not permitted. Three-way an shall have the corners soldered watertight.
4. Roof flashings and related metal shall be installed with flanges on top ply of roofing felt and reinforced as per Roofing Section. Installation of flange below or between roofing plies is not permitted.
5. Unless metal manufacturer has more stringent requirements, make up continuous straight runs of flashings in 24 ft. maximum lengths. Unless otherwise shown or specified, connect continuous runs together with 3-inch loose lock expansion joints sealed water-tight with sealant. Provide expansion joints at 10 ft. maximum from any external or internal corners, and in straight runs less than 24 ft. but more than 10 ft., make expansion joints at center of run. Running joints between expansion joints shall be locked and soldered or lapped and riveted/soldered.

M. Gutters:
1. Install gutter supports at no more than 24 inches on center.
2. Slope gutters evenly to downspouts; provide end caps at gutter ends and seal watertight per manufacturer’s instructions.

3. Install outlet tues at all downspout locations, seal watertight.
4. Apply joint sealants at gutter joints per manufacturer's installation instructions and to meet the requirements of Section 07 9200 Joint sealants.

3.05 CLEANING AND PROTECTION

A. Remove damaged, defective or improperly installed materials. Replace with new materials installed per requirements of this Section.

B. Protect dissimilar metals subject to galvanic corrosion from contact with each other and from other surfaces which cause corrosion of metal.

C. Clean finished surfaces according to manufacturer's written instructions; maintain clean condition until Final Acceptance.

END OF SECTION

SECTION 07 6500

FLEXIBLE FLASHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Self adhesive elastomeric sheet waterproofing membrane.
2. Self adhering flexible strip flashing for louvers, doors and windows.
3. Corner flashing at sills of louvers, doors and windows.

B Related Sections:
1. Section 07 4113 – Metal Roof Panels.
2. Section 07 6200 - Sheet Metal Flashing and Trim.
3. Section 07 9200 - Joint Sealants.
4. Section 08 1113 – Hollow Metal Doors and Frames.
5. Section 08 5113 - Aluminum Windows.

1.02 REFERENCES

A. American Society for Testing and Materials:
1. ASTM D412 - Rubber Properties in Tension.
2. ASTM E96 - Water Vapor Transmission of Materials.

1.03 SUBMITTALS

A. Section 01 3300 - Submittals: Requirements for submittals.

B. Product Data: Submit manufacturer's product data and installation instructions.

1.04 QUALITY ASSURANCE

A. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with three years documented experience.

B. Strip Flashing: Company specializing in self adhering strip flashing with three years documented experience.

C. Applicator: Company specializing in application of specified waterproofing and flashing with three years documented experience and approved by manufacturers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Maintain products dry. Do not store in direct sunlight.

C. Maintain minimum ambient temperature of between 50 and 90 degrees F.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Do not install waterproofing membrane or strip flashing during inclement weather or when air temperature is below 40 degrees F.

1.07 WARRANTY

A. Provide five year manufacturer's warranty.

B. Warranty: Include coverage of materials and installation and resultant damage from failure

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Materials shall be as provided by one of the following manufacturer's, or equal having products conforming to Specification requirements.
   1. Elastomeric Sheet Membrane:
      a. W.R. Grace, Vycor Ice and Water Shield.
      b. Carlisle Coatings & Waterproofing, CCW WIP 300HT.
      c. Henry Company; Blueskin SA.
   2. Elastomeric Flexible Strip Flashing:
      a. Fortifiber "Fortiflash-40" flashing: www.fortifiber.com .
      b. Fortifiber "Moistop Corner Shield" door and window sill flashing.
      c. W.R. Grace, Vycor V40 Weather Barrier Strips.
      d. Henry Company; Blueskin SA.

2.02 MATERIALS - ELASTOMERIC SHEET MEMBRANE

A. Elastomeric Sheet Waterproofing: W.R. Grace Vycor Ice and Water Shield:
   1. Cross laminated high density polyethylene film and a rubberized asphalt adhesive, to withstand puncture and severe stress,
   2. 40 mil thickness.
   3. Width: 36 inch minimum.
   4. Tensile Strength (ASTM D412): 250 psi.
   5. Elongation(ASTM D412): 250 percent.
   6. Water Vapor Transmission (ASTM E96): 0.05 perms.

B. Primer: Bituthene Water-Based Primer as recommended by manufacturer.

2.03 MATERIALS - ELASTOMERIC FLEXIBLE STRIP FLASHING

A. Elastomeric Sheet Waterproofing: FortiFlash 40.
   1. Thickness: 40 mils.
   2. Modified elastomeric composition reinforced with an inert reinforcing to withstand puncture and severe stress.
   3. Elongation (ASTM D412): 200%.
   4. Puncture Resistance (ASTM E154): 40 lbf.
   5. Water Vapor Permeance (ASTM E96): 0.05 perms.

B. Primer: Water-based primer as recommended by manufacturer.

2.04 ACCESSORIES

A. Corner Flashing: Fortifiber "Moistop Corner Shield"; or equal. Provide at doors, louvers, and window sills.

B. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

C. Sealants: As recommended by membrane manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify items which penetrate surfaces to receive waterproofing are rigidly installed.

B. Verify surfaces are free of cracks, depressions, waves, or projections which may be detrimental to successful installation.

C. Do not apply waterproofing to damp, frozen, dirty, dusty, or deck surfaces unacceptable to manufacturer.

D. Correct unacceptable conditions prior to commencing work.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Seal cracks and joints with recommended material and sealant. Use proper depth-width ratio as recommended by sealant manufacturer and in accordance with Section 07 92 00 – Joint Sealants.

C. Clean surfaces of foreign matter detrimental to installation of membrane or flashing. Vacuum horizontal substrates clean.

3.03 INSTALLATION - ELASTOMERIC SHEET MEMBRANE

A. Apply elastomeric sheet waterproofing membrane in accordance with manufacturer's instructions.

B. Roll out waterproofing. Minimize wrinkles and bubbles.

C. Apply primer in accordance with manufacturer's instructions. Completely bond sheet to substrate, except those areas directly over or within 3 inches of a working crack or expansion joint.

D. Remove release paper layer. Roll out on surfaces receiving membrane to encourage contact bond.

E. Overlap edges and ends minimum 3 inches.

F. Shingle joints on vertical substrate in direction of drainage.

G. Seal to adjoining surfaces.

H. Seal items penetrating flashing with mastic material.

3.04 INSTALLATION – ELASTOMERIC FLEXIBLE STRIP FLASHING

A. Apply strip flashing and corner flashing at louvers, doors and windows in the sequence required by manufacturer's installation instructions.

B. Install corner flashing at louvers, door and window sill locations.

C. Install strip flashing at exterior wall locations as indicted on Drawings.

END OF SECTION

SECTION 07 9200

JOINT SEALANTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Caulking and sealant work required for the project and not specified elsewhere.

B. Related Sections:

1. Section 07 6200, Sheet Metal Flashing and Trim

2. Section 08 8100, Glazing.

3. Section 09 2400, Acrylic Modified Portland Cement Plastering

4. Section 09 2900, Gypsum Board Assemblies

5. Division 22, Plumbing.

6. Division 26, Electrical.

1.02 SUBMITTALS

A. Samples: Samples of exposed caulking and sealants are required for Architect's approval of colors. Unless otherwise directed, apply samples in 6-inch runs in actual joints at the project site.

B. Manufacturer's Specifications and Materials List: At least 30 days prior to commencing work, furnish to Architect, 2 copies of manufacturer's specifications for installations indicated, listing specific materials proposed. Specifications shall indicate completely, recommendations for use of primers, joint preparation and sealant dimensions.

1.03 QUALITY ASSURANCE

A. Exterior, elastomeric type sealants shall be applied by a firm normally in the business of applying sealants similar to those specified.

1.04 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver caulking and sealants and related accessories to the job site in factory sealed, unopened containers bearing manufacturer's name and product designation.

B. Storage: Store in unopened containers. Follow manufacturer's recommendations for storage temperatures and shelf life.

C. Handling: Follow manufacturer's recommendations for handling products containing toxic materials. Keep flammable material away from heat, sparks and open flame. Use recommended solvents and cleaning agents for cleaning tools, equipment and skin.

1.05 PROJECT CONDITIONS

A. Environmental Conditions: Schedule caulking and sealing operations so that working joints are most likely to be normal size. Apply materials within manufacturer's recommended surface and ambient temperature ranges.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Exterior joint sealants are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, with recognized limitations of wear and aging as indicated for each application.

2.02 MANUFACTURER/TYPE - SEALANTS

A. Colors: Match sealant color to color of adjacent materials as closely as possible using colors selected from the manufacturer's standard palette, as approved by the Architect.

B. General:

1. Do not mix multiple component materials until required for use.
2. Use materials "as received" from manufacturer, without additions, deletions and adulterations of materials.
3. Do not use sealants that have started to cure and those whose shelf life expired.

C. Compatibility: Provide joint sealers, joint fillers and other related materials as follows:

1. That will not cause staining, degradation and premature aging of the adjacent surfaces and the sealant itself, when in contact with these surfaces.
2. Compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

D. Bulk sealants:

1. For interior slabs where heavy wheeled traffic will occur: One of the following, or equal.
    a. L&M:
        1) "Epoflex" (epoxy).
        2) "Joint Tite" (urea).
    b. Atlas "Epoxy Joint Filler."
    c. Nox-Crete: "Dynaflex JF-85."
    d. VersaFlex, Inc.: SL Series (polyurea) as recommended by the manufacturer after surveying the conditions at the site.

2. For interior and exterior horizontal application subject to pedestrian or vehicular traffic: Single component silicone sealant.
   a. Dow Corning Corp.; "890-SL" or "SL Parking Structure Sealant" (basis of design).
   b. Pecora Corp.; "300 SL Pavement Sealant."
   c. Crafco Inc.; "RoadSaver Silicone SL."

3. For all other exterior applications:

   a. Dow Corning "795" (basis of design).
   b. General Electric "Silpruf," "Silpruf LM," "Silpruf NB."
   c. Tremco "Spectrem 1."

4. For interior damp, wet and semi-wet locations, other than floors, such as toilet rooms where a mildew-resistant sealant is required: Provide white sealant, unless otherwise noted. Single-component mildew-resistant neutral-curing silicone sealant:

   a. Dow Corning Corp. "786" basis of design.
   b. Pecora Corp. "898."
   c. General Electric Corp. "1700."

5. For all other interior applications (paintable sealant): Latex sealant complying with ASTM C 834, Type P, Grade NF.

   a. Pecora Corp. "AC-20+."
   b. Schnee-Morehead, Inc. "SM8200."
   c. Sonneborn, Division of ChemRex Inc. "Sonolac."
   d. Tremco "Tremflex 834" or "Acrylic Latex 384."

E. Tape sealants: American Saint-Gobain "Norseal 730" or "Norseal 770," or equal by Pres-On Tape & Gasket Corp. or Schnee-Morehead.

2.03 ACCESSORY MATERIALS

A. Sprayed polyurethane foam sealant: One- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 pcf density; flame spread index of 25 or less according to ASTM E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

B. Joint cleaner, primer and sealer: As recommended by the sealant manufacturer, for the surfaces to be cleaned, primed or sealed.

C. Bond breaker tape:

1. Polyethylene or other plastic tape recommended by the sealant manufacturer to prevent 3-sided adhesion where backer rod cannot be used, except for non-moving joints.

2. Use self-adhering tape wherever possible.

D. Backer rod:

1. General: Provide size, density and shape of rod which will control the joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back, and provide a highly compressible backer to minimize the possibility of sealant extrusion when joint is compressed.
2. Type: ASTM C 1330, of type indicated below:

   a. Type C: Closed-cell material with a surface skin, Nomaco "SOF ROD/Dual Rod," or equal.

   b. For sealant in vehicular traffic areas, provide solvent-resistant backer rods, Nomaco HBR/Green Rod, or equal.
   c. For fillet and cove joints, Nomaco "HBR" 1/4-inch Round."

3. Elastomeric tubing sealant backings:

   a. Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, non- absorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26-degree F.
   b. Provide products with low compression set.

4. In paving subject to traffic: Provide hard joint filler such as cork; prevent 3-sided adhesion by using bond breaker tape.

E. Masking tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect surfaces to receive caulking and sealant materials and report defects. Starting work implies acceptance of surfaces as satisfactory.

B. Verify that joints and spaces to be caulked or sealed is of proper width.

C. Concrete, masonry, and plaster surfaces shall be thoroughly cured.

D. Apply no caulking or sealant materials in contact with surfaces contaminated with oil, grease, bituminous materials, form release agents, bond breakers, and deleterious curing compounds, water repellents and other special surface treatments. Aluminum surfaces must be free of lacquer and other oxidizing coatings. Costs occasioned by removal of such contaminants shall be responsibility of the trade having caused their presence.

3.02 PREPARATION

A. Thoroughly clean joints, removing foreign matter such as dirt, dust, moisture, frost, rust, mill scale, paint, lacquer and protective coatings. Blow joints free of loose particles.

B. Use no cleaning solvents that leave residue. Wipe joints free of solvent using clean, dry white cloths or white lint-less paper. Do not permit solvent to air dry.

C. Follow the Manufacturer's directions for products and surfaces.

3.03 INSTALLATION

A. Unless otherwise required by these Specifications, install materials in strict accordance with Manufacturer's specifications and recommendations using approved equipment.

B. Usage:

1. Use butyl sealant for interior static joints not otherwise noted.

2. Use interior type silicone sealant for caulking around ceramic tile and similar conditions at vertical surfaces.

3. Use exterior type silicone sealant for joints not otherwise noted or specified.

C. Prime surfaces as recommended by manufacturer immediately prior to caulking or sealing. Make preliminary tests to ensure that primers will not stain exposed materials or deteriorate back-up material.

D. Unless otherwise required by caulking and sealant manufacturer's specifications and recommendations, use back-up material to control caulking and sealant depths as follows, depths are measured at bond face:

1. Silicone Sealants at Exterior: Make depth half of width but not less than 3/16 inch or more than 3/8 inch.

2. Do not twist or stretch preformed bead or rope type back-up material during installation.

E. At joints subject to movement, where required by nature of back-up material used or where sealant contacts back of joint, use release material between back-up material or back of joint and sealant to confine adhesion to surfaces of materials being joined. Follow manufacturer's recommendations exactly. Release material is not required over polyethylene backing.

F. Neatly tool joints to slightly concave surface using tooling agent recommended by sealant manufacturer. Repair any air pockets exposed by tooling. Tool so as to compress material and improve adhesion to surfaces joined.

G. Use masking tape where practical to control lap of materials onto adjacent surface or to facilitate tooling. Remove tape immediately after caulking and sealing.

3.04 REPAIR/RESTORATION

A. Patch or replace defective or damaged sealants. Be responsible for damage to adjacent surfaces caused by caulking and sealant operations.

3.05 CLEANING

A. Clean adjacent surfaces soiled by caulking and sealing operations. Remove wet material before it sets. Follow manufacturer's recommendations for cleaning procedures. Cleaning agents shall not stain or be injurious to exposed surfaces nor shall they be potentially dangerous to glass and metal surfaces due to wash-off by rain.

END OF SECTION

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes
   1. Provision of steel frames for interior doors and glazing.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

C. Related Sections
   1. 08 1416 – Flush Wood Doors.
   2. 08 7100 - Door Hardware: For door hardware
   3. 08 8100 - Glazing: For glass and glazing standards.
   4. 09 9000 - Painting and Coating: For field painting of primed frames.

1.02 REFERENCES

A. ASTM - American Society for Testing and Materials
   1. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   2. A568 - Standard Specification for General Requirements for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.
   3. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   4. A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   5. A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   6. E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
   7. E413 - Classification for Rating Sound Insulation.
   8. E2074 - Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.

B. DHI - Door and Hardware Institute
   1. A115 Series - Steel Door Preparation Standards.

C. NFPA - National Fire Protection Association
   1. 80 - Standard for Fire Doors and Fire Windows.

D. SDI - Steel Door Institute
   1. 105 - Recommended Erection Instructions for Steel Frames.
   2. 112 - Galvanized Standard Steel Doors and Frames.
   3. 117 - Manufacturing Tolerances Standard Steel Doors and Frames.
   4. A250.8 - Recommended Specifications for Standard Steel Doors and Frames.

E. UL - Underwriters Laboratories Inc.

1.03 SUBMITTALS

A. Product Data: Submit product data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

B. Shop Drawings: Submit shop drawings showing fabrication and installation of standard steel doors and frames referenced to the Architect's door mark and hardware group. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
   1. Provide schedule of doors and frames using same reference numbers for details and openings as those on the Drawings.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements
   1. Provide fire resistance rated door assemblies that comply with NFPA 80, are identical to door and frame assemblies whose fire resistance characteristics have been determined in accordance with ASTM E2074 and which are labeled and listed by UL.
   2. Temperature Rise Rating: At stairwell enclosures, provide doors which have Temperature Rise Rating of 450 degrees Fahrenheit maximum in 30 minutes of fire exposure.

1.05 WARRANTY

A. Installation Warranty: Unconditional 2 year installation warranty commencing on recordation date of the Notice of Completion in addition to the 10 year manufacturer's standard warranty.
   1. Site review with designated District representative is required prior to expiration of warranty as a condition to end installation warranty period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Door Components;
   1. Ceco Doors, an Assa Abloy Company
   2. Curries Steel Doors and Frames, an Assa Abloy Company
   3. Steelcraft an Allegion Brand or approved equal.

2.02 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A568 and ASTM 1011.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A568.

C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, hot dipped galvanized in accordance with ASTM A653 and ASTM A924 with A60 or G60 coating designation, mil phosphatized.

D. Supports and Anchors: Fabricate of not less than 18 gauge sheet steel; galvanized where used with galvanized frames.

E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built in at exterior walls, hot-dip galvanize in compliance with ASTM A153, Class C or D as applicable.

F. Shop Applied Paint: Apply after fabrication.
   1. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints.

G. Finish: As specified in Section 09 9000.

2.03 DOORS

A. Frames
   1. Provide metal frames for doors of types and styles as indicated on the Drawings and schedules. Conceal fastenings, unless otherwise indicated.
      a. Interior: Fabricate fully welded frames of minimum 16 gauge cold-rolled steel.
      b. Exterior: Fabricate fully welded frames of minimum 14 gauge hot-rolled steel and galvanized.
      c. Door Silencers: Except on weather stripped and smoke gasketed frames, drill stops to receive 3 silencers on strike jambs of single door frames and 2 silencers on heads of double door frames.
      d. Moldings for Glazed Lites in Doors: Minimum 0.032-inch thick, fabricated from same material as door face sheet in which they are installed.
      e. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8-inch high unless otherwise indicated.
   2. Provide fire resistance rated frames with 20 minute and 90 minute fire resistance ratings as indicated on the Drawings.

B. Glazing: As specified in Section 08 8100.

2.04 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at Project site. Comply with SDI A250.8 requirements.
   1. Internal Construction: Manufacturer's standard vertical steel stiffeners or unitized steel grid with internal sound deadener on inside of face sheets where appropriate in accordance with SDI standards.
   2. Clearances: Not more than 1/8-inch at jambs and heads except between non-fire resistance rated pairs of doors not more than 1/4-inch. Not more than 3/4-inch at bottom.

B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel.

C. Tolerances: Comply with SDI 117.

D. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold-rolled or hot-rolled steel.

E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

F. Fabricate exterior doors, panels, and frames from galvanized sheet steel in accordance with SDI 112. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 14 gauge inverted steel channels.

G. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

H. Where latch-jamb gaskets protrude more than 1/2-inch, prepare door for latch hardware with additional back-set.

I. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of DHI A115 Series Specifications for door and frame preparation for hardware.
1. For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.

J. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface applied hardware may be done at Project site. Provide beveled hinge and lock edges.

K. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with DHI.

L. Shop Painting: Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
2. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

2.05 FINISHES

A. Finish Painting: As specified in Section 09 9000.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install steel frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated.
1. Except for frames located at existing concrete, masonry, or drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames

accurately in position, plumbed, aligned and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

2. Where applies, install fire resistance rated frames in accordance with NFPA 80

C. Door Installation: Fit specified door(s) accurately in frames, within clearances specified in SDI A250.8.

3.02 ADJUST AND CLEAN

A. Prime Coat Touch-Up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Final Adjustments: Check and readjust operating hardware items, leaving doors and frames undamaged and in complete and proper operating condition.

END OF SECTION

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SECTION 08 1400

WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Wood doors and related accessory items.

B. Related Sections:
1. Section 08 1113, Metal Doors and Frames.
2. Section 08 7100, Door Hardware.
3. Section 08 8100, Glazing

1.02 REFERENCES

A. The following references and standards are hereby made a part of this Section. Wood doors shall conform to applicable requirements therein except as otherwise specified herein or shown on the Drawings.

B. National Wood Window and Door Association (NWWDA), National Woodwork Manufacturers Association Industry Standard I.S. 1-97.

C. Woodwork Institute (WI).

D. American National Standards Institute/National Electrical Manufacturers Association (ANSI/NEMA), LD3-2005.

E. International Standards Organization (ISO), ISO 4586 High Pressure Decorative Laminate (HPDL) Sheets Based on Thermosetting Resins - Part 1.

1.03 SUBMITTALS

A. Shop Drawings: Submit schedule indicating core types, veneers, grades, elevations, or sections showing accessories.

1.04 QUALITY ASSURANCE

A. Woodwork Institute (WI) Certification: Manufacture millwork, casework and cabinetwork in accordance with standards established in the Manual of Millwork of the Woodwork Institute of (WI) in the grade or grades herein specified or as shown on the Drawings.
1. If the manufacturer is not a WIC licensee, prior to fabrication furnish a Certificate of Reinspection by the WIC indicating that the work in question meets the requirements of the WIC grade specified.
2. If the manufacturer is a WIC licensee, each elevation of work shall bear the WI Certified Compliance grade label indicating the grade specified. By the completion of the project issue WIC Certified Compliance Certificates certifying that the installation fully meets the requirements for the grade specified.
3. The foregoing shall not be construed to limit the power and authority of the Owner to reject millwork which does not in the Owner's opinion meet with one or more of the requirements of this specification.

1.05 DELIVERY, STORAGE AND HANDLING

A. Do not deliver doors to project site until plaster, concrete, and other wet work is dry and the building is closed to the elements.

B. Store doors flat, on a level surface, not less than 4 inches above floor and in a dry, well-ventilated area. Use protective covering under bottom door, and cover top to keep clean. Allow air circulation under and around stacks of doors. Handle doors with clean hands. Do not slide door face over another door face.

C. Do not expose a portion of the wood face to sunlight; keep entirely covered or entirely exposed.

D. Do not expose doors to abnormal heat, extreme dryness, humid conditions, or sudden changes therein. Condition doors to prevailing humidity conditions of the locality before hanging.

1.06 WARRANTY

A. Warranty for Interior Doors: Lifetime.

B. Include coverage for de-lamination of veneer, warping, or twisting, not to exceed 1/4 inch in any face including diagonally, or other defects. Warranty shall cover replacement of door plus costs of hanging and finishing.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Wood veneer faced doors shall be as manufactured by one of the following manufacturers, or equal as approved by Architect, with products in conformance with specification requirements:
1. Eggers Industries: www.eggersindustries.com.
2. Haley Brothers: www.haleybros.com.
3. Marshfield Door Systems: www.marshfielddoors.com.
4. Substitutions: See Section 01600 – Material and Equipment

2.02 MATERIALS AND FABRICATION

A. Interior Doors: 1-3/4 inch thick unless otherwise noted.
1. Solid Core Doors: Flush type. Particleboard Core: NWWDA I.S., minimum density: 25 pcf.
2. Face Veneer: High pressure decorative laminate, as manufactured by Wilsonart.
a. Type: 335, Vertical surface (VGP), with #38, fine velvet texture.
b. Thickness: 0.028 inch.
c. Color: 7921-38, Tuscan Walnut.
3. Edge Bands: Edge bands shall be glued to core.
4. Adhesives: As recommended by laminate manufacturer.
5. Doors to be factory finished.

B. Fire rated Construction: Provide fire rated doors as per rating indicated on door schedule.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type Particleboard meeting ANSI A208.1, Grade LD-1 or LD-2, made with binder containing no added urea-formaldehyde, SCS-certified recycled content or glue-block staved core wood, FSC-certified, plies and faces as indicated above.

B. Sound Retardant Doors:Equivalent to Type PC construction with core as required to achieve rating specified; plies and faces as indicated above.

2.04 DOOR FACINGS

A. Wood Veneer Facing for Transparent Finish: Wenge veneer supplied by Certified Forest Products; www.certifiedforestproducts.com/ or equal, veneer grade as specified above, quarter sliced, book veneer match, running assembly match; unless otherwise indicated.
   1. Grade: AA.
   2. Vertical Edges: Any option allowed by quality standard for grade.
   3. Pairs: Pair match each pair; set match pairs within 10 feet of each other when doors are closed.

B. Facing Adhesive: Type II - water resistant.

2.05 ACCESSORIES

A. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

2.06 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with Stiles and Rails:

C. Provide solid blocks at lock edge for hardware reinforcement.
   1. Provide solid blocking for other through-bolted hardware.

D. Fit door edge trim to edge of stiles after applying veneer facing.

E. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

G. Provide edge clearances in accordance with AWI Quality Standards Illustrated Section 1700.

2.07 FACTORY FINISHING - WOOD VENEER DOORS

A. Factory finish doors in accordance with specified quality standard:
   1. Transparent Finish: Transparent catalyzed polyurethane, Premium quality, satin sheen.

B. Seal door top edge with color sealer to match door facing.

PART 3 - EXECUTION

3.01 PREPARATION

A. Exercise caution in ordering pre-machined doors. Verify dimensions and hardware requirements. Alterations and repairs to such doors required because of failure to fit openings or to accommodate specified hardware or because of damage to surface may subject doors to rejection.

3.02 INSTALLATION

A. Door Clearances:
   1. Bottom: 3/4 inch.
   2. Top and Sides: 1/8 inch.
   3. Bevel lock stiles 1/8 inch in 2 inches. Ease edges.

B. When hardware is installed on site-finished doors prior to final finishing, remove hardware except prime coated items and hinges until completion of painting work.

3.3 PROTECTION

A. Protect doors from damage and marring until acceptance of project..

END OF SECTION

SECTION 08 7100

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions of Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following, but is not necessarily limited to:

1. Door Hardware, including electric hardware.
2. Gate Hardware.
3. Hold-open closers with smoke detectors.
4. Power supplies for electric hardware.
5. Thresholds, gasketing and weather-stripping.
6. Door silencers or mutes.

C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.

1. Division 8: Section – Hollow Metal Doors and Frames.
2. Division 8: Section – Flush Wood Doors.
3. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

1.03 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

A. 2016 California Building Code, CCR, Title 24.

B. BHMA – Builders' Hardware Manufacturers Association

C. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

D. DHI – Door and Hardware Institute

E. WHI - Warnock Hersey Incorporated

1.04 SUBMITTALS & SUBSTITUTIONS

A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.

B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Submit six (6) copies of schedule organized vertically into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Include a Cover Sheet with;
   a. Job Name, location, telephone number.
   b. Architects name, location and telephone number.
   c. Contractors name, location, telephone number and job number.
   d. Suppliers name, location, telephone number and job number.
   e. Hardware consultant's name, location and telephone number.

2. Job Index information included;
   a. Numerical door number index including; door number, hardware heading number and page number.
   b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
   c. Manufacturers' names and abbreviations for all materials.
   d. Explanation of abbreviations, symbols, and codes used in the schedule.
   e. Mounting locations for hardware.
   f. Clarification statements or questions.
   g. Catalog cuts and manufacturer’s technical data and instructions.

3. Vertical schedule format example:

Heading Number 1 (Hardware group or set number – HW -1)					
			(a) 1 Single Door #1 - Exterior from Corridor 101		
			(b) 90°		
			(c) RH		
			(d) 3' 0" x 7' 0" x 1-3/4"		
			(e) 20 Minute		
			(f) WD x HM		
			(g) 1		
			(h)		
			(i) ea		
			(j) Hinges		
			(k) 5BB1HW 4.5 x 4.5 NRP		
			(l) ½ TMS		
			(m) 626		
			(n) IVE		
2	6AA	1 ea	Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location

(b) - Degree of opening

(c) - Hand of door(s)

(d) - Door and frame dimensions and door thickness

(e) - Label requirements if any

(f) - Door by frame material

(g) - (Optional) Hardware item line #

(h) - Keyset Symbol

(i) – Quantity

(j) - Product description

(k) - Product Number

(l) - Fastenings and other pertinent information

(m) - Hardware finish codes per ANSI A156.18

(n) - Manufacture abbreviation.

D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.

E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.

F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.

I. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

J. LEED Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification; coordinate and cooperate with Owner and Architect in providing information necessary for required LEED rating.

1.05 QUALITY ASSURANCE

A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to

Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Responsible for detailing, scheduling and ordering of finish hardware.
2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.

C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.

1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.06 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.

B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.

C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.07 WARRANTY

A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:

1. Locksets: "L" Series (3) years – "ND" Ten (10) years.
2. Electronic: One (1) year.
3. Closers: Thirty (30) years –1260 twenty (20) years –Concealed High Security fifteen (15) years --except electronic closers shall be two (2) years.
4. Exit devices: Three (3) years.
5. All other hardware: Two (2) years.

1.08 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.09 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference at least one week prior to beginning work of this section.

B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, and Key District Personnel.

C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Item	Manufacturer	Acceptable Substitutes
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	District Standard
Exit Devices	Von Duprin	District Standard
Closers	LCN	District Standard
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
Flush Bolts	Ives	Trimco, BBW, DCI
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

2.02 MATERIALS

A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.

1. Hinges shall be sized in accordance with the following:

a. Height:
   1) Doors up to 42" wide: 4-1/2" inches.
   2) Doors 43" to 48" wide: 5 inches.
b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.

2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.

B. Floor Closers: Shall be equipped with compression springs, cam and roller operating mechanism and a one piece spindle-cam for maximum operating performance and longevity.

C. Pivots: High strength forgings and castings with precision bearings for smooth operation. Positive locking vertical adjustment mechanism to allow installer to precisely position the door and balance the load.

D. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" design, fastened with through-bolts and threaded chassis hubs.

1. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
   a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
   b. Offset lever pull – minimum 1,600 foot pounds without gaining access
   c. Vertical lever impact – minimum 100 impacts without gaining access

2. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers
3. UL 10C for 4'-0" x 10'-0" 3-hour fire door.
4. Cylinders: Refer to "KEYING" article, herein.
5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
7. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4' x 10' opening. Provide proper latch throw for UL listing at pairs.
8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
11. Provide wired electrified options as scheduled in the hardware sets.
    a. 12 through 24 volt DC operating capability, auto-detecting
    b. Selectable EL (fail safe)/EU (fail secure) operating mode via switch on chassis
    c. 0.230A (230mA) maximum current draw
    d. 0.010A (10mA) holding current
    e. Modular / "plug in" request to exit switch

12. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

E. Levers: Schlage "L" Series as scheduled with "06" Style Lever and "A" Style Rose.

1. Locksets to comply with ANSI A156.13, Series 1000, Operational Grade 1 and Security Grade 1 with all standard trims. Locksets shall also comply with UL10C Positive Pressure requirements
2. Lock case shall be manufactured with heavy 12 gauge steel with fully wrapped design. Lock cases with exposed edges are not acceptable. Lock case shall be multi-functional allowing transformation to a different function without opening lock case.
3. Latchbolt shall have ¾" throw and be non-handed, field reversible without opening the lock case. Solid latchbolts and / or plastic anti-friction devices are not acceptable.
4. The deadbolt, when used, shall be 1" throw stainless steel with a ¾" internal engagement when fully extended.
5. All trim shall be through-bolted with the spring cages supporting the trim attached to the lock cases to prevent torqueing.
6. Levers to have independent rotation in both directions. Exterior lever assembly to be one-piece design attached by threaded bushing. Interior lever assembly shall be attached by screwless shank
7. Thru-bolt lever assemblies through the door for positive interlock. Locks using a through the door spindle for attachment are not acceptable. Spindles shall be independent, designed to "break-away" at a maximum of 75psi torque.
8. Hand of lock chassis to be changeable by simply moving one screw from one side to the case to the other and pulling and reversing the latchbolt.
9. Cylinders to be secured by a cast stainless steel, dual retainer. Locks utilizing screws and / or stamped retainers are not acceptable.

F. Access Control Card Readers provided by Access Control Section.

G. Exit devices: Von Duprin as scheduled.

1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
3. Mechanism case shall have an average thickness of .140".
4. Compression spring engineering.
5. Non-handed basic device design with center case interchangeable with all functions.
6. All devices shall have quiet return fluid dampeners.
7. All latchbolts shall be deadlocking with ¾" throw and have a self-lubricating coating to reduce friction and wear.
8. Device shall bear UL label for fire and or panic as may be required.
9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
10. Lever Trim: "Breakaway" design, forged brass or bronze escutcheon with a minimum of .130" thickness, match lockset lever design.
11. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
12. Furnish glass bead kits for vision lites where required.
13. All Exit Devices to be sex-bolted to the doors.
14. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
    a. The unlatching force shall not exceed 15 lbs. applied in the direction of travel.
    b. Provide exit devices UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4, and UL listed for Panic Exterior Fire Exit Hardware.

H. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.

1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
5. Closers shall be installed to permit doors to swing 180 degrees.
6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.

I. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.

1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
2. Provide dust proof strikes at openings using bottom bolts.

J. Door Stops:

1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

K. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 30" high and 2" LDW. Sizes of armor and mop plates shall be listed in the

Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

L. Thresholds: As Scheduled and per details.

1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 “Thermal and Moisture Protection”.
3. Use ¼” fasteners, red-head flat-head sleeve anchors (SS/FHSL).
4. Thresholds shall comply with CBC Section 11B-404.2.5.

M. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.

N. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

A. Furnish a Proprietary Schlage masterkey system as directed by the owner or architect. Key system to be designated and combinated by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer.

B. A detailed keying schedule is to be prepared by the owner and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.

C. Establish a new masterkey system for this project as directed by the keying schedule.

D. Furnish all cylinders in the Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI)

E. Furnish construction keying for doors requiring locking during construction.

1. For FSIC systems provide 23-030-ICX Full Size Construction Cores
2. For FSIC systems provide ten 48-101-ICX Construction Keys
3. For FSIC systems provide two 48-056-ICX Control Keys (const.)
4. For FSIC systems provide two control keys for installing the permanent cores (49-056 for “Classic” keyways, 48-052-XP for “Classic Primus”) (49-003 for “Everest Conventional”, 48-005–XP for “Everest Primus”)

F. Furnish all keys with visual key control

1. Stamp key “Do Not Duplicate”.

G. Furnish mechanical keys as follows:

1. Furnish 2 cut change keys for each different change key code.
2. Furnish 1 uncut key blank for each change key code.
3. Furnish 6 cut masterkeys for each different masterkey set.
4. Furnish 3 uncut key blanks for each masterkey set.
5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.

6. Furnish 1 cut control key cut to each SKD combination.

H. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.

1. Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47-413 (conventional) or 47-743-XP (PrimusXP) with above.
2. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
3. Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.

2.04 FINISHES

A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.

B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.

C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.

D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.

B. Screws for butt hinges shall be flathead, countersunk, full-thread type.

C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.

D. Provide expansion anchors for attaching hardware items to concrete or masonry.

E. All exposed fasteners shall have a phillips head.

F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) latest Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.

G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.

I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.

J. All wiring for electro-mechanical hardware mounted on the door shall be connected through the power transfer and terminated in the interface junction box specified for in the Electrical Section.

K. Conductors shall be minimum 18 gage stranded, multicolored. A minimum 12 in. loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.

L. If a power supply is specified in the hardware sets, all conductors shall be terminated in the power supply. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer's technical documentation.

3.03 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surface soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.04 HARDWARE LOCATIONS

A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.06 SCHEDULE

A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.

C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

GLY = Glynn-Johnson Corporation Overhead Door Stops

IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
LCN	=	LCN	Door Closers
SCE	=	Schlage Electronics	Electronic Door Components
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

HARDWARE GROUP NO. 001 - INTERIOR

FOR USE ON MARK/DOOR #(S):
A01

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	VANDL OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 30" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

CARD READER, POWER SUPPLY, AND WIRING FURNISHED BY ACCESS CONTROL SUPPLIER

HARDWARE GROUP NO. 002 – UTILITY GATE

FOR USE ON MARK/DOOR #(S):
G01

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

1	SET	HARDWARE	BY GATE MFR

END OF SECTION

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SECTION 08 8100

GLASS GLAZING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Glass glazing required throughout project and not specified as a part of other Sections.

1.02 REFERENCES

A. References, Codes and Standards: The following references, codes and standards are hereby made a part of this Section. Glass glazing work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.
   1. California Building Code – Chapter 24
   2. Title 24
   3. Attention of the Contractor is directed to "Safety Standard for Architectural Glazing Materials" issued by the Consumer Product Safety Commission, relating to safety glazing materials.

1.03 DELIVERY, STORAGE AND HANDLING

A. Glass shall be properly crated and packaged to prevent damage, including damage from etching of surface while in storage.

B. Deliver glass to project site and store on edge in clean, dry, well ventilated area. Should glass or its packing material become wet during storage, remove from crates, dry thoroughly discarding wet packing material, place in a ventilated area and protect from damage until installation.

C. Deliver glazing materials and accessories in manufacturer's labeled containers.

1.04 PROJECT CONDITIONS

A. Environmental Conditions: Perform no glazing operations when ambient temperature is at or below 40 degrees F.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Except as specified herein, glass thickness shall be as indicated on the Drawings or, where no thickness is given, shall be as determined by glass manufacturer for the wind loads and conditions of use at the project site. In no case shall thickness be less than that required by the governing code.

B. Gl-1-Tempered Single Glazed: 1/4 inch Float Glass: ASTM C1048, Type I, transparent flat glass, Quality Q3, Kind HS.

C. Glazing Materials and Accessories:
   1. Glazing Tapes: Preformed, preshimmed polyisobutylenebutyl tape, 1/2" wide x thickness to suit proper face clearance of glass, black color; Pecora "BB-50",

Tremco Pre-shimmed #440, or "Polyshim", or approved equal.

2. Glazing Sealant: Tresco "Mono", black color.
3. Glazing Spline: Tremco "Vision Strip", black color.
4. Setting Blocks: Neoprene or EPDM conforming to AAMA SG-1-76, 80-90 Shore A durometer hardness. Blocks shall be 0.1" long for each square foot of glass area (but no less than 4") x 1/16" less than full channel width and of thickness to provide proper bite and minimum edge clearance for glass.
5. Edge Blocks: Neoprene or EPDM conforming to AAMS SG-1-76, 60-70 Shore A durometer hardness, 3" minimum length full channel width and of thickness to provide 1/8" (nom.) clearance between block and glass edge.

2.02 FABRICATION

A. Cut glass to full fit and play consistent with glass and glazing material manufacturer's recommendations and the requirements of the Drawings and References, Codes and Standards Article.

B. Follow code requirements and manufacturer's recommendations for minimum bite and edge and face clearances.

C. Cut lights to smooth straight edges, clean, free of nicks and flares: nipping not permitted.

D. Tempered glass shall be free of tong marks on exposed surfaces. Polish edges.

E. Glass Identification: tempered glass shall bear the manufacturer's identification as to type and thickness. Such identification for glazing shall be permanently etched so as to be visible after glass has been set in place and glazed. Glass other than tempered glass shall not have labels.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspect surfaces to receive glazing materials and report defects which might adversely affect the glazing work. Commencing work implies acceptance of surfaces as satisfactory.

B. Surfaces must be free of condensation and moisture.

3.02 PREPARATION

A. Clean rebates and glazing reveals free of foreign matter, special coatings, dust, grease, projections and irregularities prior to setting glass. Solvents used for cleaning shall not etch or damage glass or metal surfaces.

3.03 INSTALLATION

A. Conform to recommendations of glass manufacturer where such covers points not shown on Drawings or specified herein.

B. Remove "loose" stops furnished with the units and reinstall as a part of the glazing operation.

C. Handle lites so as to prevent nicks and flares on glass edges.

D. Set glass to maintain bite, edge and face clearance stipulated by code and the manufacturer.

E. Install door hinges per manufacturer’s instructions.

3.04 PROTECTION

A. Protect installed glass from damage due to subsequent construction operations.

B. Identification or caution markers shall not be applied to glass surfaces nor shall they be applied to metal surfaces in any way which would damage or stain the metal.

C. Replace glasses broken or damaged prior to acceptance of project. Costs occasioned by replacement shall be borne by those causing the damage.

3.05 CLEANING

A. At completion of installation remove excess materials, and leave the project site in a clean neat condition.

END OF SECTION

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SECTION 09 2216

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Non-load bearing metal studs for interior wall assemblies.

B. Related Sections:
1. Section 09 2900 – Gypsum Board.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM A 780 – Standard Practice for Repair of Damaged and Uncoated areas of Hot-Dip Galvanized Coatings; 2015.
2. ASTM A 1003 – Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic- Coated for Cold-Formed Framing Members; 2013.
3. ASTM B 633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.
4. ASTM C 645 – Standard Specification for Nonstructural Steel Framing Members, 2014.
5. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products, 2011.
6. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.

B. AISI Cold Formed Steel Design Manual; 2013.

C. AWS D.1.3 – Structural Welding Code – Sheet Steel; 2008.

1.03 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product specified, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

B. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.06 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer of non-structural metal framing shall be Clark Dietrich, West Chester, OH, (513) 870-1300. www.ClarkDietrich.com, or equal.

2.02 MATERIALS

A. Cold-Formed Steel Sheet Complying with ASTM A 1003/A 1003M; unless indicated otherwise.

B. Galvanized Coating: G40 coating weight minimum. Complying with ASTM C 645.

2.03 COMPONENTS

Studs: Cold formed galvanized steel sheet C-studs, in conformance with AISI Specifications for Design of Cold Formed Steel Structural members; Clark Dietrich ProSTUD drywall Framing System.

1. Designation: 33 MIL (20 STR Gauge), 0.0329 inches sheet thickness.
2. Web Size: 3-5/8 inches unless noted otherwise.
3. Flanges: Equal lengths 1-1/4-inches.
4. Section Properties: Manufacturer's standard section properties.

B. Runner Track: Cold form galvanized steel sheet in conformance with AISI Specifications for Design of Cold Formed Steel Structural Members; Dietrich Big "D" drywall runner track.

1. Designation: 33 MIL (20-S Gauge), 0.0329 inches sheet thickness, 1-1/4 inch leg height.
2. Track Size: 3-5/8 inches unless noted otherwise.
3. Flanges: Equal lengths 1-1/4-inches.
4. Section Properties: Manufacturer's standard section properties.

C. Furring Channel: Cold formed galvanized steel sheet in conformance with AISI Specifications for Design of Cold Formed Steele Structural Members; Clark Dietrich furring channel.

1. Designation: 087F125-33, 20-STR gauge, 0.0329 inches thick, 7/8 inches height, 2-11/16 inches width; Dietrich Bid "D" furring channel.

D. Gypsum Board Corner Bead: Cold formed galvanized steel sheet.

1. Type: Heavy Construction - CB.
2. Flange Length: 1-1/4 inches.

E. Framing Component Accessories: Provide the following accessories as required for a complete system.

1. Clip Angle (AC).
2. Angles.
3. Backing Strip.

F. Fasteners: Self-drilling, self-tapping screws; steel, complying with ASTM C 1002; galvanized coating, plated or oil-phosphate coated complying with ASTM B 633 as

needed for required corrosion resistance.

G. Touch-Up Paint: Zinc rich, containing 95-percent metallic zinc, ZRC 350 as manufactured by ZRC Worldwide, Marshfield, MA.

H. Non-Hardening, Flexible Sealant: latex acrylic.

2.04 FABRICATION

A. General: Framing components may be preassembled into panels prior to erecting.

B. Fabricate panels square, with components attached in a manner so as to prevent racking or distortion.

C. Cut all framing components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Hold members positively in place until properly fastened.

D. Fasteners: Fasten components using self-tapping screws or welding.

E. Welding: Welding is permitted on 18 gauge, 0.0428 inches (1.22 mm) or heavier material only.
1. Indicate welding configuration and size on shop drawings.
2. Qualify welding operators in accordance with Section 6.0 of AWS D1.3.
3. Touch-up all welds with zinc-rich paint in compliance with ASTM A 780.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation, inspect previous work of all other trades. Verify that all work is complete and accurate to the point where this installation may properly proceed in strict accordance with framing shop drawings.

B. If substrate preparation is unsatisfactory, notify the Architect before proceeding.

3.02 ERECTION

A. Install cold formed framing in accordance with requirements of ASTM C 754.

B. Perform welding in accordance with AWS D.1.3.

C. Framing Installation:
1. Erect framing and panels plumb, level and square in strict accordance with approved drawings.
2. Handle and lift prefabricated panels in a manner to not cause distortion in any member.
3. Anchor runner track securely to the supporting structure. Install concrete anchors only after full compressive strength has been achieved.
4. Butt all track joints. Securely anchor abutting pieces of track to a common structural element, or butt-weld or splice them together.
5. Align and plumb studs, and securely attach to the flanges or webs of both upper and lower tracks.
6. Attach wall stud bridging in a manner to prevent stud rotation. Space bridging rows according to manufacturer's recommendations.
7. Provide temporary bracing until erection is completed.
8. Where indicated in the drawings, provide for structural vertical movement using

means in accordance with manufacturer's recommendations.

9. Provide provision for structure vertical movement where indicated on drawings.

3.02 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09 2400

PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Furring and lathing including metal accessories.
2. Portland cement plaster scratch and brown coats with integral color acrylic finish coat.

B. Related Requirements:
1. Sheet Metal Flashing and Trim: Section 07 6200.
2. Flexible Flashing and Underlayment: Section 07 6500; underlayment paper and flexible flashings.
3. Joint Sealants: Section 07 9200.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:

1. Action and Informational Submittals shall be submitted in accordance with Section 01 3300, “Submittal Procedures.”

B. Pre-installation Meeting: Prior to installation of portland cement plaster work, Contractor, Architect, plaster installer, and other installers whose work may affect quality of installation shall meet at the Project site to coordinate related requirements and plastering.

1. Notify participants at least 5 working days before conducting meeting.

2. Review material selections and procedures to be followed in performing the work.

3. Review in detail job conditions, schedule, construction sequence, curing procedures, required appearance of finish coat, and quality of completed installation.

4. Review underlayment, flashing, and lath installation with special attention to detailing of flashing at openings.

5. Contractor shall record discussions of conference and any conflict, incompatibility, or inadequacy and furnish a copy of record to each participant.

1.03 ACTION SUBMITTALS

A. Product Data: Manufacturer's published literature containing complete description for lath, metal accessories including fasteners, control joints, and instructions for mixing and application of plaster.

B. Samples: 12-inch-square panel of plaster showing finish coat texture and color.

1.04 INFORMATIONAL SUBMITTALS

A. Statement of applicator qualifications.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Application of specified plaster system on at least three projects equal in scope to this Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Keep cement dry, stored off ground, under cover, and away from damp surfaces.

B. Remove wet and deteriorated materials from Project site.

C. Protect metallic materials and accessories from dampness or wetting.

D. Comply with additional requirements specified in Section 01 6000, "Product Requirements."

1.7. FIELD CONDITIONS

A. Ambient Conditions:

1. Cold-Weather Requirements: Do not apply cement plaster, unless minimum ambient temperature has been at least 50 degrees F for at least 48 hours prior to application and temperature can be maintained at that level until plaster is cured.

2. Hot-Weather Requirements: Protect cement plaster from uneven and excessive evaporation during hot, dry weather.

B. Protection:

1. Protect finished surfaces installed prior to plastering as required to prevent damage.

2. Maintain protection in place until completion of plastering.

PART 2 - PRODUCTS

2.01 DESIGN AND PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with requirements of CBC Article 25 and all local amendments, except as otherwise specified.

B. Industry Standards: Comply with applicable requirements of ASTM C847, ASTM C897, ASTM C926, and ASTM C1068.

2.02 FURRING AND LATHING MATERIALS

A. Self-Furring Welded Wire Lath: Galvanized welded steel-wire fabric, 17-gage minimum, with openings not to exceed 1.5 inches, and conforming to ASTM C933. “Megalath” by Structa Wire, or equal.

1. Weight: Not less than 1.95 pounds per square yard.

2. Provide with crimped cross wires forming a continuous 1/4-inch-deep furring crimp at nominal 3-inches on center.

B. Expanded Metal Reinforcing Lath: Flat, diamond mesh expanded galvanized-steel sheets,

C. Protective Finishes:

1. Galvanize all ferrous items, unless otherwise indicated.
2. Fabricate metal lath and furring from galvanized sheet steel complying with ASTM A653.

2.03 FURRING AND LATHING ACCESSORIES

A. Zinc and Zinc-Coated (Galvanized) Accessories:

1. General:

a) Products shall conform to material requirements for accessories of ASTM C1861
b) Provide in maximum possible lengths.
c) Flanges
1) Design to permit complete embedment of accessory in plaster.
2) Provide for alignment and attachment to underlying surface.

2. Casing Beads: Square edge “J” style with expanded flanges; #66X by ClarkDietrich Building Systems, or equal.

3. External Corner Beads: Small, plastic nosed, with welded wire flanges at least 2-1/2 inches wide; by Stockton Products, or equal.

4. Internal Corner Expansion Joint: Double “V” with expanded flanges; #30 “Corner Master” by ClarkDietrich Building Systems, or equal.

5. Vertical Control Joints: Double “J” style with expanded flanges; “#XJ-15” by ClarkDietrich Building Systems, or equal.

6. Weep (“Drip”) Screed: Model W-S (#7) by Stockton Products, or equal.

7. Horizontal Control Joints: “Solid Leg; #15 by CEMCO, or equal.

B. Aluminum Accessories: Extruded; Fry Reglet Corp. as specified, or equal.

1. Channel Screed: Model PCS-75-150.

a) Reveal Width: 1-1/2 inch.
b) Reveal Depth: 3/4 inch.

2. Finish: Manufacturer’s standard paint coating in custom colors to match appearance of portland cement plaster at location of use.

C. Tie Wire: ASTM A641; 0.0625-inch nominal diameter (No. 16 W&M gage) minimum.

D. Provide miscellaneous components required for completion of installation.

2.04 UNDERLAYMENT AND FLEXIBLE FLASHING

A. Paper Underlayment and Self-Adhering Flashings: As specified in Section 07 6500, “Flexible Flashing and Underlayment.”

2.5 BASE COAT MATERIALS

A. Premixed Fibered Base Plaster: Factory prepared blend of portland cement, sand, reinforcing fibers, and lime conforming to ASTM C926; LaHabra “Fiber-47 Fastwall” by Parex USA, Inc., “Super Cement” with fibers by Omega Products International, “BMI 690F” by BMI Products, or equal.

2.06 FINISH COAT MATERIALS

A. Primer: Color matched by manufacturer of finish coat; “LaHabra Acrylic Primer” by Parex USA, Inc., or equal.

B. Finish Coat with Integral Color: Factory-mixed, integral color, water-based formulation of 100 percent acrylic binder, colorfast mineral pigments, quartz sand aggregate; with dirt- pickup-resistant finish; LaHabra “Perma-Flex” Stucco Grade Acrylic Finish by Parex USA, Inc., “or equal.

1. Color: Standard or custom, as selected by Architect.

2. Texture: Equal to LaHabra “Fine.”

2.07 ACCESSORIES

A. Water: Potable and free from substances harmful to plaster.

2.08 MIXES

A. General:

1. Mix factory-prepared plasters in accordance with manufacturer's written instructions.

2. Accurately proportion materials for each plaster batch with measuring devices of known volume.

3. Size batches for complete use within maximum of | hour after mixing.

4. Retemper plaster stiffened from evaporation, but do not use or retemper partially hydrated cement plaster.

5. Do not use caked or lumping materials.

B. Hand Mixing: Do not hand-mix, unless small amounts are needed, using less than one bag of plaster material.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that support framing is spaced in accordance with code requirements.

B. Examine construction, grounds, and accessories to ensure that finished plaster surfaces will be true to line, level, and plumb, without requiring additional thickness of plaster.

C. Apply protective coverings to prevent application or spilling of plaster on surfaces not intended to receive plaster.

D. Verify that membrane air barrier and flashings have been applied and are acceptable at all locations.

3.2. INSTALLATION OF METAL LATH

A. General: Furring and lathing shall be installed in accordance with ASTM C1063.

B. Welded Wire Lath:

1. Unroll exercising care to minimize any undue distortions or stepping on the lath.

2. Apply with long dimension at right angles to supports.

3. Follow manufacturers' installation instructions for initial securing and fastening at each framing member at 6-inch intervals.

4. Secure with galvanized pan-head or washer head screws of sufficient length to penetrate into metal framing.

5. Stagger ends of lath to avoid continuous joints on same support.

6. Comply with manufacturer's recommendations for end and side laps.

3.3. INSTALLATION OF METAL ACCESSORIES

A. General:

1. Fasten in place using wire ties or non-corrosive/non-corroding screws as required to prevent dislodging or misalignment by subsequent operation.

2. Fasten at both ends and maximum 7 inches on center along sides.

3. Bring grounding edge of accessories to true lines, plumb, level, and straight.

4. Install accessories to provide required depth of plaster and to bring plaster surface to required plane.

5. Connect lengths of accessories as recommended by manufacturer to assure a continuous line.

6. Where plaster abuts dissimilar materials, terminate with plaster casing bead.

B. Control Joints:

1. Install at locations and at spacing shown on the Drawings.

2. If not shown, space control joints, as directed by the Architect, so as to provide plaster panels not exceeding 144 square feet with no dimension exceeding 18 feet or a length-to- width ratio of 2-1/2 to 1.

3. Fasten discontinuous lath edges to framing by wire tying accessory to lath.

C. Weep Screed: Install at bottom of wall overlapping metal flashing as shown.

3.04 APPLICATION OF PLASTER - GENERAL

A. Comply with ASTM C926.

B. Apply first and second coats of three-coat system by hand or gun applied.

C. Provide plaster surfaces that are ready to receive field-applied finish.

D Interrupt cement plaster only at junctions of plaster planes, at openings, and at c control joints. Do not make cold joints in plaster.

E Plaster Thickness Measured from Back Face of Lath: 7/8 inch typical.

1. First (Scratch) Coat: 3/8 inch minimum, 1/2 inch maximum.

2. Second (Brown) Coat: 1/4 inch minimum, 3/8 inch maximum.

3. Third (Finish) Coat: 1/8 inch minimum.

3.05 APPLICATION OF PLASTER BASE COATS

A. Apply scratch coat with sufficient quantity of material to embed and fill all spaces of lath and to form keys through metal lath.

B. Allow scratch coat to set slightly, then score surface using metal scratching tool with teeth | inch apart.

C. Score surfaces in direction perpendicular to direction of supporting framing.

D. Apply brown coat to scratch coat, bringing out to grounds, flat to true surface.

1. Reconsolidate brown coat by floating or brushing to eliminate “slick spots” and assure a good mechanical bond with finish coat.

2. Completed brown coat shall be free of imperfections that would reflect in finish coat.

3.06 CURING OF PORTLAND CEMENT BASE COATS

A. Moist-cure scratch and brown coats.

1. Maintain moist conditions by fine fog spray.

2. Each coat must maintain a dark gray color to ensure full hydration at the end of each day.

3. Moist-curing conditions shall be continuously maintained. Moisture curing on weekends and holidays is required only in the event of temperatures exceeding 95 degrees F and/or winds in excess of 25 miles per hour, unless otherwise acceptable to District.

4. Curing may vary depending on weather conditions. Additional moisture curing is required if winds are above 20 mph.

5. Dampen scratch coat immediately before applying brown coat, and brown coat immediately before applying finish coat.

B. Allow scratch coat to cure not less than 48 hours prior to application of brown coat. Do not use the “double-back method” of applying brown coat immediately after scratch coat has set or is “thumb-print” hard.

C. Permit brown coat to cure minimum 7 days after application prior to applying finish coat.

D. The above curing times and methods shall be adjusted by Contractor for environmental conditions during the curing period as recommended in ASTM C926, Appendix. When such conditions occur, provide written notification and justification to Architect.

3.7. APPLICATION OF FINISH COAT

A. Prior to application, surface irregularities in base coat, such as trowel marks, board lines, and reinforcing mesh laps shall be corrected.

B. Do not apply until portland cement base coats have been allowed to cure as specified.

C. Comply with in accordance with manufacturer's instructions, ASTM C926, and specified requirements to minimum 1/8 inch thickness.

D. Apply finish coat to achieve approved appearance and textures.

1. Finish coat shall be applied and textured continually over a wall surface.

2. Maintain a wet edge at all times to obtain a uniform appearance.

3. Work to corners or joints, and do not allow the material to set up within a distinct wall area.

4. Tool finish coat off of drainage screed nosing to promote drainage.

E. Sufficient staging and workers shall be employed to accomplish a uniform appearance. All applicators shall use the same tools, equipment and techniques to achieve uniformity.

F. Cure proprietary finish in accordance with manufacturer's instructions.

3.8 FIELD QUALITY CONTROL

A. Installation Tolerances: Maximum deviation from true plane of 1/8 inch as measured from the line of a 10-foot straightedge placed at any location on surface.

B. Repair cracks greater than 30 mils width, or otherwise objectionable to Architect.

3.9 ADJUSTING AND CLEANING

A. Patching:

1. Point up plaster around trim and other locations where plaster meets other materials.

2. Cut out and patch defective or damaged plaster.

3. Match patch of defective or damaged plaster to existing work in form, color, and texture.

4. Patch shall be continuous to corner or control joint.

B. Cleaning: Remove plaster and protective materials from expansion beads, perimeter beads, and adjacent surfaces.

END OF SECTION

SECTION 09 2900

GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Gypsum board systems as shown on the Drawings or specified herein. This Section also includes:
   1. Caulking and sealants related to gypsum board systems sound retardant construction.
   2. Cementing and taping.

B. Related Sections:
   1. Section 08 1113, Hollow Metal Doors and Frames
   2. Section 09 2216, Non-Structural Metal Framing
   3. Section 09 9000, Painting
   4. Division 22, Plumbing
   5. Division 23, Heating, Ventilating, and Air Conditioning
   6. Division 26, Electrical

1.02 REFERENCES

A. The following references, codes and standards are hereby made a part of this Section. Gypsum board work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing in the Drawings or these Specifications shall be construed as permitting work that is contrary to code requirements.

B. Gypsum Association, latest editions:
   1. GA-216 “Application and Finishing of Gypsum Panel Products".
   2. GA-214 “Recommended Levels of Gypsum Board Finish".
   3. Drywall Information Trust-Textures for Drywall Systems Used in California.

C. California Building Code, current edition.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12 inch long length for each trim accessory indicated.
   2. Textured Finishes: 12 inch by 12 inch sample for each textured finish indicated and on same backing indicated for Work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers or bundles bearing brand and manufacturer's names.

B. Store materials in protected dry storage areas. Neatly stack in flat position with suitable stickers to prevent sagging and contact with concrete slabs.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Gypsum Board: ASTM C36 and C1396. Pieces to be 4 feet wide, lengths as required for minimum of end joints. Tapered edge for finish surfaces butt edge for concealed surfaces.
   1. Fire rated board for fire resistance rated assemblies, Type X, tapered edges, 48 inches wide, 5/8-inch thick.
   2. Water resistant board, tapered edges, 48 inches wide, 5/8-inch thick.
   3. Water resistant board, Type X, mold-resistant, tapered edges, 48 inches wide, 5/8-inch thick.
   4. High impact type, plastic film laminated to back side for greater resistance to through-penetration (impact resistance).
      (1) Core: 5/8-inch thick.
      (2) Plastic Film Thickness: 0.010-inch.
   5. Soffit board, 48 inches wide, tapered edge, maximum permissible length, Type X at exterior soffit applications.

B. Fire-Rated Moisture and Mold Resistant Board: ASTM C1396, Type X, unless more stringent required by code; USG “Sheetrock Mold Tough Firecode Core,” or accepted equal.
   1. Thickness: 5/8 inch, unless otherwise noted.
   2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
   3. Mold Resistance: 10 on scale of 10 in when tested accordance with ASTM D3273.
   4. Moisture Resistance: The average water absorption for panels shall not exceed 5 percent by weight after two-hour immersion when tested in accordance with ASTM C473.

C. Gypsum Board, Type C: ASTM C 1396, manufactured to have increased fire-resistive capability; USG “Firecode C Core,” or accepted equal.
   1. Thickness: 5/8 inch, unless otherwise noted, and as required by fire-resistance-rated assembly.
   2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

D. Sheathing Board at Walls (Dens Glass Sheathing) Silicone treated gypsum core, surfaced with inorganic glass mats and gold color alkali resistant surface coating, 5/8-inch thick, as manufactured by Georgia Pacific, “Dens-Glass Gold”, or approved equal

G. Gypsum Board Accessories:
   1. Metal Edge Trim: USG 200-A, National Gypsum No. 100, or equivalent, where board edge is exposed; where edge is not exposed, USG 200-B, National Gypsum No. 00, or equivalent, may be used. Corner bead to be USG "Dur-A-Bead, 1-1/4 inch by 1-1/4 inch or National Gypsum Wallboard corner bead 1-1/8 inch by 1-1/8 inch.
   2. Fasteners: ASTM C 1002.
      a. Metal Framing: Type ‘S’ self-drilling and self-tapping drywall screws. 1 inch long screws for 5/8 inch board.
      b. Screw sizes given are for material applied directly to framing; where material is applied over backing, increase screw size for a minimum 5/8 inch penetration into wood bearing and 3/8 inch minimum into metal bearing.
      c. Conform to CBC, Section 2508 and manufacturer’s assembly approvals.
   3. Tape and Cement: As recommended by gypsum board manufacturer and meeting ASTM C 475 non-asbestos containing.
   4. Caulking and Sealant:
      a. Concealed: Inmont "Presstite" 579.64, polyisobutylene, non-drying, non-skinning, gun grade; Tremco or USG "Acoustical Sealant", synthetic rubber, non-drying, non-skinning, gun grade; or approved equal or Coplanar Corp. "Polycel One", Pecora "Dyrafoam I", or approved equal, polymeric foam sealant.

b. Exposed: Pecora, DAP, Tremco, or approved equal, one component butyl sealant, skinning type, gun grade, white or gray color.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspect surfaces, backing, structural systems, etc., to receive wallboard, and report discrepancies. Starting work implies acceptance of existing conditions.

3.02 PREPARATION

A. Coordinate with other trades for provisions for insulation, blocking, backing, special anchors, etc., and ensure that such items are properly installed and located prior to installing wall finish.

B. Coordinate with trades responsible for furnishing access doors with exact locations subject to Architect's approval.

3.03 INSTALLATION

A. Erect gypsum wallboard systems in accord with applicable requirements of References, Codes and Standards Article, referenced manufacturer's specifications and governing codes. In event of conflict with Gypsum Association Standards, Code and manufacturer's specifications shall govern.

B. Install wallboard plumb, level, and/or plane, applied vertically or horizontally with vertical edges and ends on bearing except that gypsum board applied over sound deadening board shall be applied vertically only.
1. Where board is applied horizontally, place rippers, if required, so that the cut edge is at the ceiling or floor; cut edges and ends will not be acceptable within the field of the gypsum board.
2. Properly space fastenings as per manufacturer's specifications and code requirements, with heads driven slightly below surface for proper cementing, but without breaking paper covering.
3. Loosely butt joints to be taped; firmly butt concealed joints to be left untreated.
4. Stagger end joints and joints in finish material 12 inches minimum with those in backing. Joints on opposite sides of partition shall occur on different studs.
5. Install backing for finish material to present no surface imperfections in applied finish.
6. Make holes and cutouts by sawing or by such method as will not fracture core or tear covering and with such accuracy that plates, escutcheons, trim, etc. will cover edges. Clearance for cutouts in partitions shall not exceed 1/4 inch.

C. Caulking for Sound Control: Insulate construction with caulk as indicated on Drawings. In addition, caulk penetrations of sound insulated construction such as conduit, pipes, ducts, registers, etc., so that such openings are sealed tight against passage of airborne sound.
1. Holes smaller than 1 inch but too large to caulk shall be packed with glass fiber, sealed over with 1/16 inch thick sheet lead and then caulked airtight.
2. Seal the backs of electrical boxes in sound insulated construction airtight using specified resilient sealer pads.
3. Conceal caulking and sealing where possible; where caulking must remain exposed, use skinning type material and neatly tool.

D. Install metal edge trim at exposed edges and ends and at untrimmed joints between wallboard finish and other material. Where edge trim is required at wallboard edge, and headers, studs, sill or other backing are not available for positive fastening of trim, apply trim

to board with contact type of adhesive.

3.04 TAPING AND FINISHING

A. Environmental conditions: Control heating and ventilation during finishing operations to ensure the maintenance of 55 degree F. minimum temperature at least 48 hours prior to, during, and following the application of the gypsum board and joint treatment material or the bonding of adhesives.

B. Tape and finish gypsum board in accordance with ASTM C 840 and GA-214.
   1. Provide a level 1 finish in mechanical rooms and plenums.
   2. Provide a level 3 finish in areas to be covered with acoustical tile, or vinyl wall covering.
   3. Provide a Knock Down texture over a level 3 finish at exposed areas.
   4. Provide a level 4 finish in Storage, Janitor and electrical rooms.
   5. Provide a Level 5 finish at exposed areas in Toilet rooms.

3.05 CLEANING

A. Do not allow the accumulation of scraps and debris arising from the work of this Section but maintain the premises in a neat and orderly condition. In the event of spilling or splashing compound onto other surfaces, immediately remove the spilled or splashed material and trace residue to the approval of the Architect.

END OF SECTION

SECTION 09 9000

PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Surface preparation and field application of paints and coatings on all surfaces scheduled to receive paint.

2. Cleaning and preparation of surfaces.

B. Related Sections:

1. Section 03 3000 - Cast-In-Place Concrete.
2. Section 05 5000 - Metal Fabrications: Shop primed products.
3. Section 08 1113 – Metal Doors and Frames.
4. Section 09 2900 - Gypsum Board.
5. Division 22 - Plumbing.
6. Division 23 - Heating, Ventilating, and Air-Conditioning.
7. Division 26 - Electrical.

C. Color Schedule: Provide paint colors as selected by the Architect.

1. Prior to commencement of work, the Architect will furnish three copies of color schedule. Accent colors used for exterior and interior surfaces shall not exceed 40 percent. Color selection will include up to eight different colors.

2. Where deep tone colors are scheduled, provide sufficient extra coats of paint as required to provide uniform color.

1.02 REFERENCES

A. American Society for Testing and Materials:

1. ASTM D16 - Terminology Relating to Paint, Varnish, Lacquer, and Related Products.

2. ASTM D2486 - Test Method for Scrub Resistance of Wall Paints.

3. ASTM D5031 - Practice for Conducting Tests on Paints and Related Coatings and Materials Using Enclosed Carbon-Arc Light and Water Exposure Applications.

B. Painting and Decorating Contractors of America (PDCA) - Architectural Specification Manual.

C. Steel Structures Painting Council (SSPC) - Steel Structures Painting Manual.

D. 2016 California Code of Regulations, Title 24:

1. Part 2, California Building Code, CBC.

2. Part 11, California Green Building Standards Code, CGBSC.

a. Conform to VOC-limits of Section 5.504.4.3.

1.03 SUBMITTALS

A. Comply with requirements of Section 01 3300, Submittals.

B. Product Data: Manufacturer's description of products and manufacturer's preparation, mixing and application instructions.

C. Samples: Prepare four (4) sets of 8-1/2 x 11 inch sample “brush-outs” of each paint color and finish. Apply finishes on identical type materials to which they will be applied on job.

D. Identify each sample as to color name and mixture number, finish, formula, sheen name and gloss units in accordance with ASTM D16.

E. Manufacturer's Instructions: Indicate special surface preparation procedures, substrate conditions requiring special attention.

F. Material Safety Data Sheets (MSDS): Send MSDS directly to site. Do not send to Architect for review.
1. Provide manufacturer's material safety data sheets for all products proposed for use on the project.
2. Products containing volatile and semi-volatile aromatic hydrocarbons, halogenated aliphatic and aromatic hydrocarbons, mucous membrane irritants, central nervous system depressants, and liver and kidney toxins and compounds found on the California Proposition 65 list of known carcinogens shall not be used.
3. Where there is a suitable alternative product, products which have any of the above mentioned components shall not be used.

1.04 QUALITY ASSURANCE

A. Acceptable manufacturers, materials, workmanship and all items affecting the work of this section is to be in accordance with Division One - Product Requirements.

B. Applicator: Company specializing in performing work of this section with minimum three (3) years documented experience, and possessing a valid Contractors State License Board C-33 Painting & Decorating license.

C. Pre-Installation Meeting: Convene at least two weeks prior to starting work of this section. Review detailed requirements of this Section.

1.05 DELIVERY. STORAGE AND HANDLING

A. Deliver paint materials in sealed and labeled containers, inspect to verify acceptability.

B. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, clean-up requirements, color designation and instructions for mixing and/or reducing.

1.06 ENVIRONMENTAL CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F. for interiors; 50 degrees F. for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish and Epoxy Finishes: 65 degrees F. for interior, unless required otherwise by manufacturer's instructions.

E. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 45 degrees F. for 24 hours before, during and 48 hours after application of finishes.

F. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

1.07 MAINTENANCE

A. Extra Materials: Provide 1 gallon of each color and type to District.
1. Label each container in accordance with ASTM D16 with color, type, room locations in addition to manufacturer's label.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Paints:
1. Campus Standard: Kelly Moore, www.kellymoore.com.
2. Substitutions: Not allowed.

B. Non-bridging Paint:
1. SonoKote Romabio/EcoDomus
2. Dunn Edwards Acoustikote
3. Or equal as approved.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:
1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
2. For good flow and brushing properties.
3. Capable of drying or curing free of streaks or sags.

B. Volatile Organic Compound (VOC) Content:
1. Provide coatings that comply with the most stringent requirements specified in the following:
a. Architectural coatings VOC limits of State in which the project is located.
b. USGBC LEED-NC Rating System, Version 2.2, EQ Credit 4.2; for interior wall and ceiling finish (all coats), anti-corrosive paints on interior ferrous metal, clear wood stains and finishes, sanding sealers, other sealers, shellac, and floor coatings.
c. Anti-corrosive anti-rust paints applied to interior ferrous metal substrates and VOC content limits-Green Seal Standard GC-03.

C. Chemical Content: The following compounds are prohibited:
   1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.

2.03 PAINT SYSTEMS – EXTERIOR

A. Not all paints and coatings listed are used in all projects.

B. Paint WE-OP-3L - Wood, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer; ACRY-SHIELD 100% Acrylic Exterior Wood Primer.
   2. Gloss: Two coats of latex enamel; 1680 Dura-Poxy + 100% Acrylic Gloss Enamel.
   3. Semi-gloss: Two coats of latex enamel; 1250 Acry-Shield 100% Acrylic Exterior Semi- Gloss Enamel.
   4. Satin; Two coats of latex enamel; 1245 Acry-Shield Exterior Low Sheen Acrylic Finish.
   5. Flat; Two coats of latex enamel; 1240 Acry-Shield Exterior Flat Acrylic Finish

C. Paint WE-TR-VS - Wood, Transparent, Varnish, Stain:
   1. Filler coat (for open grained wood only).
   2. One coat sealer.
   3. Satin: One coat of varnish; Varathane 93 Spar Urethane Satin.

D. Paint CE-OP-3L - Concrete, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer; 521 FILL & PRIME Acrylic Block Filler
   2. Semi-gloss: Two coats of latex enamel; 1250 ACRY-SHIELD 100% Acrylic Exterior Semi-Gloss Enamel.
   3. Satin: Two coats of latex enamel: 1245 Acry-Shield Exterior Low Sheen Acrylic Finish.
   4. Flat: Two coats of latex enamel; 1240 ACRY-SHIELD 100% Acrylic Exterior Flat Finish.

E. Paint ME-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
   1. One coat of latex primer, 5725 DTM Acrylic Primer/Finish.
   2. Gloss: Two coats of latex enamel; 5880 Direct-to-Metal Acrylic Gloss Enamel.
   3. Semi-gloss: Two coats of latex enamel; 5885 Direct-to-Metal Acrylic Semi-Gloss Enamel.

F. Paint ME-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Gloss: Two coats of latex enamel; 5880 Direct-to-Metal Acrylic Gloss Enamel.

3. Semi-gloss: Two coats of latex enamel; Direct-to-Metal Acrylic Semi-Gloss Enamel.

G. Paint MgE-OP-3L - Galvanized Metals, Latex, 3 Coat:
1. One coat primer. 1725 ACRY-SHIELD 100% Acrylic Metal Primer.
2. Gloss: Two coats of latex enamel; 1680 DURA-POXY + 100% Acrylic Gloss Enamel.
3. Semi-gloss: Two coats of latex enamel; 1250 ACRY-SHIELD 100% Acrylic Exterior. Semi-Gloss Enamel.

H. Paint MaE-OP-3A - Aluminum and Copper, Unprimed, Alkyd, 3 Coat:
1. One coat etching primer: XIM 400 Primer
2. Gloss: Two coats of alkyd enamel; 1700 KEL-GUARD Alkyd Rust-Preventative Gloss Enamel.
3. Semi-gloss: Two coats of alkyd enamel; 6630 PLASTI-NAMEL Alkyd Rust Preventative Semi-Gloss Enamel.

2.04 PAINT SYSTEMS - INTERIOR

A. Not all paints and coatings listed are used in all projects.

B. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:
1. One coat of water-based primer sealer; 975 Acry-Plex Interior Latex Enamel Undercoat.
2. Semi-gloss: Two coats of latex enamel; 1520 Enviro-Cote Interior Acrylic Semi-Gloss Enamel.
3. Eggshell: Two coats of finish paint; 1510 Enviro-Cote Interior Acrylic Satin Enamel.

C. Paint WI-TR-V - Wood, Transparent, Varnish, No Stain:
1. One coat sealer.
2. Satin: One coat of varnish; Varathane 91 Polyurethane Satin. a. Comply with SCAQMD VOC limits.

D. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
1. One coat of waterborne acrylic primer; 1725 Kel-Guard Acrylic Metal Primer.
2. Semi-gloss: Two coats of enamel; 1520 Enviro-Cote Interior Acrylic Semi-Gloss Enamel.
3. Eggshell: Two coats of finish paint; 1510 Enviro-Cote Interior Acrylic Satin Enamel.

E. Paint MI-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with latex primer.
2. Semi-gloss: Two coats of enamel; 1520 Enviro-Cote Interior Acrylic Semi-Gloss Enamel.

F. Paint MgI-OP-3L - Galvanized Metals, Latex, 3 Coat:
1. One coat galvanize primer; 1722 Kel-Guard Acrylic Galvanized Iron Primer.

2. Semi-gloss: Two coats of latex enamel; 1520 Enviro-Cote Interior Acrylic Semi- Gloss Enamel.

G. Paint MaI-OP-3L - Aluminum, Unprimed, Latex, 3 Coat:
1. One coat etching primer. 1722 Kel-Guard Acrylic Galvanized Iron Primer.
2. Semi-gloss: Two coats of latex enamel; 1520 Enviro-Cote Interior Acrylic Semi-gloss Enamel.

H. Paint GI-OP-3LA - Gypsum Board/Plaster, Acrylic Co-Polymer, 3 Coat:
1. One coat of water-based primer sealer; 971 Acry-Prime Interior Primer Sealer.
2. Semi-gloss: Two coats of latex enamel; 1520 Enviro-Cote Interior Acrylic Semi-Gloss Enamel.
3. Eggshell: Two coats of finish paint; 1510 Enviro-Cote Interior Acrylic Satin Enamel.
4. Flat: Two coats of latex; 1500 Enviro-Cote Interior Acrylic Flat Paint.

I. Paint Other: Non-Bridging Paint for existing Acoustical Panels, number of coats as recommended by manufacturer.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and substrate conditions are ready to receive work as instructed by product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report in writing to the Architect, any condition that may potentially affect proper application. Do not commence until all such defects have been corrected.

C. Test shop applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic "Moisture Meter" with one inch long prongs (minimum). Do not apply finishes unless the moisture content of surfaces are below the following maximums:

1. Plaster and gypsum wallboard: 12 percent.

2. Concrete and Masonry: 12 percent.

3. Interior located wood: 15 percent.

E. Measure exterior Portland cement for pH value using litmus paper. If pH value is 8 or less, paint can be applied, if more than 8, wait until pH value is determined to be less than 8, or consult manufacturer's data sheets for recommendation.

3.02 PREPARATION OF SURFACES

A. Comply with Painting and Decorating Contractors of America (PDCA) Architectural Specifications Manual, and as herein specified.

B. Remove all electrical cover plates, surface hardware, fittings, escutcheons, and fastenings, prior to painting operations.
   1. Store items carefully, clean and replace on completion of work.
   2. Do not use solvent to clean hardware that may remove the permanent lacquer finish.

C. Prepare all surfaces, including areas to be patched, in strict accordance with paint manufacturer's published instructions for each particular substrate condition.
DO NOT SAND OR GRIND ANY PAINTED SURFACE.

D. Adequately protect other surfaces from paint and damage. Make good any damage as a result of inadequate or unsuitable protection.

E. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation area.

F. Place cotton waste, cloths and material which may constitute a fire hazard in closed metal containers and remove daily from site.

G. Impervious Surfaces: Remove mildew, by scrubbing with a solution of tri-sodium phosphate. Rinse with clean water and allow surface to dry completely.

H. Gypsum Wallboard Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

I. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply a coat of etching primer.

J. Shop Primed Steel Surfaces:

   1. Sand and scrape to remove all loose primer rust.
   2. Feather edges to make touch-up patches inconspicuous.
   3. Clean surfaces with solvent.
   4. Prime bare steel surfaces. Prime metal items including shop primed metals.

K. Interior Wood Items Scheduled to Receive Painted Finish: (verify)

   1. Remove dust, grit and foreign matter.
   2. Seal knots, pitch streaks and sappy sections.
   3. Fill nail holes with tinted exterior caulking compound after sealer has been applied.
   4. Allow caulking primer to cure as recommended by compound manufacturer.

L. Interior Wood Items Scheduled to Receive Transparent Finish: (verify)

1. Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer.
2. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

3.03 APPLICATIONS

A. Apply products in accordance with manufacturer's instructions.

B. Finishes specified are intended to cover surfaces satisfactorily when applied in accordance with manufacturer's recommendations.

C. Apply each coat to uniform finish.

D. Apply each coat of paint slightly darker than the preceding coat unless otherwise approved by the Architect.

E. Sand lightly between coats to achieve required finish.

F. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

G. Allow each coat of finish to dry before a following coat is applied, a minimum of 24-hours, unless directed otherwise by manufacturer.

H. Paint tops and bottoms of doors; match color of doors edges.

I. Where clear finishes are required ensure tint fillers match wood. Wood fillers well into the grain before it has set. Wipe excess from the surface.

J. Backprime exterior and interior woodwork, which is to receive a paint or enamel finish, with enamel undercoat paint.

K. Backprime interior woodwork, which is to receive a stain and/or varnish finish, with a gloss varnish. Do not thin varnish for backpriming.

L. Factory finished and anodized aluminum: No paint finish required.

M. Provide intumescent coating at all steel exposed surfaces of new lunch shelter. Prepare surfaces and applied coating as per manufacturer’s instructions.

3.04 MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Mechanical and Electrical sections with respect to painting and finishing requirements color coding identification banding of equipment, ducting, piping and conduit.

B. Remove grilles, covers and access panels for mechanical and electrical systems from location and paint separately.

C. Finish paint primed equipment to color selected in schedule.

D. Prime and paint insulated and bare pipes, conduits, boxes, except where items are plated or covered with a pre-finished cladding.

E. Replace identification markings on mechanical or electrical equipment when painted over or spattered.

F. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed immediately behind louvers, grilles.

G. Paint exposed conduit and electrical equipment occurring in finished surfaces.

H. Paint both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.

I. Color code equipment, piping, conduit and exposed ductwork in accordance with requirements indicated. All color banding and identification flow arrows, naming, numbering, etc., in accordance with ANSI requirements.

3.05 CLEANING

A. As the work proceeds and upon completion, promptly remove all paint where spilled, splashed or spattered.

B. During the progress of the work keep the premises free from any unnecessary accumulation of tools, equipment, surplus materials and debris.

C. Upon completion of work leave premises neat and clean, to the satisfaction of the Architect.

END OF SECTION

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SECTION 09 9500

VINYL TACKBOARD PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Vinyl wall covering factory applied over 1/2-inch thick fiberboard. Vinyl covered tackboard panel shall be applied over existing walls.

B. Related Sections
1. Section 08 1113, Metal Doors and Frames.
2. Section 09 2900, Gypsum Board.
3. Section 09 9000, Painting and Coatings

1.02 REFERENCES

A. ASTM - American Society for Testing and Materials: E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. UL - Underwriters' Laboratories Inc.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions.

B. Samples: Submit samples of each type of tackboard illustrating range of color and pattern variation; submit sets of sample moldings.

C. Certification: Submit manufacturer's certification that materials furnished for the work comply in all respects with requirements specified.

1.04 QUALITY ASSURANCE

A. Qualifications
1. Manufacturer: Provide each type of tackboard as produced by a single manufacturer including recommended primers, adhesives, and sealants.
2. Installer: A firm specializing in tackboard work and with not less than 3 years of experience in installing vinyl covered tackboard similar to those required for this work. The mechanic installing board shall provide examples of similar successful projects.

B. Fire hazard classification: Provide materials bearing UL label and marking, indicating fire hazard classification of wall covering, as determined by ASTM E84.

C. Provide materials with the following fire hazard classification:
1. The flame spread rating of the vinyl covering shall be Class 1 with a flame spread rating of not more than 25 and smoke density no greater than 450.
2. The 1/2-inch thick tackboard underlayment shall be Class 3 rated, flame spread rating of 76 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with instructions and recommendations of manufacturer and as herein specified.

1.06 PROJECT CONDITIONS

A. Maintain constant minimum temperature of 60 degrees Fahrenheit at areas of installation for a least 72 hours before and 48 hours after application of materials.

B. Illuminate areas of installation using building's permanent lighting system; temporary lighting alone will not be acceptable.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Koroseal, “School Collection”
   2. Approved equal.

2.02 MATERIALS

A. Vinyl Covered Tackboard
   1. General: Comply with FS CC-W-408 for vinyl types required, and comply with requirements specified herein.
   2. Vinyl wall covering shall be medium duty (VWC-MD), Type I, total weight not less than 9.5 oz. per sq. yd., vinyl coating not less than 7 oz. per sq. yd., fabric backing of osnaburg or drill.
   3. Color Pattern/Texture:
      a. Burlap pattern.
      b. Color: As selected by the Architect from manufacturer's standard colors. Colors shall be limited to not more than 4 vinyl covered tackboard colors in the total work.

B. Tackboard Base for Field Applied Vinyl: As manufactured by Homosote,”440 Sound Board”, or approved equal.

C. Accessories
   1. Adhesives: Provide manufacturer's recommended adhesive, primer, and sealer, produced expressly for use with selected wall covering on substrate as shown on the Drawings. Provide materials which are mildew-resistant and non-staining.
   2. Provide edge moldings around door and window frames and around all other building features which penetrate vinyl covered tackboard (such as fire extinguisher cabinets).
   3. Edge moldings shall be covered with factory applied veneer to match color and texture of vinyl wall covering.
   4. Provide edge moldings at the bottom of tackboard panels where detailed in the Drawings.
   5. Provide vinyl covered tackboard over 5/8-inch Type X gypsum board as specified in Section 09 29 00.
   6. Panel Sizes: 8, 9, or 10 feet lengths, depending on ceiling height, with width of 48-inches minimum cut panel size in any direction.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer shall examine substrates and conditions under which vinyl covered tackboard is to be installed and shall notify the Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

3.02 PREPARATION

A. Acclimatize board materials by removing from packaging in area of installation not less than 24 hours before application.

B. Remove switchplates, wall plates, and surface-mounted fixtures in areas where board is to be applied.

3.03 INSTALLATION

A. Vinyl wall covering shall be factory installed on 1/2-inch thick tackboard.

B. Corners of edge moldings around doors and windows shall be carefully cut at 45 degrees to provide tight fitting mitered corners. Sloppy corners will not be permitted. Putty fill of gaps is not acceptable.

C. Provide "corner moldings" at outside corners.

D. Apply glue to backside of panels or to gypsum board in a uniform coat completely covering entire surface. Provide all temporary bracing required to ensure that vinyl covered tackboard is totally adhered to gypsum board underlayment.

E. Cut the fiberboard backing, where required, so that the vinyl covering is left longer than the backing. Wrap the vinyl around the cut surface and glue. All finished panels shall have all edges wrapped.

F. Where vinyl covered tackboard is to be covered with rubber base, the maximum gap between concrete slab and tackboard shall be 3/8-inch. The minimum gap shall be 1/8-inch (to prevent moisture from wicking up into tackboard). Provide non-porous (metal or hardwood) backing for rubber base in resulting gap.)

G. Tackboard shall extend behind all display boards and future cabinet work. Tackboard shall not extend behind cabinet work that is part of this Contract unless otherwise indicated on the Drawings.

3.04 ADJUST AND CLEAN

A. Replace removed plates and fixtures; verify cut edges of wall coverings are completely concealed.

B. Remove surplus materials, rubbish, and debris resulting from wall covering installation upon completion of work, and leave areas of installation in neat, clean condition.

C. Remove and re-glue any panels which show movement when "pushed" toward wall plane.

END OF SECTION

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SECTION 10 1400

SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: The signs system required for this work may or may not be indicated on the Drawings and includes but is not limited to, door signs and support members.

B. Related Sections:
1. Section 08 7100, Door Hardware.

1.02 SUBMITTALS

A. Materials List: Within 30 days after award of Contract, submit to the Architect a complete list of materials proposed to be furnished and installed under this Section.

B. Shop Drawings: Accompanying the materials list, submit complete Shop Drawings showing details of the fabrication and installation, including proper and adequate provision for installation and completely describing necessary hardware. Show lettering proposed; room names and numbers to be provided by the Architect.

C. Samples: Accompanying the materials list, submit a Sample of the system material illustrating the actual finish obtained in the specified finish.

1.03 QUALITY ASSURANCE

A. For the actual fabrication and installation of the architectural signage system, use only mechanics who are thoroughly trained and experienced in the skills required and who are completely familiar with the manufacturer's recommended methods of installation plus the requirements of this work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Protection: Use such means necessary to protect system materials before, during, and after installation and to protect the installed work and materials of other trades.

B. Replacements: In the event of damage, immediately make repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Signage products shall be as provided by the following manufacturers, or equal as approved by Architect with products in conformance with specification requirements.
1. Metal Plaque Signs: Advance Corporation / Braille-Tac Division, Cottage Grove, Minnesota, 800-328-9451 www.advancecorp.com/brailletac Product: Braille-Tac Etched Magnesium (Chemsast).
2. Plastic Plaque Signs: Vomar Plaque series 100, Vomar Products, Inc., Canoga Park, CA 818-610-5115
3. Vinyl Graphics: 3M / Commercial Products Division, St. Paul, Minnesota, 800-374-6772. Product: 3M Premium Grade Vinyl.
4. Luminescent Exit Signs: Active Safety, 408-625-6151.

2.02 MATERIALS

A. Signs shall be .25 inch thick solid acrylic plastic with permanent integral color and satin matte finish face. Type image shall be fused to the plastic under heat and pressure to .005 inch depth. The signs shall be unframed and meet State and Federal Handicap laws.

B. Signs shall consist of:
   1. Raised Characters: Section 11B-703.2
      a. Letter Type: Section 11B-703.2.1; Raise characters on signs 1/32 inch minimum. Characters shall be sans serif uppercase characters accompanied by Grade 2 Braille.
      b. Character Size: Section 11B-703.2.5; Raised characters shall be a minimum of 5/8 inch and a maximum of 2 inches high.
      c. Proportions of Letters and Numbers: Section 11B703.2.4; Characters on signs shall have a width-to-height ratio of between 3:5 and 1:1 and a stroke width-to-height ratio of between 1:5 and 1:10.
      d. Letters measured must be uppercase. After choosing a typestyle to test, begin by printing the letters I, X, and O at 1 inch high. Place the template's 1:1 square over the X or O, whichever is narrower. If the character is not wider than 1 inch, nor narrower than the 3:5 rectangle, the proportions are correct. Use the 1:5 rectangle to determine if the stroke of the I is too broad, and the 1:10 rectangle to see if it is too narrow. If the tests are passed, the typestyle is compliant with proportion code.
   2. Braille Symbols: Section 11B-703.3; California Contracted Grade 2 Braille shall be used wherever Braille is required in other portions of these standards. Space dots 1/10 inch on center in each cell with 2/10 inch space between cells, measured from the second column of dots in the first cell to the first column of dots in the second cell. Raise dots a minimum of 1/40 inch above the background.
      a. Recommended Rounded or domed California Braille dots, each distinct and separate. Dots with straight sides and flat tops are not readable for many Braille users.
      b. Installation Height: 11B-703.4.
   3. Pictograms: Section 11B-703.6.
      a. Field: 6" high. Characters and Braille shall not be located in the pictogram field, 11B-703.6.1.
      b. Text Descriptors: Locate text descriptors directly below the pictogram field.
   4. International Symbol of Accessibility: Section 11B-703.7.2.1 and figure 11B-703.7.2.1.
   5. Contrast and Finish of Symbols: Section 11B-703.6.2; Contrast between character, symbols and their background must be 70 percent minimum and have a non-glare finish.
   6. Mounting Height and Location: Signs with tactile characters shall comply with Section 11B-703.4.
   7. Doorways Leading to Men's and Women's Sanitary Facilities: Provide Signs that Comply with Applicable Requirements of Sections 11B-703.7.2.6.
   8. Grade Level Exterior Exit Doors: Provide tactile exit signage to comply with 1011.1 and 11B-703.4.2.

C. Other Materials not specifically described but required for a complete and proper installation of identifying devices, shall be new, first quality of their respective kinds, and subject to approval of the Architect.

2.03 FABRICATION

A. Workmanship: Fabricate in strict accordance with the approved Shop Drawings and the manufacturer's published recommendations.
   1. No discoloration on the face after lettering will be acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.

B. Verify that signage system may be installed in complete accordance with the original design and the approved Shop Drawings.

3.02 INSTALLATION

A. Sign Locations: Where possible, locate signs on the door. See location details and Door Schedule on drawings.

B. Anchoring: Firmly anchor all members, using all anchoring devices required to ensure positive attachment of the members for long life under hard use.

3.03 CLEANING

A. Immediately prior to acceptance of the Work, remove protective materials from the signage system and clean exposed members.

B. Do not use abrasives or harmful cleaning agents.

END OF SECTION

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SECTION 21 0000

FIRE SUPPRESSION BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work included in 21 00 00, Fire Suppression Basic Requirements applies to Division 21, Fire Suppression work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of fire protection systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:
   1. Provide: To furnish and install, complete and ready for intended use.
   2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
   3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete Item of work furnished.
   4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent," substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted Item.
   5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.02 RELATED SECTIONS

A. Content of Section applies to Division 21, Fire Suppression Contract Documents.

B. Related Work:
   1. Additional conditions apply to this Division including, but not limited to:
      a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
      b. Drawings
      c. Addenda
      d. Owner/Architect Agreement
      e. Owner/Contractor Agreement
      f. Codes, Standards, Public Ordinances and Permits

1.03 REFERENCES AND STANDARDS

A. References and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 21, Fire Suppression Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
   1. State of California:
      a. CBC - California Building Code
      b. CEC - California Electrical Code
      c. CEC T24 - California Energy Code Title 24
      d. CFC - California Fire Code
      e. CMC - California Mechanical Code
      f. CPC - California Plumbing Code
      g. CSFM - California State Fire Marshal

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
   1. ABA - Architectural Barriers Act
   2. ADA - Americans with Disabilities Act
   3. AHRI - Air-Conditioning Heating & Refrigeration Institute
   4. ANSI - American National Standards Institute
   5. ASCE - American Society of Civil Engineers
   6. ASCE-7 Minimum Design Loads for Buildings and Other Structures
   7. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers
   8. ASHRAE Guideline 0, the Commissioning Process
   9. ASME - American Society of Mechanical Engineers
   10. ASPE - American Society of Plumbing Engineers
   11. ASSE - American Society of Sanitary Engineering
   12. ASTM - ASTM International
   13. AWWA - American Water Works Association
   14. CFR - Code of Federal Regulations
   15. EPA - Environmental Protection Agency
   16. ETL - Electrical Testing Laboratories
   17. FCC - Federal Communications Commission
   18. FM - FM Global
   19. FM Global - FM Global Approval Guide
   20. IAPMO - International Association of Plumbing and Mechanical Official
   21. ICC - International Code Council
   22. IEC - International Electrotechnical Commission
   23. ICC-ESR - International Code Council Evaluation Service Reports
   24. HI - Hydraulic Institute Standards
   25. ISO - International Organization for Standardization
   26. MSS - Manufacturers Standardization Society
   27. NEC - National Electric Code
   28. NEMA - National Electrical Manufacturers Association
   29. NFPA - National Fire Protection Association:
      a. NFPA 13 - Standard for the Installation of Sprinkler Systems
      b. NFPA 24 - Standard for Installation of Private Fire Service Mains and Their Appurtenances
      c. NFPA 25 - Standard for Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
      d. NFPA 70 - National Electrical Code
      e. NFPA 72 - National Fire Alarm and Signaling Code
   30. NRCA - National Roofing Contractors Association
   31. NSF - National Sanitation Foundation
   32. OSHA - Occupational Safety and Health Administration

33. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
34. TIMA - Thermal Insulation Manufacturers Association
35. UL - Underwriters Laboratories Inc.

D. See Division 21, Fire Suppression individual Sections for additional references.

1.04 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 21, Fire Suppression sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

D. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. Copy Architect on all transmissions/submissions.

E. Submit shop drawings, calculations and product data sheets as one complete stand-alone package to AHJ, Owner's insurance underwriter and Engineer.

F. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 21, Fire Suppression Sections.

G. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
1. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed Item. Highlight connections by/to other trades.
2. Include technical data, installation instructions and dimensioned drawings for products, equipment and devices installed, furnished or provided. Reference Division 21, Fire Suppression specification Sections for specific Item required in product data submittal outside of these requirements.
3. Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.
4. For vibration isolation of equipment, list make and model selected with operating load and deflection. Indicate frame type where required. Submit manufacturer's product data.

5. See Division 21, Fire Suppression Sections for additional submittal requirements outside of these requirements.

H. Maximum of two reviews provided of complete submittal package. Arrange for additional reviews and/or early review of long-lead Item; Bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

I. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer’s comments. Identify Engineer’s comments and provide an individual response to each of the Engineer’s comments. Cloud changes in the submittals and further identify changes which are in response to Engineer’s comments.

J. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-10 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.

K. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 21, Fire Suppression coordination documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical and Division 28, Electronic Safety and Security submittals.

L. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.

M. Substitutions and Variation from Basis of Design:
1. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
2. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals". For any product marked "or approved equivalent", a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.

N. Shop Drawings:
1. Provide coordinated Shop Drawings which include physical characteristics of all systems, equipment and piping layout, pipe layout, hanger layout, sway brace layout, seismic restraints, sway brace calculations, drains, location of drain discharge, risers, valves, details, water test information, physical device layout plans, and control wiring diagrams. Reference individual Division 21, Fire Suppression Sections for additional requirements for shop drawings outside of these requirements.

2. Shop Drawings and hydraulics calculations, sway brace calculations, trapeze hanger calculations, and the like, to be prepared under the direct supervision and control of a Professional Engineer competent to do such work and licensed in the state of California. Drawings and calculations to bear the seal and wet signature of the professional Engineer.
3. Provide Shop Drawings which indicate information required by NFPA 13. Include room names and fire sprinkler occupancy hazard classifications.
4. Provide Shop Drawings illustrating information for Hydraulic Information Sign for each hydraulic remote area calculated.
5. Utilizing the Reflected Ceiling backgrounds, provide Shop Drawings illustrating locations of fire sprinklers and piping.
6. Utilizing the Structural backgrounds, provide Shop Drawings illustrating locations and types of hangers and sway braces.
7. Provide Shop Drawings illustrating each type of hanger, including fasteners to structure.
8. Provide Shop Drawings illustrating each type of branchline restraint and sway brace, including length of sway brace member, sway brace fittings, minimum and maximum angles from vertical of sway brace member, method of attachment to structure, size, length and embedment of attachment to structure and size and type of structural member to which sway brace will be attached. Number each type of restraint and sway brace. Indicate on Drawings locations of each type of numbered restraint and sway brace.
9. Provide details for any hanger, attachment, or sway brace to be attached to any I-joist, structural insulated panels (SIPs), cross laminated timber, and similar engineered structural products according to the specifications of the engineered product manufacturer.
10. Provide Shop Drawings illustrating information for Sprinkler System General Information Sign.
11. Shop Drawings to include a cross-sectional view that shows the sprinkler heads and piping in relation to the building's architectural and structural information. View to be chosen based on a location that will display the most information.
12. When required, provide Coordination Drawings.
13. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.
14. Provide details of hanger, sway bracing and branch line restraint attachments to structure and to piping. Include details on the size and load capacities of fasteners. Provide verification of the structural capacity to withstand seismic load.
15. Provide sway bracing calculations on drawings showing horizontal seismic design load and requirements, with indication of zone of influence for each bracing location.
16. Provide a schedule of sway bracing type, size, and design criteria, including length, angle from vertical, and load capacities.
17. Clearly indicate the elevation of the highest sprinkler in relation to the elevation of the flow test pressure gauge monitor hydrant.
18. Provide details of flexible sprinkler hose fitting per manufacturer's schedule of equivalent feet used in hydraulic calculations, showing device length, maximum number of 90-degree bends and expected radius of bends.
19. Provide a schedule of signage to be installed at each flexible sprinkler hose fitting.
20. On the drawings, provide a list of number, model, temperature, sprinkler Identification number, manufacturer, orifice, deflector type, thermal sensitivity and pressure rating, quantity of each type to be contained in the spare sprinkler cabinet and the issue date or revision date of the list."
21. Spare sprinkler head cabinet size indicating the number of spare sprinkler head to be contained therein.

O. Samples: Provide samples when requested by individual Sections.

P. Resubmission Requirements:
1. Make any corrections or change in submittals when required. Provide submittals as specified. The Engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Clearly indicate changes on Drawings and cloud changes in the submittals.
2. Resubmit for review until review indicates no exceptions taken or make "corrections as noted".

Q. Operation and Maintenance Manuals/Owner's Instructions:
1. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or Item requiring servicing. Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
   a. Include copies of certificates of code authority acceptance, code-required acceptance tests; test reports and certificates.
   b. Include Warranty per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Sections.
   c. Catalog description of each Item of equipment actually installed on job.
   d. Instructions for operation and maintenance of fire suppression systems composed of operating instructions, maintenance instructions and manufacturer's literature as follows:
      1) Testing and Maintenance Schedule Chart: Provide an 8-1/2- by 11-inch typewritten list of each item of installed equipment requiring testing inspection , lubrication or service, describing and scheduling performance of maintenance.
      2) Manufacturer's Literature: Provide copies of manufacturer's instructions for operation and maintenance of fire suppression equipment, including replacement parts list with name and address of nearest distributor. Mark each copy with equipment identification label as listed in equipment schedule, i.e. F-5 etc.
   e. Include product certificates of warranties and guarantees.
   f. Include Record Drawings,
   g. Include copy of water supply flow test used as basis for hydraulic calculations.
   h. Include hydraulic calculations and sway brace calculations.
   i. Include Contractor’s Material and Test Certificates for Aboveground Piping/Underground Piping.
   j. Include a copy of NFPA 25.
   k. Include a copy of valve charts and whether normally open or normally closed.
   l. Include a copy of drain, auxiliary, and low point drains charts.
   m. Include a copy of the list to be included in the spare sprinkler head box.
   n. Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
   o. Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance

required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, and quantities relevant to each piece of equipment: i.e. belts, motors, lubricants, and filters.

p. Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.

q. Include copy of startup and test reports specific to each piece of equipment.

r. Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

2. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 21 00 00, Fire Suppression Basic Requirements, Article titled "Demonstration".

3. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

R. Record Drawings:

1. Maintain at site at least one set of Drawings for recording “As-constructed” conditions. Indicate on Drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical Item. Include items changed by field orders, supplemental instructions, and constructed conditions.

2. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for project.

3. At completion of project, input changes to original project on CAD Drawings and make one set of black-line drawings created from CAD Files in version/release equal to contract drawings. Submit CAD disk and drawings upon substantial completion.

4. Invert elevations and dimensioned locations for water services and drainage piping below grade extending to 5-feet outside building line.

5. Record Drawings to include site information or reference site information for complete understanding of the fire protection system between the building and the point of connection to the water supply and location of flow test pressure hydrants.

6. See Division 21, Fire Suppression individual Sections for additional items to include in Record Drawings.

S. Calculations: Submit hydraulic and sway brace and the like calculations.

1. Hydraulic Calculations:

a. Include friction losses between the hydraulically most remote design area and the hydrant flow test pressure hydrant.

b. Hydraulic calculations to be performed on a nationally recognized fire sprinkler hydraulic calculation computer program, with cover sheets in the format required by the latest edition of NFPA 13. Hydraulic calculations performed “by hand” or not on a nationally recognized fire sprinkler hydraulic calculations computer program will be returned without review by engineer.

c. Provide one or more hydraulic calculations for each hydraulically most remote area.

d. Where it is not obvious which area is most hydraulically remote, perform and submit for review additional hydraulic calculations proving the hydraulically most remote area.

e. For grid systems, either provide “peaked” hydraulic calculations, or provide two additional sets of hydraulic calculations for each hydraulically most remote area.
f. Include pressure losses between the highest sprinkler and the elevation of the pressure gauge monitor hydrant of the flow test.
g. Include friction loss for flexible branch line connectors per manufacturer's schedule of equivalent feet for device length, maximum number of bends and expected radius of bends.
h. When flexible sprinkler hose fittings are added to an existing system, provide hydraulic calculations verifying the design flow rate will be achieved."
i. For Future Tenant Improvement Spaces: Include in hydraulic calculations friction loss allowances for future installation of flexible sprinkler head connectors so that flexible connectors may be installed in the future without revisions to the overhead system.

2. Sway Brace Calculations:
a. Sway brace calculations utilizing a proprietary computer calculation program only used for the sway brace components supported by that manufacturer. For example, only “manufacturer X” sway brace components, and not those of another manufacturer, may be calculated on a "manufacturer X” sway brace computer calculation program.
b. Provide seismic calculations for any sway brace to be attached to any I-joist, structural insulated panels (SIPs), cross laminated timber, and similar engineered structural products according to the specifications of the I-joist manufacturer.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every Item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

F. Provide products that are UL listed.

G. Piping Insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

1.06 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

1.07 COORDINATION DOCUMENTS

A. Prior to construction, prepare and submit coordinated layout drawings (composite drawings), to coordinate installation and location of ductwork, grilles, diffusers, piping, fire sprinklers, fire alarm, plumbing, cable trays, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system. Prior to completion of Drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including plumbing, HVAC, electrical, fire alarm ceiling suspension and tile systems, etc.), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling and finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence. Unless otherwise required by Division 00, Procurement and Contracting Requirements and/or Division 01, General Requirements, Division 23, HVAC to combine information furnished by other trades onto master coordination documents.

B. Prepare Drawings as follows:
   1. Provide drawings in CAD Format. CAD format release equal to design documents. Drawings to be same sheet size and scale as Contract Drawings and indicate location, size and elevation above finished floor of equipment and distribution systems.
   2. Review and revise, as necessary, section cuts in Contract Drawings after verification of field conditions.
   3. Indicate fire protection system piping including fittings, hangers, access panels, valves, and bottom of pipe elevations above finished floor.
   4. Indicate inverts and provision for piping that must be graded to have right-of-way over more flexible Item. Drawings also to indicate proposed ceiling grid and lighting layout as shown on electrical drawings, architectural reflected ceiling drawings and HVAC equipment, ductwork and piping. Drawings to indicate proposed and identified structural members to which hangers and sway braces will be attached as shown on structural drawings.
   5. Incorporate Addenda Item and change orders.
   6. Provide additional coordination as requested by other trades.

C. Advise Architect in event conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

D. Verify in field exact size, location, invert, and clearances regarding existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation related thereto.

E. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to sprinkler heads, pipe, fittings, hangers and bracing materials.

2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL, ETL, FM, ICC-ES, and CSFM approved for their intended fire protection function or have adequate approval or be acceptable by State, County, and City authorities.

B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

C. Hazardous Materials:
1. Comply with local, State of California, and Federal regulations relating to hazardous materials.
2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Install equipment requiring access (i.e. drains, control operators, valves, motors, engines, pumps, controllers, air compressors, gauges, fill cups, tanks, cleanouts and the like) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.

D. Earthwork:

1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with the following:
    a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with the provisions specified. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
    b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
    c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E. Firestopping:
1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection.
2. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM International E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F. Pipe Installation:
1. Provide installation of piping systems coordinated to account for expansion and contraction of piping materials and building as well as anticipated settlement or shrinkage of building. Install work to prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, expansion joints, sleeves, anchors or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building with Project Structural Engineer. Verify construction phasing, type of building construction products and rating coordinating installation of piping systems.
2. Include provisions for servicing and removal of equipment without dismantling piping.

G. Plenums: Provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 21, Fire Suppression Sections.

B. Provide fire suppression equipment and piping, both hanging and base mounted, with mounting connection points of sufficient strength to resist lateral seismic forces equal to lateral seismic forces as determined by building code and NFPA 13 calculations, whichever is more demanding.

C. See Structural Drawings for seismic design criteria for sway bracing and seismic restraint.

D. Earthquake resistant designs for Fire Protection (Division 21) equipment and distribution, i.e. fire sprinkler systems, fire standpipe systems, fire pumps, fire pump controllers, fire tanks, clean agent fire suppression systems, etc. to conform to regulations of jurisdiction having authority.

E. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.

F. Provide stamped Shop Drawings from licensed Engineer of seismic bracing and seismic movement assemblies for piping, equipment, tanks, pumps controllers and the like. Submit shop drawings along with equipment submittals.

G. Provide stamped Shop Drawings from licensed Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.

H. Provide details of flexible drops for sprinklers in conformance with Building Code and ASCE 7 requirements of ceilings. Coordinate with Architectural and Structural Drawings and Specifications.

I. Piping: Per NFPA 13, ASCE-7 and local requirements.

J. Equipment:
   1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA, ASCE 7 and local requirements.
   2. Provide means to prohibit excessive motion of fire protection equipment during an earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
   1. Underground piping installation prior to backfilling.
   2. Prior to covering walls.
   3. Prior to ceiling cover/installation.
   4. When main systems, or portions of, are being tested and ready for inspection by AHJ.
   5. When mains or branchlines are to be permanently concealed by construction or insulation systems.
   6. When fire suppression systems, or portions of, are being tested and ready for inspection by AHJ.

C. Bear responsibility and cost to make piping accessible, to expose concealed lines, or to demonstrate acceptability of the system. If Contractor fails to notify Architect at times prescribed above, costs incurred by removal of such work are the responsibility of the Contractor.

D. Final Punch: Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CUTTING AND PATCHING

A. Confirm Cutting and Patching requirements in Division 01, General Requirements. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and the following:
   1. Cutting and patching performed under Division 21, Fire Suppression includes, but is not limited to:
      a. Cutting and patching of plaster or partitions.
      b. Cutting and patching of finished ceilings.
   2. Perform cutting and patching by skilled craftsmen in trade of work to be performed. Fill holes which are cut oversized for completed work. Match refinished areas with existing adjacent finish in a manner acceptable to Architect.
   3. When masonry to concrete construction must be penetrated, provide a steel pipe sleeve in opening and grout in place in a neat manner. Leave grout surface to match existing finish. Provide escutcheons. If sleeves are not provided, core drill penetrations.
   4. Locate concealed utilities to eliminate possible service interruption or damage.
   5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.
   6. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
   7. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.
   8. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
   9. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, landscaping, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
   10. Repair mutilation of building around pipes, equipment, hangers, and braces.

3.05 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing at no additional cost to Owner.

3.06 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and the following:
   1. Handle materials delivered to project site with care to avoid damage and deterioration. Store materials in original containers which identify manufacturer, name, brand and model numbers on site inside building or protected from weather, sun, dirt and construction dust. Insulation and lining that becomes wet

from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.

2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
3. Protect bright finished shafts, bearing housings and similar Item until in service.

3.07 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

D. Prior to acceptance of work and during time designated by Architect, provide necessary qualified personnel to operate system for a period of two hours.

E. Instruct the Owner in the operation of the sprinkler system, including main valve position (open or closed) recognition, system drainage, system testing, dry pipe valve reset and the relation to the fire alarm system.

F. Upon completion of work and adjustment of equipment, test systems to demonstrate to Owner's Authorized Representative and Architect that equipment is furnished and installed or connected under provisions of these Specifications.

3.08 CLEANING

A. Confirm Cleaning requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Upon completion of installation, except for sprinklers, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

C. Sprinklers may not be cleaned except for vacuuming in a manner in which no part of the sprinkler is touched by the vacuuming equipment. Replace sprinklers which bear traces of foreign substances with sprinklers of same model, temperature, K-factor, orifice, finish, style, orientation, and the like.

3.09 INSTALLATION

A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Install equipment in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start-up equipment, in accordance with manufacturer's start-up instructions, in the presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment. Provide pump impellers to obtain Basis of Design design capacities.

D. Provide miscellaneous supports/metals required for installation of equipment and piping.

3.10 PAINTING

A. Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and the following:
   1. Ferrous Metal: After completion of fire protection work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
   2. After acceptance by Authority Having Jurisdiction (AHJ), in a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
   3. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
   4. Piping: Clean, primer coat and paint exposed piping on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.
   5. Covers: Covers such as vault covers and the like will be furnished with finishes which resist corrosion and rust.

3.11 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Sections in Division 21, Fire Suppression and the following:
   1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
      a. Testing reports including Contractor's Material and Test Certificate for Underground Piping, Contractor's Material and Test Certificate for Aboveground Piping, Contractor's Material and Test Certificate for Private Fire Service Mains, Fire pump acceptance test data report, and the like.
      b. Cleaning
      c. Operation and Maintenance Manuals
      d. Training of Operating Personnel
      e. Record Drawings

f. Warranty and Guaranty Certificates
g. Start-up/Test Document and Commissioning Reports
h. Letter of Conformance

3.12 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Upon completion of installation of equipment, sprinklers, hose valves and piping and after units are water pressurized, test system to demonstrate capability and compliance with requirements. When possible, correct malfunctioning Item at site, then retest to demonstrate compliance; otherwise remove and replace with new Item and proceed with retesting.

C. Inspect each installed Item for damage to finish. If feasible, restore and match finish to original, except fire sprinklers, at site; otherwise, remove Item and replace with new Item. Feasibility and match to be judged by Architect. Remove cracked or dented Item and replace with new Item.

D. Fire sprinklers may not be reused, or cleaned, except for dusting. Replace damaged, field painted, oversprayed, overcoated or field coated sprinklers with new sprinklers of same manufacturer, model, finish, K-factor and performance characteristics. Where identical replacement sprinklers are not available, provide sprinklers of similar finish, style, K-factor and performance characteristics.

3.13 LETTER OF CONFORMANCE

A. Provide Letter of Conformance and copies of manufacturers' warranties and extended warranties with a statement that fire suppression items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

3.14 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize fire protection equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

3.15 CONNECTIONS TO EXISTING

A. Prior to connection of piping to existing piping or utilities, field verify existing conditions and exact sizes and locations of existing piping. Provide additional offsets, transitions, joints, cut-ins, and replace portions of existing as required to facilitate connections of new.

END OF SECTION

SECTION 21 0500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Joint Restraints
   2. Aboveground Black Steel Pipe and Fittings
   3. Wall and Floor Penetrations and Sleeves
   4. Hangers and Supports
   5. Struts and Strut Clamps
   6. Sway Braces and Restraints
   7. Anchors and Attachments

1.02 RELATED SECTIONS

A. Contents of Division 21, Fire Suppression and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Division 22, Plumbing
   2. Division 23, Heating, Ventilating and Air Conditioning
   3. Division 26, Electrical
   4. Division 28, Electronic Safety and Security
   5. Division 31, Earthwork
   6. Section 21 00 00, Fire Suppression Basic Requirements
   7. Section 21 13 00, Fire Suppression Sprinkler Systems
   8. Section 21 13 19, Fire Suppression Preaction Sprinkler Systems

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. Meet requirements of ASCE 7, Minimum Design Loads for Buildings and Other Structures, by American Society of Civil Engineers, latest adopted edition.

1.04 SUBMITTALS

A. Submittals as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Material and Equipment: Listed for its intended fire protection use in current UL Fire Protection Equipment Directory, or UL Online Certifications Directory for Fire Protection, International Code Council Evaluation Service Reports, or FM Global Approval Guide. All material and equipment to be new and from a current manufacturer.
   2. Provide per AHJ requirements.

3. References to product Specifications for materials are listed according to accepted ANSI, ASTM, ASME, AWWA and other base standards. Materials to meet latest approved versions of these standards.
4. Fire Suppression Screw-Thread Connections: Comply with local fire department/fire marshal regulations for sizes, threading and arrangement of connections for fire department equipment to fire department connections.
5. Manufacturers: Unless an item is marked "No substitutions", submit substitution request for materials of other than named manufacturers.
6. Noise and Vibration:
   a. Install vibration isolators and measures required to prevent noise and vibration from being transmitted to occupied areas. Select equipment to operate within noise coefficient (NC) design level for particular type of installation in relation to its location.
   b. After installation, make proper adjustments to reduce noise and vibration to acceptable levels as defined by Architect.
   c. In acoustically sensitive areas, design system in a manner that minimizes the number of wall penetrations.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.07 SYSTEM IMPAIRMENT

A. When returning a water-based fire protection system to service after impairment or control valve closure, verify the system is in working order by performing a main drain test per NFPA 25.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Joint Restraints:
   1. Star Pipe Products
   2. Tyler Pipe Company
   3. EBAA Iron, Incorporated
   4. Uni-Flange Corporation
   5. Union Foundry Company
   6. United States Pipe and Foundry Company
   7. Or approved equivalent.

B. Aboveground Black Steel Pipe and Fittings:
   1. Pipe:
      a. Bull Moose Tube
      b. Wheatland Tube Company
      c. Youngstown Tube Company
      d. Tex-Tube Company
      e. State Pipe and Supply, Incorporated
      f. Or approved equivalent
   2. Fittings, Mechanical and Grooved Couplings:
      a. Victaulic
      b. Gruvlok
      c. Shurjoint Piping Products Incorporated
      d. Smith-Cooper International
      e. Tyco Fire & Building Products

f. Viking Corporation
g. Allied Rubber and Gasket Company Incorporated, dba ARGCO
h. Anvil International
i. Dixon Valve & Coupling
j. Or approved equivalent.

3. Fittings, Threaded:
a. Ward Manufacturing
b. Anvil International
c. Smith-Cooper International
d. Aegis Technologies
e. Or approved equivalent.

4. Fittings, Rubber Gasketed:
a. Victaulic
b. Anvil International
c. AnvilStar
d. EBAA Iron, Incorporated
e. Shurjoint Piping Products, Incorporated
f. Smith-Cooper International
g. Tyco Fire & Building Products
h. Viking Corporation
i. Ward Manufacturing
j. Allied Rubber and Gasket Company Incorporated, dba ARGCO
k. Dixon Valve & Coupling
l. Or approved equivalent.

5. Fittings, Welded:
a. Anvil International
b. Shurjoint Piping Products Incorporated
c. Smith-Cooper International
d. State Pipe & Supply, Incorporated
e. Or approved equivalent.

6. Fittings, Flanged:
a. Victaulic; Groove/Flange Adapter.
b. United Brand Fittings
c. U.S. Pipe
d. Anvil S.P.F.
e. Iowa Fittings Company
f. Tyco Fire Products; Grinnell Groove/Flange Adapter
g. Or approved equivalent.

C. Wall and Floor Penetrations and Sleeves:
1. Allied Rubber and Gasket Company, Incorporated, dba ARGCO
2. Fire Protection Products Incorporated (FPPI)
3. Or approved equivalent.

D. Hangers and Supports:
1. Cooper B-Line Tolco:
a. Ring Hangers: Figure 200.
b. U-Bolts: Model B3188.
c. Straps:
1) Figure 22.
2) Figure 22L2.
3) Figure 23.
4) Figure 24.
5) Figure 28.
6) Figure 29.
7) Model B3184.

d. Riser Clamps: Model B3373.
e. Pipe Clamps: Model B3140, Figure 4B.

2. Anvil International
3. ITW Buildex Sammys
4. Erico International
5. PHD Manufacturing Incorporated
6. Or approved equivalent.

E. Struts and Strut Clamps:
1. Struts:
a. Cooper B-Line Tolco
b. Or approved equivalent.
2. Strut Clamps:
a. Cooper B-Line Tolco; Model B2400.
b. Or approved equivalent.

F. Sway Braces and Restraints:
1. Cooper B-Line Tolco:
a. Fig. 75
b. Fig. 4A
c. Fig. 4L
d. Fig. 4LA
e. Fig. 800
f. Fig. 825
g. Fig. 825A
h. Fig. 828
i. Fig. 906
j. Fig. 910
k. Fig. 975
l. Fig. 980
m. Fig. 1000
n. Fig. 1001
o. Fig. 2002
2. Anvil International
3. Erico International
4. PHD Manufacturing Incorporated
5. Or approved equivalent.

G. Anchors and Attachments:
1. Concrete:
a. Cast-In Place Anchors for Hangers:
1) Cooper B-Line Tolco; Models 109, 109AF, B2500 with N2500 nut, or B3014 with B3014N nut.
2) Erico International
3) Or approved equivalent.
b. Cast-In Place Anchors for Braces:
1) Cooper B-Line Tolco; Models B2500 with N2500 nut, or B3014 with B3014N nut.
2) Anvil International; Figure 282 with nut.
3) Erico International
4) Or approved equivalent.
c. Attachments as specified or described by structural. If not specified or described by structural, then as follows:
1) Hilti; Model Kwikbolt TZ
2) Powers; Models Snake+, Power Stud+ SD2, or Powers Wedge-Bolt.

3) Simpson Strong-Tie
4) DeWalt; Mini-Undercut+, internally threaded undercut anchor.
5) Or approved equivalent.

2. Steel:
   a. Cooper B-Line Tolco:
      1) Model B3037
      2) Model B3033
      3) Model B3034
      4) Fig. 65
      5) Fig. 66
      6) Fig. 67
      7) Fig. 68
      8) Fig. 69
      9) Model B3042T
      10) Fig. 22L2
      11) Fig. 23
      12) Fig. 24
      13) Fig. 28
      14) Fig. 78
   b. Anvil International
   c. Elco Construction Products, Hangermate
   d. Erico International
   e. ITW Buildex Sammys
   f. Or approved equivalent.

2.02 JOINT RESTRAINTS

A. Mechanical joint wedge action for ductile iron pipe.

B. Gland: Ductile Iron.

C. Wedges: Ductile iron.

D. Full restraint pressure rating of pipe with minimum safety factor of 2:1.

2.03 ABOVEGROUND BLACK STEEL PIPE AND FITTINGS

A. Wet Pipe Systems:
   1. Pipe Size 2-inch Diameter and Smaller: ASTM A53, ASTM A135, or ASTM A795; minimum Corrosion Resistance Ratio (CRR) of 1.00 per UL Listing or FM Global Approval.
   2. Pipe Size 2-1/2-inch Diameter and Larger: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 10 or minimum CRR of 1.00 per UL Listing or FM Global approval. Wall thickness greater than Schedule 5. Schedule 5 not approved.

B. Joints:
   1. Threaded, flanged or bevel welded.
   2. Piping installed in plenums or shafts to have welded joints.

C. Fittings:
   1. Threaded:
      a. Malleable Iron: Class 150 and Class 300, ANSI B16.3.
      b. Cast Iron: Class 125 and 250, ANSI B16.3.
   2. Flanged:
      a. Cast iron; Class 125 and 250, ASME B16.1.

b. Raised ground face, bolt holes spot faced.

3. Welded:
   a. Carbon Steel: Long radius, standard weight or extra strong.
   b. Factory Wrought Steel Buttweld Fittings: ASME B16.9.
   c. Buttwelding Ends for Pipe, Valves, Flanges and Fittings: ASME B16.25.
   d. Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures: ASTM A234.
   e. Steel Pipe Flanges and Flanged Fittings: ASME B16.5.
   f. Forged Steel Fittings, Socket Welded and Threaded: ASME B16.11.
4. Mechanical Fittings and Grooved Couplings:
   a. Couplings: UL 213, AWWA C606, ASTM A536 ductile iron or ASTM A47 malleable iron, with enamel finish and grooves or shoulders designed to accept grooved couplings. Synthetic-rubber gasket with central-cavity, pressure-responsive design and ASTM A183 carbon-steel bolts and nuts.
   b. FM Global approved.

D. Anti-Microbial Coating: Factory-applied coating to inhibit corrosion from microbiological organisms.

2.04 WALL AND FLOOR PENETRATIONS AND SLEEVES

A. Below Grade and High Water Table Areas: Waterproof elastomeric compound.

2.05 HANGERS AND SUPPORTS

A. General: Select size of hangers and supports to exactly fit pipe size for bare piping.

B. Hangers: Ferrous.

C. Hanger Rods: Zinc electroplated carbon steel.

D. Finishes: Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

E. Materials:
   1. Use carbon steel pipe hangers and supports, metal trapeze pipe hangers and attachments for general service applications.
   2. Use stainless steel hangers, rods and attachments for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries and the like.

F. Anti-Scratch Padding: Use padded hangers for piping subject to scratching.

2.06 STRUTS AND STRUT CLAMPS

A. Electro-galvanized steel.

B. Designed for supporting pipe runs from strut supports.

C. Strut clamps UL listed for fire protection.

D. Stainless steel for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries and the like.

2.07 SWAY BRACES AND RESTRAINTS

A. Sway Bracing: From a single manufacturer and compatible with sway brace calculation program.

B. Stainless steel for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries, and the like.

2.08 ANCHORS AND ATTACHMENTS

A. General: Anchor supports to masonry, concrete and block walls per anchoring system manufacturer's recommendations, or as modified by project Structural Engineer.

B. Materials:
   1. Ferrous.
   2. Stainless steel for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries, and the like.

C. Cast in Place Anchors for Hangers: Verify listing is for hangers, braces, or both.

D. Attachments in Concrete:
   1. Suitable for hanging and bracing fire protection systems in concrete which is subject to cracking in a seismic event.
   2. Seismic Design Areas C, D, E and F:
      a. Compatible with International Code Council Evaluation Service Acceptance Criteria AC-193 and AC308 for expansion, screw and adhesive anchors. Meet requirements of ACI 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary.
      b. All models of Hilti HDI and ITW Red Head Multi-Set II anchors are not approved for attaching fire protection systems in Seismic Design Areas C, D, E and F. No Exceptions.

E. ITW Buildex Sammys with FM Approval only are not allowed in certain seismic zones. Verify with FM that FM Approval is effective in project's seismic zone.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install in conformance with UL Listing, FM Approval or ICC-ES requirements and restrictions.

3.02 JOINT RESTRAINTS

A. Install per manufacturer's instructions and recommendations.

B. Reference 3.01, General Installation Requirements.

3.03 ABOVEGROUND BLACK STEEL PIPE AND FITTINGS

A. Piping Routing:

1. Route piping, except as otherwise indicated, vertically and horizontally (sloped to drain). Avoid diagonal runs wherever possible. Orient horizontal routes parallel with walls and beam lines.
2. Install piping as shown or described by diagrams, details and notations on Drawings or, if not indicated, install piping to provide the shortest route which does not obstruct usable space or block access for servicing the building and its equipment.
3. Install piping in concealed spaces above finished ceilings. Prior to design and installation. obtain pre-approval by Architect for exposed piping.
4. In open-to-structure areas which are open to public view, route exposed piping to minimize visual impact. Obtain Architect's and Engineer's approval of exposed piping installation.
5. Coordinate installation with other trades. Route piping as required to avoid building structure, equipment, plumbing piping, HVAC piping, ductwork, lighting fixtures, electrical conduits and bus ducts and similar work. Final location of lighting will have priority over final sprinkler locations. Provide drains to trapped sections of system which result from such routing. Other trades take precedence for installation space.
6. Support piping adjacent to walls, overhead construction, columns and other structural and permanent enclosure elements of the building. Limit clearance to 2-inches wherever furring is indicated for concealment of piping. Allow for insulation thickness. Locate insulated piping to provide minimum 1-inch clearance outside insulation.
7. Wherever possible in finished and occupied spaces, conceal piping from view by locating within column or beam enclosures, hollow wall construction, or above suspended ceilings. Do not encase horizontal routes in solid partitions, except where approved.
8. General Electrical Equipment Clearances: Do not route piping through electrical rooms, transformer vaults, elevator equipment rooms and other electrical or electronic equipment spaces and enclosures. Do not route piping above electric power or lighting panel, switchgear, low voltage panel, or similar electric device.
9. Rooms Protected by Alternative Systems: Route water filled and dry system piping around rooms protected by pre-action systems, clean agent systems, gaseous suppression systems and other alternative fire suppression systems.
10. Install pipe runs to minimize obstruction to other work.
11. Pitch all dry and pre-action system piping 1/4-inch per 10-feet for mains and 1/2-inch per 10-feet for branch lines, including pipe passing through both warm and cold areas.

B. Couplings:
1. Install where indicated on Drawings and on each side of pieces of equipment to permit easy removal of equipment.
2. Deburr cut edges.

C. Pipe Penetrations: Wire pipe cutout coupon at point of pipe penetration.

D. Pipe and Pipe Fittings:
1. Expansion and Flexibility: Install work with due regard for expansion and contraction to prevent damage to the piping, equipment, building and its contents. Provide piping offsets, loops, approved type expansion joints, sway bracing, wire restraints, vertical restraints, flexible couplings or other means to control pipe movement and to minimize pipe forces.
2. Coordinate support of pipe 4-inches and larger with Structural Engineer.
3. Provide clearances around piping per NFPA 13.
4. Install dry and pre-action welded pipe with welds facing vertically up, or where this is not possible, as close as possible to vertical between 46 degrees and 234

degrees. Intent is to minimize corrosion caused by moisture in the bottom of pipes.

3.04 WALL AND FLOOR PENETRATIONS AND SLEEVES

A. Escutcheons: Install on exposed pipes passing through walls or floors.
   1. Pipe Sleeves: Lay out work in advance of pouring concrete and furnish and set sleeves necessary to complete work.
   2. Floor Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1-inch above finished floor. Caulk pipes passing through floor with nonshrinking fire and water resistant grout or approved equivalent caulking compound. Caulk/seal piping passing through fire rated building assembly with UL rated assemblies. Provide fire-rated assemblies per local AHJ requirements.
   3. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with non-shrinking caulking compound. Caulk/seal piping passing through fire-rated building assemblies with UL Listed or FM Approved fire-rated firestopping compound. Provide fire-rated assemblies per local AHJ requirements.
   4. Beam Sleeves: Coordinate with trades for locations of pipe sleeves in reinforced concrete and steel beams. Penetrations must be indicated on structural shop drawings. See Drawings and Specifications for specific sleeve location limitations. Pipe sleeve locations must be indicated on reinforced concrete and steel beam shop drawings. Field cutting of beams not allowed without written approval of structural engineer. No extra costs allowed for failure to coordinate beam penetrations prior to reinforced concrete and steel beam shop drawing submittal.
   5. Penetrations in Fire-Rated Wall/Floor Assemblies:
      a. Reference Division 07, Thermal and Moisture Protection.
      b. Coordinate with Drawings location of fire rated walls, ceilings and floors. When these assemblies are penetrated, seal around piping and equipment with approved firestopping material.
      c. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814 and NFPA.
      d. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814.

3.05 HANGERS AND SUPPORTS

A. Installation of pipe hangers, inserts and supports to conform to NFPA 13. Provide adjustable hangers, inserts, brackets, clamps, supplementary steel and other accessory materials required for proper support of pipe lines and equipment. Provide supplementary materials for proper support and attachment of hangers.

3.06 STRUTS AND STRUT CLAMPS

A. Install per manufacturer's listed orientation.

3.07 SWAY BRACES AND RESTRAINTS

A. Locate per orientation and spacing as required by sway brace calculations.

B. Attach sway bracing directly to pipe or equipment being braced.

C. Do not attach sway bracing to bottom of truss members.

3.08 ANCHORS AND ATTACHMENTS

A. In post-tension construction, determine location of post-tension cables and install anchors to avoid contact or interference with post-tension cables. Coordinate with Structural.

B. Do not use powder-driven attachments.

C. Building Attachments and Inserts: Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves and flanges, for sizes NPS 2-1/2 and larger. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

D. Hanger and Support Attachments:
   1. Concrete:
      a. Before Pouring: Prior to installation, coordinate locations of cast in place concrete inserts with other trades. Install in accordance with manufacturer's instructions.
      b. After Pouring:
         1) Where supports in slabs are required after concrete has been poured, provide drilled-in threaded inserts (mechanical-expansion anchors), installed in accordance with manufacturer's recommendations.
         2) Install mechanical-expansion anchors after concrete is completely cured and in accordance with manufacturer's installation instructions.
         3) Where anchors are to be installed in post-tension construction, determine and avoid locations of post-tension cables prior to drilling.
   2. Metal Floor Deck: Support hangers per UL Listing or FM Approval for selected concrete insert before pouring of concrete topping, or from beam clamps fastened to structural steel.
   3. Steel Joists: Support hangers from beam clamps fastened to bar joists or to auxiliary steel between bar joists as required.
   4. C-Clamp Hangers: Do not attach to one side of double-angle bottom members.
   5. Locate and install hangers, supports and attachments connecting to I-joists, structural insulated panels (SIPs), cross laminated timber and similar engineered structural products according to the structural product manufacturer specifications.

E. Make available to the Architect information required to verify the anchorage, sway bracing and restraint of fire protection systems.

END OF SECTION

SECTION 21 1300

FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Sprinklers

B. This is a contractor designed system. Contact AHJ prior to bid to verify fire system requirements. Provide design compliant with codes as interpreted by AHJ.

C. Scope: Wet-Pipe Sprinkler System.

D. Coordinate location and type of tamper, flow and pressure switches and fire alarm system.

E. Provide electrical connections and wiring as required for a complete and operable system. Includes but is not limited to bells, air compressors, sump pumps, fire pumps, jockey pumps and pump controllers.

1.02 RELATED SECTIONS

A. Contents of Division 21, Fire Suppression and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Division 22, Plumbing
   2. Division 23, Heating, Ventilating and Air-Conditioning
   3. Division 26, Electrical
   4. Division 28, Electronic Safety and Security
   5. Section 21 00 00, Fire Suppression Basic Requirements
   6. Section 21 05 00, Common Work Results for Fire Suppression
   7. Section 21 13 19, Fire Suppression Preaction Sprinkler Systems

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Hydraulic calculations.
   2. Sway brace calculations.
   3. Details of sway bracing.
   4. Details of interval and end of branch line restraints.
   5. Details of flexible sprinkler hose fitting assembly, including number and radius of bends, corresponding to equivalent feet used in hydraulic calculations. Provide details of sign to be installed at each flexible sprinkler hose fitting assembly.
   6. Details of oversized ceiling penetrations and oversized sprinkler escutcheons.

7. Trapeze hanger details and calculations, including size, length and material. Additionally, provide size, weight and number of pipes to be carried on the trapeze.
8. On submittal and As-Built drawings, provide text of sprinkler list to be installed in the spare sprinkler cabinet.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.07 SYSTEM DESCRIPTION

A. Provide coverage for entire building. Field verify field conditions prior to submittal of bid. Adjust bid to provide protection features in accordance with applicable codes and interpretations by AHJ. Provide design and installation based on more stringent requirements if this specification and AHJ requirements differ from Code.

B. Sprinkler system design to include a 10 percent pressure and flow cushion between system demand point and available water supplies.

C. Extend hydraulic calculations from hydraulically most remote design area back to location of pressure hydrant of flow test or effective point of water supply where characteristics of water supply are known.

1.08 EXTRA STOCK

A. Provide extra sprinklers per code.

B. Provide suitable wrenches for each sprinkler type and metal storage cabinet in riser room.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Sprinklers: Viking.

2.02 SPRINKLERS

A. Finished Areas:
   1. Type: Glass-Bulb
   2. Style:
      a. Concealed
      b. Recessed
   3. Response: Quick-Response
   4. Finish:
      a. Chrome
      b. White Polyester
   5. Escutcheon: White Polyester
   6. Coverplate for Concealed Sprinklers:
      a. Flat Plate
      b. White

B. Pendent sprinklers supplied by dry or preaction piping: Dry pendent type.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install per manufacturer's requirements and recommendations.

3.02 SPRINKLERS

A. Center sprinklers in center or quarter points of suspended ceiling tile.

B. Align sprinklers with architectural column lines, lighting, diffusers and other ceiling features. In unfinished ceilings, route piping to minimize visual impact. Sprinklers and piping not so aligned are to be removed and replaced at no additional cost to Owner.

C. Install dry sprinklers in a manner which does not trap water.

END OF SECTION

SECTION 21 1319

FIRE SUPPRESSION PREACTION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
1. Inspector's Test Connection
2. Preaction Cabinet
3. Sprinklers
4. Initiating Devices
5. High/Low Pressure Alarm Switch
6. Alarm Pressure Switches
7. Valve Tamper Switches and Supervisory Pressure Switches
8. Notification Appliances
9. Miscellaneous
10. Drum Drip Drains

B. This is a contractor designed system. Contact AHJ prior to bid to verify fire system requirements. Provide design compliant with codes as interpreted by the AHJ.

C. Scope:
1. Preaction Sprinkler System
2. Revision and extension of existing system to new and remodeled areas.

D. Corrosive conditions are known to exist in project area. Provide corrosion-resistant products.

E. Coordinate location and type of tamper, flow and pressure switches.

F. Provide electrical connections and wiring as required for a complete and operable system. Includes but is not limited to air compressors, bells, control equipment and power supplies.

1.02 RELATED SECTIONS

A. Contents of Division 21, Fire Suppression and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
1. Division 22, Plumbing
2. Division 23, Heating, Ventilating and Air-Conditioning
3. Division 26, Electrical
4. Division 28, Electronic Safety and Security
5. Section 21 00 00, Fire Suppression Basic Requirements
6. Section 21 05 00, Common Work Results for Fire Suppression
7. Section 21 13 00, Fire Suppression Sprinkler Systems

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Hydraulic calculations.
   2. Sway brace calculations.
   3. Details of sway bracing.
   4. Details of interval and end of branch line restraints.
   5. Details of oversized ceiling penetrations and oversized sprinkler escutcheons.
   6. Trapeze hanger details and calculations, including size, length and material. Additionally, provide size, weight and number of pipes to be carried on the trapeze.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.07 SYSTEM DESCRIPTION

A. Provide a complete and operable single- interlocked preaction sprinkler system (cabinet) for each room as follows: MPOE. Each system to be operationally independent of other rooms.
   1. Cabinet assembly to contain a single-interlock preaction system, electric release, pre-assembled, pre-wired and factory tested under ISO-9001 manufacturing and quality control procedures.
   2. The integrated unit to be cULus Listed and FM Approved as an assembled unit. All system components to be compatible, cULus listed or FM approved.
   3. System to have unique serial number for easy traceability.

B. Field verify field conditions prior to submittal to bid. Adjust bid to provide protection features in accordance with applicable codes and interpretations by AHJ. Provide design and installation based on more stringent requirements if this specification or AHJ requirements differ from Code.

C. Design Parameters:
   1. Increase remote design area for sloped roofs or concealed areas per NFPA 13.
   2. Building Area: Area of Work.
      a. Occupancy Classification: Light.
   3. Design parameters above are NFPA 13 minimums. Provide increased design densities, design areas and hose allowances to meet requirements of AHJ.

D. Sprinkler system design to include a 10 percent pressure and flow cushion between system demand point and available water supplies.

E. Extend hydraulic calculations from hydraulically most remote design area back to location of pressure hydrant of flow test or effective point of water supply where characteristics of water supply are known.

F. Develop cost-effective designs that may include use of extended coverage sprinklers and design area reductions as allowed by NFPA 13.

1.08 EXTRA STOCK

A. Provide extra sprinklers per code.

B. Provide suitable wrenches for each sprinkler type and metal storage cabinet in riser room.

C. Inside the cabinet, provide a list of sprinklers installed in the property, including sprinkler identification number, manufacturer, model, orifice, deflector type, thermal sensitivity and pressure rating, quantity of each type to be contained in the cabinet an issue or revision date of the list.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Inspector's Test Connection: See Section 2.02 for Manufacturer information.

B. Preaction Cabinet: Viking; TOTALPAC 3

C. Sprinklers:
1. Finished Areas:
    a. Viking Corporation
    b. Tyco
    c. Reliable
    d. Victaulic
    e. Globe
    f. Or approved equivalent.
2. Nonfinished Areas:
    a. Viking Corporation
    b. Tyco
    c. Reliable
    d. Victaulic
    e. Globe
    f. Or approved equivalent.
3. Storage:
    a. Viking Corporation
    b. Tyco
    c. Reliable
    d. Victaulic
    e. Or approved equivalent.
4. Dry Pendent:
    a. Viking Corporation
    b. Tyco
    c. Reliable
    d. Victaulic
    e. Or approved equivalent

D. Initiating Devices:
1. Same manufacturer as control equipment.
2. System Sensor
3. Xtralis
4. Or approved equivalent.

E. High/Low Pressure Alarm Switch:
   1. Potter Electric Signal Company
   2. System Sensor
   3. Or approved equivalent.

F. Alarm Pressure Switches:
   1. Potter Electric Signal Company
   2. System Sensor
   3. Or approved equivalent.

G. Valve Tamper Switches and Supervisory Pressure Switches:
   1. Potter Electric Signal Company
   2. System Sensor
   3. Or approved equivalent.

H. Notification Appliances: Notification appliances must be compatible with control equipment.
   1. Same manufacturer as control equipment.
   2. Wheelock
   3. Gentex
   4. Federal Signal
   5. System Sensor
   6. Or approved equivalent.

I. Miscellaneous:
   1. Circuit Conductors:
      a. Allied Wire and Cable
      b. CCI
      c. West Penn Wire
      d. Or approved equivalent.
      e. No substitutions permitted.
   2. Locks and Keys:
      a. Same manufacturer as fire alarm control equipment.
      b. Or approved equivalent.
      c. No substitutions permitted.
   3. Instruction Charts:
      a. Trade
      b. Or approved equivalent.
      c. No substitutions permitted.
   4. Caution and Advisory Signs and Placards:
      a. Fire Protection Products, Incorporated
      b. Allied Rubber and Gasket Company Incorporated, dba ARGCO
      c. Or approved equivalent.
   5. Document Storage Cabinet:
      a. Same manufacturer as fire alarm control equipment.
      b. Meir Products
      c. Space Age
      d. Or approved equivalent.
      e. No substitutions permitted.

J. Drum Drip Drains:
   1. Custom Piping and Valves per NFPA 13.
   2. AGF; Collect an Drain, Model 5100A.
   3. AGF; Collect an Drain, Model 5200A.
   4. Or approved equivalent.

2.02 INSPECTOR'S TEST CONNECTIONS

A. Integrated Releasing Control Panel: Viking VFR-400
   1. Release control panel to be fully integrated to the TOTALPAC3 cabinet enclosure. It is to be pre-assembled, pre-wired, programmed and tested at the factory. It is to be FM Approved and cULus listed to UL 864-9 standard. Panel to include four programmable Class B, Style B initiating zones, two class B supervisory zones, and four programmable output circuits. Provide onboard, menu-driven programming with pre-installed programs for ease of set-up. Size batteries to provide emergency power as per UL (24 hours) or FM (90 hours) requirements. Control panel to include both an LCD Annunciator and a set of yellow and red LED lamps identifying alarm, trouble, supervisory and flow conditions. Include easy to operate control buttons for the operation of the panel functions.
   2. Stand-By Duration:
      a. Five minutes of alarm after 24 hours stand-by (UL).
      b. 10 minutes of alarm after 90 hours stand-by (FM).
   3. Control Panel: Class A, Style D initiating device module; provide a CA2Z module to allow the installation of Class A, Style D wiring on the initiating circuit.

2.03 PREACTION CABINET

A. Manufacturer: Viking TOTALPAC 3

B. Cabinet to be self-contained type and integrate a single-interlock preaction system, Electric release, and shall contain all hydraulic, pneumatic devices, and electrical components required for the control of a self-contained preaction system. System to include the following:
   1. Sturdy free-standing 14 gauge steel cabinet measuring 23-inches x 25-inches x 77-inches for 1-1/2-inch and 2-inch systems.
   2. Textured rust proof coating, inside and outside, fire red, oven baked polyester powder on phosphate base (powder coated).
   3. One or two locked access door(s), depending on cabinet size, to reduce frontal clearance required for opening.
   4. Individual access doors for the hydraulic section and the emergency release.

C. Integrated Preaction System:
   1. Viking Deluge valves model F-1 for 1-1/2-inch through 8-inch diameter c/w supervised butterfly control valve, releasing trim rated at 250 psi and all the necessary accessories. Trim too include a mechanical latching device to prevent system from resetting in case of loss of power to the release solenoid. Systems provided with solenoid only, without this mechanical latching device, are not acceptable. Clearly identify every valve as to its operation with arrows indicating all positions to facilitate system operation.
   2. Pressure gauges to indicate water supply, priming water and air pressures of the system. Provide each pressure gauge with its own three-way valve.
   3. Release trim with solenoid valve and supervisory and alarm devices required to be Schedule 40 galvanized steel. Do not use black pipe.
   4. Schedule 40 steel pipe header painted fire red, with grooved ends to be connected to supply water from either side.
   5. Schedule 40 steel pipe drain manifold of 2-inch diameter painted fire red, with grooved ends for drain connections from either side.
   6. Trim to include properly identified contractor test ports factory mounted into the trim piping to facilitate system testing and commissioning.

7. Viking VFR-400 integrated releasing control panel with emergency batteries pre-wired and factory-assembled inside the TOTALPAC3 cabinet.
8. System to have an Integrated Releasing Circuit Disconnect Switch to allow the system to be tested without actuating the fire suppression system as required per NFPA 72, 2010 Edition. Operation of the Disconnect Switch to cause a supervisory signal at the releasing service fire alarm control unit. The disconnect switch to be a physical switch and not be accomplished by using software.
9. Field wiring terminal strips and junction box integrated with the cabinet for connection of field wiring. Standard factory-wired terminal strips to accept field installation of ARM-44 Relay Module, CA2Z Class initiating circuit module, RA-4410RC remote annunciator.

D. Cabinet assembly to be pre-assembled, pre-wired and factory tested under ISO-9001 conditions, as a Viking TOTALPAC3 system, by FireFlex Systems Inc.

E. System to be complete in all ways.

F. System to incorporate all components required for complete system operation.

2.04 SPRINKLERS

A. Finished Areas:
1. Type:
   a. Dry-Type Glass-Bulb
   b. Dry-Type Solder Link
2. Style:
   a. Concealed
   b. Recessed
   c. Deep
   d. Standard
3. Response:
   a. Quick-Response
   b. Standard Response
   c. Match thermal characteristics of existing sprinklers in area.
4. Finish:
   a. Chrome
   b. White Polyester
   c. Brass
5. Escutcheon:
   a. Chrome
   b. White Polyester
   c. Brass
6. Coverplate for Concealed Sprinkler:
   a. Flat Plate
   b. Domed
   c. Chrome
   d. White
   e. Match ceiling color.
   f. Clean Room Seal
   g. Air and Dust Seal

B. Nonfinished Areas:
1. Type:
   a. Glass-Bulb
   b. Solder Link
2. Style:

a. Dry Pendent without Escutcheon
b. Upright

3. Response:
a. Quick-Response
b. Standard Response
c. Match thermal characteristics of existing sprinklers in area.

4. Finish:
a. Chrome
b. White Polyester
c. Brass

C. Storage

1. Type:
a. Glass-Bulb
b. Solder Link

2. Style:
a. Dry Pendent Concealed
b. Dry Pendent Recessed
c. Dry Pendent Surface Mount
d. Dry Pendent without Escutcheon
e. Upright

3. Response:
a. Standard Response
b. Special
c. Match thermal characteristics of existing sprinklers in area.

4. Finish:
a. Chrome
b. White Polyester
c. Brass

5. Escutcheon:
a. Chrome
b. White Polyester
c. Brass

2.05 INITIATING DEVICES

A. Photoelectric Type Analog Detectors:

1. LED source, multiple cell, 360 degree smoke entry, visual latching operation indicator, insect screen, functional test switch and two- wire operation.
2. Provide device with vandal-resistant locking feature.

2.06 HIGH/LOW PRESSURE ALARM SWITCH

A. Pressure actuated to detect 10 PSI increase or decrease; SPDT switches.

B. Manufacturer: Potter PS40A, System Sensor.

2.07 ALARM PRESSURE SWITCHES

A. Monitor each alarm pressure switch with preaction control panel.

2.08 VALVE TAMPER SWITCHES AND SUPERVISORY PRESSURE SWITCHES

A. Monitor each tamper switch or supervisory pressure switch with preaction control panel.

2.09 NOTIFICATION APPLIANCES

A. Combination Horn/Strobe:
   1. Multi-candela, flush, wall mount, red finish, insect-proof.
   2. Provide horn/strobes that meet the latest requirements of NFPA 72, ANSI 117.1 and UL 1971.
   3. Candela rating as required by NFPA 72 for the space where used.

B. Strobe:
   1. Multi-candela, flush, wall mount, red finish, insect-proof.
   2. Provide strobes that meet latest requirements of NFPA 72, ANSI 117.1 and UL 1971.
   3. Candela rating as required by NFPA 72 for the space where used.

C. Horn:
   1. Flush, wall mount, red finish. Insect-proof.
   2. Provide horn that meets the latest requirements of NFPA 72.

D. Surface Backboxes: Provide manufacturer surface backboxes where devices cannot be installed recessed.

2.10 MISCELLANEOUS

A. Circuit Conductors:
   1. Copper or optical fiber; color code and label. Type FPL, FPLR and FPLP as required by NEC. Provide conductors in compliance with the requirements of the manufacturer.
   2. Minimum signaling line circuit and initiating device circuit wire size: AWG18. Minimum notification appliance circuit wire size: AWG14, or as approved by Engineer.

B. Locks and Keys:
   1. Provide same standard lock and key for each key operated switch and lockable panel and cabinet; provide five keys of each type.
   2. Provide a different standard lock and key for key operated disable switch; provide five keys of each type.

C. Instruction Charts:
   1. Printed instruction chart for operators, showing steps to be taken when signal is received (normal, alarm, supervisory and trouble). Charts to be easily readable from normal operator's station.
   2. Frame: Constructed from stainless steel or aluminum with polycarbonate or glass cover. Provide one for each control unit where operations are to be performed.

D. Caution and Advisory Signs and Placards:
   1. Provide manual release station operation placards.
   2. Provide signs and placards compliant with NFPA 13 and manufacturer requirements.

E. Document Storage Cabinet:
   1. Suitable for as-built drawings, operation and maintenance manual, system data file disk, spare parts and tools.
   2. Constructed from steel with baked enamel finish, size adequate for full size drawings, operation and maintenance manual, spare parts and tools.

2.11 DRUM DRIP DRAINS

A. Normally open upper ball valve.

B. Normally closed lower ball valve with alarm water detector connected to fire alarm system.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Obtain approval of system design from AHJ prior to installation. Do not begin installation without approval from AHJ and submittal review comments from Engineer.

B. Install in accordance with applicable codes, NFPA 2001, NFPA 72, NFPA 70 and the Contract Documents.

C. In accordance with manufacturer's instructions, provide storage containers, extinguishing agent, nozzles, pipe, fittings, manual release stations, abort stations, detection and control system, notification appliances, shutdowns, auxiliary system interfaces, signs, wiring, conduit and outlet boxes, piping, bracing, hangers, etc., required for the erection of a complete system as described in these specifications, as shown on Drawings and as required by AHJ.

D. Provide wiring to meet the requirements of national, state and local electrical codes. Provide color coded wiring as recommended and specified by the preaction detection system manufacturer.

E. Conceal wiring, conduit, boxes and supports where installed in finished areas.

F. Provide complete conduit system for wiring.

G. At junction boxes and termination points, provide identification tags on wires and cables.

H. Route wiring and piping to avoid blocking access to equipment requiring service, access, or adjustment.

I. Provide machine printed zone label on initiating devices visible from the floor without magnification.

J. Obtain Owner's approval of locations of devices before installation.

K. Install instruction placards in or adjacent to control panel.

L. Install warning and advisory placards adjacent to manual release stations and notification appliances at the entrance to the protected space and in the protected space.

M. Provide control panel and remote power supplies with 120VAC dedicated circuit per NFPA requirements.

N. Do not install cabinets or equipment below the battery cabinet. Do not locate battery and charging system cabinets in ceiling space.

O. Coordinate location of auxiliary drains with Architect. Architect to approve location before drain is installed. Protect valves from tampering or accidental operation. Coordinate with Division 22, Plumbing.

P. Mount dry and preaction system drum drips a minimum of 7'-6" -feet above floor.

Q. System Operation - Single Interlock:
1. Alarm Sequence of Operation:
a. Activation of one automatic initiating device or manual release station causes system to enter “alarm” mode including following operations:
1) Provide local annunciation of alarm zone and condition and audible and visual alarm signal at control panel.
2) Provide manual "acknowledge" function at control panel to silence audible alarm signal. Visual signal remains displayed until initiating alarm is cleared.
3) Transmit “alarm” signal to building fire alarm control panel.
4) Initiate the alarm bells located in the protected space.
5) Open solenoid valve thereby operating sprinkler preaction valve and filling the sprinkler pipes with water in the protected space.
6) Operate emergency power off for the equipment in the protected space.
7) Operate HVAC fan shutdown and damper closure in the protected space.
b. Operation of sprinkler system fusible element in conjunction with automatic initiating device or manual release station discharges water from the operated sprinkler.

R. Fire Safety Systems Interfaces and Functions:
1. Provide power and control conduit, wiring, boxes and terminations to power devices and interface devices to preaction system.
2. Provide alarm, supervisory and trouble relay output connections to the building fire alarm system.
3. Emergency Power Shutdown: Provide control wiring from relay contacts to activate emergency power shutdown for the protected space.
4. HVAC Control: Provide control wiring from relay contacts to activate fan shutdown and damper closure for the protected space.

S. Inspection and Testing for Completion:
1. System inspection, testing and commissioning to be performed by a certified manufacturer's representative.
2. Perform testing and inspection in accordance with NFPA 13. In addition, test the fire control and detection system in accordance with NFPA 72. Document each inspection and test.
3. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction and adjustments.
4. Provide tools, software and supplies required to accomplish inspection and testing.
5. Prepare for testing by ensuring work is complete and correct; perform preliminary tests as required to test system.
6. Correct defective work, adjust for proper operation and retest until entire system complies with Contract Documents.
7. Notify Owner seven days prior to beginning completion inspections and tests.
8. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
9. Diagnostic Period: After successful completion of inspections and tests, operate system in normal mode for at least 14 days without any system or equipment malfunctions.
a. Record system operations and malfunctions.

b. If a malfunction occurs, start diagnostic period over after correction of malfunction.
c. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
d. At end of successful diagnostic period, submit completed test documentation.

T. Owner Personnel Instruction:
1. Comply with all requirements of Division 01, General Requirements and Section 21 00 00, Fire Suppression Basic Requirements.
2. Provide the Following Instruction to Designated Owner Personnel:
a. Hands-On Instruction: On-site, using operational system.
b. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
c. Factory Instruction: At control unit manufacturer's training facility.
3. Basic Operation: One-hour sessions for attendant personnel, security officers and engineering staff, combination of classroom and hands-on.
a. Initial Training: One session pre-closeout.
b. Refresher Training: One session post-occupancy.
4. Detailed Operation: Two-hour sessions for staff, combination of classroom and hands-on:
a. Initial Training: One session pre-closeout.
b. Refresher Training: One session post-occupancy.
5. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data and record drawings available during instruction.
6. Provide means of evaluation of trainees suitable to type of training given; report results to Owner.

U. Closeout:
1. Comply with all requirements of Division 01, General Requirements and Section 21 00 00, Fire Suppression Basic Requirements.
2. Closeout Demonstration: Demonstrate proper operation of functions to Owner.
a. Be prepared to conduct any of the required tests.
b. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix and operator instruction chart(s) available during demonstration.
c. Have authorized technical representative of control unit manufacturer present during demonstration.
d. Demonstration may be combined with inspection and testing required by AHJ. Notify AHJ in time to schedule demonstration.
e. Repeat demonstration until successful.
3. Substantial Completion of the project cannot be achieved until inspection and testing is successfully completed.
4. Diagnostic Period:
a. Specified diagnostic period without malfunction has been completed.
b. Approved operating and maintenance data has been delivered.
c. Aspects of operation have been demonstrated to Owner.
d. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
e. Occupancy permit has been granted.
f. Specified pre-closeout instruction is complete.
g. Perform post-occupancy instruction within three months after date of occupancy.

V. Inspection, Testing and Maintenance, Post-Completion:

1. Reference Division 01, General Requirements and Section 21 00 00, Fire Suppression Basic Requirements, for additional requirements relating to maintenance service.
2. Provide to Owner, at no extra cost, a written maintenance contract for two years, to include the work described below.
3. Provide to Owner a proposal for later acceptance, for a maintenance contract for two years, to include the work described below; include the total cost of contract, proposal to be valid at least until 30 days after date of Substantial Completion.
4. Perform routine inspection, testing and preventive maintenance required by NFPA 72 and NFPA 13, including:
   a. Maintenance of fire safety interface connected to fire suppression system.
   b. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
5. Record keeping required by NFPA 13, NFPA 72 and authorities having jurisdiction.
6. Provide system test and inspection during the sixth, eleventh and twelfth month after substantial completion. Correct deficiencies and replace defective components at no cost to the Owner.
7. Provide trouble call-back service upon notification by Owner:
8. Provide on-site response within two hours of notification.
9. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed and parts replaced.
10. Submit duplicate of each log entry to Owner's Authorized Representative upon completion of site visit.
11. Comply with Owner's requirements for access to facility and security.

3.02 INSPECTOR'S TEST CONNECTIONS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Route water supply flow test connections to a location which can accept the flow under wide-open flow and pressure for a sufficient time to assure a proper test and which will not cause damage, including to landscaping.

D. Install conveniently and accessibly located with reference to finished building for repairs, removal and service.

3.03 SPRINKLERS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Center sprinklers in center or quarter points of suspended ceiling tile.

D. Align sprinklers with architectural column lines, lighting, diffusers and other ceiling features. In unfinished ceilings, route piping to minimize visual impact. Sprinklers and piping not so aligned are to be removed and replaced at no additional cost to Owner.

E. Space sprinkler heads to meet requirements of ceiling baffles installed to create hot / cold aisles where baffles have been installed.

F. Comply with sprinkler layouts as shown in Construction Documents to meet architectural constraints. These may be more conservative than Code maximums. Notify Architect if layout does not meet Code requirements.

3.04 INITIATING DEVICES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Coordinate with Division 28, Electronic Safety and Security.

3.05 HIGH/LOW PRESSURE ALARM SWITCH

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Coordinate with Division 28, Electronic Safety and Security.

3.06 ALARM PRESSURE SWITCHES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Coordinate with Division 28, Electronic Safety and Security.

3.07 VALVE TAMPER SWITCHES AND SUPERVISORY PRESSURE SWITCHES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Coordinate with Division 28, Electronic Safety and Security.

3.08 NOTIFICATION APPLIANCES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Coordinate with Division 28, Electronic Safety and Security.

3.09 MISCELLANEOUS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Circuit Conductors: Provide wiring to meet the requirements of national, state and local electrical codes. Provide color coded wiring as recommended and specified by the fire alarm and detection system manufacturer. Provide Type FPLR cable when in a riser application or FPLP cable when installed in plenums.

D. Locks and Keys: Deliver keys to Owner.

E. Instruction Charts:
   1. Locate charts as to be easily readable from operator's station.
   2. Obtain approval of Owner prior to mounting. Mount in location acceptable to Owner.
   3. Provide extra copy of Operation and Maintenance data submittal.

F. Caution and Advisory Signs and Placards: Mount signs and placards at manual release stations and as required by NFPA 13, NFPA 72 and manufacturer's recommendations.

G. Document Storage Cabinet: Obtain approval of Owner prior to mounting. Mount in location acceptable to Owner.

3.10 DRUM DRIP DRAINS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Locate within 7-feet of finished floor.

D. Coordinate drain locations with architect prior to design and installation of dry sprinkler system.

END OF SECTION

SECTION 23 0000

HEATING, VENTILATING AND AIR CONDITIONING (HVAC) BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work included in 23 00 00, HVAC Basic Requirements applies to Division 23, HVAC work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of heating, ventilating and air conditioning systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:
   1. Provide: To furnish and install, complete and ready for intended use.
   2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
   3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work provided.
   4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
   5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.02 RELATED SECTIONS

A. Contents of Section applies to Division 23, HVAC Contract Documents.

B. Related Work:
   1. Additional conditions apply to this Division including, but not limited to:
      a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
      b. Drawings
      c. Addenda
      d. Owner/Architect Agreement
      e. Owner/Contractor Agreement
      f. Codes, Standards, Public Ordinances and Permits

1.03 REFERENCES AND STANDARDS

A. References and Standards per Division 01, General Requirements, individual Division 23, HVAC Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
   1. State of California:
      a. CBC - California Building Code
      b. CEC - California Electrical Code
      c. CEC T24 - California Energy Code Title 24
      d. CFC - California Fire Code
      e. CMC - California Mechanical Code
      f. CPC - California Plumbing Code
      g. CSFM - California State Fire Marshal
      h. DSA - Division of State Architect Regulations and Requirements

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
   1. ABA - Architectural Barriers Act
   2. ABMA - American Bearing Manufacturers Association
   3. ADA - Americans with Disabilities Act
   4. AHRI - Air-Conditioning Heating & Refrigeration Institute
   5. AMCA - Air Movement and Control Association
   6. ANSI - American National Standards Institute
   7. ASCE - American Society of Civil Engineers
   8. ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers
   9. ASHRAE Guideline 0, The Commissioning Process
   10. ASME - American Society of Mechanical Engineers
   11. ASPE - American Society of Plumbing Engineers
   12. ASSE - American Society of Sanitary Engineering
   13. ASTM - ASTM International
   14. AWWA - American Water Works Association
   15. CFR - Code of Federal Regulations
   16. CGA - Compressed Gas Association
   17. CISPI - Cast Iron Soil Pipe Institute
   18. EPA - Environmental Protection Agency
   19. ETL - Electrical Testing Laboratories
   20. FM - FM Global
   21. GAMA - Gas Appliance Manufacturers Association
   22. HI - Hydraulic Institute Standards
   23. IAPMO - International Association of Plumbing & Mechanical Officials
   24. IFGC - International Fuel Gas Code
   25. ISO - International Organization for Standardization
   26. MSS - Manufacturers Standardization Society
   27. NEC - National Electric Code
   28. NEMA - National Electrical Manufactures Association
   29. NFPA - National Fire Protection Association
   30. NFGC - National Fuel Gas Code
   31. NRCA - National Roofing Contractors Association
   32. NSF - National Sanitation Foundation
   33. OSHA - Occupational Safety and Health Administration
   34. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
   35. TEMA - Tubular Exchanger Manufactures Association
   36. TIMA - Thermal Insulation Manufactures Association
   37. UL - Underwriters Laboratories, Inc.

D. See Division 23, HVAC individual Sections for additional references.

1.04 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 23, HVAC Sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. In addition:

1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.
2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. All transmissions/submissions to be submitted to Architect. At Contractor’s option, four separate submittals may be provided, consisting of long lead items, underground/site work, building work, and building automation system. Deviations will be returned without review.
3. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 23, HVAC Sections.
4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
    a. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
    b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 23, HVAC Specification Sections for specific items required in product data submittal outside of these requirements.
    c. Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.
    d. For vibration isolation of equipment, list make and model selected with operating load and deflection.
    e. See Division 23, HVAC individual Sections for additional submittal requirements outside of these requirements.
5. Maximum of two reviews of submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of these additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

6. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer’s comments. Identify Engineer’s comments and provide an individual response to each of the Engineer’s comments. Cloud changes in the submittals and further identify changes which are in response to Engineer’s comments.
7. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet Section 23 0548, Vibration and Seismic Controls for HVAC Equipment. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.
8. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required by Division 23, HVAC Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals.
9. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
10. Substitutions and Variation from Basis of Design:
    a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
    b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals". For any product marked "or approved equivalent", a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.
11. Shop Drawings: Provide coordinated shop drawings which include physical characteristics of all systems, equipment, ductwork and piping layout plans, and control wiring diagrams. Reference individual Division 23, HVAC Specification Sections for additional requirements for shop drawings outside of these requirements.
    a. Provide Shop Drawings indicating access panel locations for items that require Code or maintenance access, size and elevation for approval prior to installation.
12. Samples: Provide samples when requested by individual Sections.
13. Resubmission Requirements:
    a. Make any corrections or change in submittals when required. Provide submittals as specified. The engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
        1) Resubmit for review until review indicates no exception taken or make "corrections as noted".

2) When submitting drawings for Engineers re-review, clearly indicate changes on drawings and "cloud" any revisions. Submit a list describing each change.

14. Operation and Maintenance Manuals, Owner's Instructions:
    a. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
        1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
        2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment: belts, motors, lubricants, and filters.
        3) Include Warranty per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Sections.
        4) Include product certificates of warranties and guarantees.
        5) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub assemblies.
        6) Include copy of startup and test reports specific to each piece of equipment.
        7) Include copy of final air and water systems balancing log along with pump, fan and distribution system operating data.
        8) Include commissioning reports.
        9) Include copy of valve charts/schedules.
        10) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.
    b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 23 00 00, HVAC Basic Requirements Article titled "Demonstration".
    c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.
15. Record Drawings:
    a. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical items. Include items changed by field orders, supplemental instructions, and constructed conditions.

b. Record Drawings are to include equipment and fixture/connection schedules, control dampers, fire smoke dampers, fire dampers, valves, bottom of pipe, duct and equipment elevations and dimensioned locations for all distribution systems (hydronic and air). Invert elevations and dimensioned locations for underground systems below grade to 5-feet outside building that accurately reflect "as constructed or installed" for project.

c. At completion of project, input changes to original project CAD Drawings and make one set of black-line drawings created from CAD Files in version/release equal to contract drawings. Submit CAD disk and drawings upon substantial completion.

d. See Division 23, HVAC individual Sections for additional items to include in record drawings.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

F. Provide products that are UL listed.

G. Piping and duct insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

H. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.

I. Provide safety controls required by National Boiler Code (ASME CSD 1) for boilers and water heaters with an input of 400,000 BTUH and higher.

1.06 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Contracting and Procurement Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

1.07 COORDINATION DOCUMENTS

A. Prior to construction, coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, equipment, fire sprinklers, plumbing, cable trays, lights, and electrical services with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

B. Advise Architect in event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

C. Verify in field exact size, location, invert, and clearances regarding existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation related thereto.

D. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to pumps, fans, valves, control devices, air handlers, vibration isolation devices, etc.

2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL or ETL approved or have adequate approval or be acceptable by State, County, and City authorities.

B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

C. Hazardous Materials:
   1. Comply with local, State of California, and Federal regulations relating to hazardous materials.

2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Install equipment having components requiring access (i.e., drain pans, drains, control operators, valves, motors and vibration isolation devices) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions including all appurtenances recommended in manufacturer's installation instructions, at no additional charge to Owner. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.

D. Earthwork:
1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
   a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork Sections. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
   b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
   c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E. Firestopping:
1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
   a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F. Pipe Installation:
   1. Provide installation of piping systems coordinated to account for expansion and contraction of piping materials and building, as well as anticipated settlement or shrinkage of building. Install work to prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, seismic flexible joints, expansion joints, sleeves, anchors or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building with Project Structural Engineer. Verify construction phasing, type of building construction products and rating for coordinating installation of piping systems.
   2. Include provisions for servicing and removal of equipment without dismantling piping.

G. Plenums:
   1. Plenums: Materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84 or UL 723. Immediately notify Architect / Engineer of any discrepancy.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, Section 23 0548, Vibration and Seismic Controls for HVAC Equipment, and individual Division 23 HVAC Sections.

B. General:
   1. Earthquake resistant designs for HVAC (Division 23) equipment and distribution, i.e. motors, ductwork, piping, equipment, etc. to conform to regulations of jurisdiction having authority.
   2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
   3. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for piping equipment and water heaters. Submit Shop Drawings along with equipment submittals.
   4. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.

C. Piping and Ductwork:
   1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA or local requirements.

D. Provide means to prohibit excessive motion of mechanical equipment during earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
   1. Underground system installation prior to backfilling.
   2. Prior to covering walls.
   3. Prior to ceiling cover/installation.
   4. After major equipment is installed.
   5. When main systems, or portions of, are being tested and ready for inspection by AHJ.

C. Final Punch:
   1. Prior to requesting a final punch visit from the Engineer, request from Engineer the Mechanical Precloseout Checklist, complete the checklist confirming completion of systems' installation, and return to Engineer. Request a final punch visit from the Engineer, upon Engineer's acceptance that the mechanical systems are ready for final punch.
   2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CONTINUITY OF SERVICE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
   1. During remodeling or addition to existing structures, while existing structure is occupied, current services to remain intact until new construction, facilities or equipment is installed.
   2. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new piping and ductwork, and wiring to point of connection. Where existing systems are being utilized, clean existing distribution systems (ductwork, piping, fans, air handlers) prior to connecting new ductwork or piping.
   3. Coordinate transfer time to new service with Owner. If required, perform transfer during off peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum.
      a. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.
   4. Organize work to minimize duration of power interruption.

3.05 CUTTING AND PATCHING

A. Confirm Cutting and Patching requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
   1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
   2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.

3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.06 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

B. Maintain design intent where equipment other than as shown as Basis of Design in Contract Documents is provided. Where equipment requires ductwork or piping arrangement, controls/control diagrams, or sequencing different from that indicated in Contract Documents, provide at no additional cost to Owner.

3.07 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt, and/or dust as a result of improper storage to be replaced before installation.
2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
3. Protect bright finished shafts, bearing housings and similar items until in service.

3.08 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.09 CLEANING

A. Confirm Cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 INSTALLATION

A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Install equipment and fixtures in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
   1. Do not place equipment in sustained operation prior to initial balancing of HVAC systems.

D. Provide miscellaneous supports/metals required for installation of equipment, piping and ductwork.

3.11 PAINTING

A. Confirm Painting requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
   1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in mechanical rooms, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
   2. After acceptance by Authority Having Jurisdiction (AHJ), In a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
   3. See individual equipment Specifications for other painting.
   4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
   5. Piping and Ductwork: Clean, primer coat and paint exposed piping and ductwork on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.
   6. Covers: Covers such as manholes, cleanouts and the like will be furnished with finishes which resist corrosion and rust.

3.12 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
    a. Testing and Balancing Reports
    b. Cleaning
    c. Operation and Maintenance Manuals
    d. Training of Operating Personnel
    e. Record Drawings
    f. Warranty and Guaranty Certificates
    g. Start-up/Test Document
    h. Commissioning Reports

3.13 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Tests:
1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in Operation and Maintenance Manuals.
2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.14 LETTER OF CONFORMANCE

A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement that HVAC items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

3.15 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

3.16 TEMPORARY HEATING, COOLING AND HUMIDITY CONTROL

A. Provide temporary heating, cooling, controls, humidification and dehumidification as required to facilitate the construction of the project. Size and select temporary system based on the requirements of the various trades during construction. This includes, but is not limited to, drywall, case work, wood flooring and wood finishes that are subject to warping. Size and install system to prevent mold growth. Coordinate the location of the temporary system. The house system can be used. Develop a procedure for how the house system will be used including a sketch depicting the house system, how filtration will be used to prevent construction debris from entering the system and how often the filters will be changed, how the ductwork will be cleaned after use to ensure a clean system is turned over to the Owner and how the units are sized. Submit this procedure to the Mechanical Engineer for review. Follow National Air Duct Cleaners Association (NADCA) duct cleaning procedures and guidelines. Warranties for the house system, if new, to commence when the Owner moves in if house system is used as the means to maintain the climate within the building during construction. Include this warranty requirement in the original bid or proposal amount. Coordinate and provide any temporary power, controls, ductwork, piping, plumbing anchorage, miscellaneous steel and structural supports required to support the temporary system. Installation of the system to comply with all applicable codes and be acceptable to the Authority Having Jurisdiction (AHJ).

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Hangers and Supports for HVAC Piping, Ductwork and Equipment
   2. Wall and Floor Sleeves
   3. Building Attachments
   4. Flashing
   5. Miscellaneous Metal and Materials

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. ASCE 7-10, Minimum Design Loads for Buildings and Other Structures.
   2. Terminology: As defined in MSS SP-90 "Guidelines on Terminology for Pipe Hangers and Supports".
   3. Install ductwork and piping per SMACNA's requirements.
   4. Hanger spacing installation and attachment to meet all manufacturer's requirements and MSS SP-58.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Welding:
      a. Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications".
   2. Welding for Hangers:
      a. Qualify procedures and personnel according to AWS D9.1, Sheet Metal Welding Code for duct joint and seam welding.
   3. Engineering Responsibility:
      a. Design and preparation of Shop Drawings and calculations for each multiple pipe support, trapeze, duct support equipment hangers/supports, and seismic restraint by a qualified Structural Professional Engineer.
         1) Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services

of the kind indicated. Engineering services are defined as those performed for installations of hangers and supports that are similar to those indicated for this Project in material, design, and extent.

4. Manufacturers regularly engaged in the manufacture of bolted metal framing support systems, whose products have been in satisfactory use in similar service for not less than 10 years.
5. Support systems to be supplied by a single manufacturer.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 PERFORMANCE REQUIREMENTS

A. Provide pipe, ductwork and equipment hangers and supports in accordance with the following:
   1. When supports, anchorages, and seismic restraints for equipment, and supports, anchorages, and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor is responsible for their design.
   2. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

B. Engineered Support Systems:
   1. Support frames such as pipe racks or stanchions for piping, ductwork, and equipment which provide support from below.
   2. Equipment, ductwork and piping support frame anchorage to supporting slab or structure.

C. Provide channel support systems, for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

D. Provide heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

E. Provide seismic restraint hangers and supports for piping, ductwork and equipment. See Section 23 0548, Vibration and Seismic Controls for HVAC Equipment.

F. Obtain approval from AHJ for seismic restraint hanger and support system to be installed for piping and equipment. See Section 23 0548, Vibration and Seismic Controls for HVAC Equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Hangers and Supports for HVAC Piping, Ductwork and Equipment:
   1. Anvil International
   2. B-Line Systems, Incorporated
   3. Erico Company, Incorporated
   4. Nelson-Olsen Incorporated
   5. Rilco Manufacturing Company, Incorporated
   6. Snappitz Thermal Pipe Shield Manufacturing
   7. Unistrut Corporation
   8. Or approved equivalent.

B. Wall and Floor Sleeves:
   1. Thunderline Corporation “Link Seal”.
   2. Or approved equivalent.

C. Building Attachments:
   1. Anchor-It
   2. Gunnebo Fastening Corporation
   3. Hilti Corporation
   4. ITW Ramset/Red Head
   5. Masterset Fastening Systems, Incorporated
   6. Or approved equivalent.

2.02 HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

A. Hanger Rods: Hanger rods continuously threaded or threaded ends only in concealed spaces and threaded ends only in exposed spaces; finish electro-galvanized or cadmium-plated in concealed spaces and prime painted in exposed spaces; sizes per MSS.

B. Hanger Rod Couplings: Anvil Figure 136, B-Line Figure B3220, or approved equivalent; malleable iron rod coupling with elongated center sight gap for visual inspection; to have same finish as hanger rods.

C. Channel Hanging System:
   1. Framing members No. 12 gauge formed steel channels, 1-5/8-inch square, conforming to ASTM A570 GR33, one side of channel to have a continuous slot within turned lips; framing nut with grooves and spring 1/2-inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A307; fittings conforming to ASTM A575; parts enamel painted or electro-galvanized.
   2. Concrete Inserts: Malleable iron body, hot dipped galvanized finish. Lateral adjustment. MSS Type 18.

D. Continuous Concrete Insert: Steel construction, minimum 12 gauge. Electrogalvanized finish. Pipe clamps and insert nuts to match.

E. Pipe Hangers:
   1. Pipe Rings for Hanger Rods:
      a. Pipe Sizes 2-inches and Smaller: Adjustable swivel ring hanger, UL listed. Erico 100 or 101, Anvil Figures 69 or 104, or approved equivalent.
      b. Pipe Sizes 2-1/2-inches and Larger: Clevis type hangers with adjustable nuts on rod, UL listed. Anvil figure 260, Erico 400, or approved equivalent.
      c. Pipe hangers to have same finish as hanger rods.

F. Pipe Saddles and Shields:
   1. Factory fabricated saddles or shields under piping hangers and supports for insulated piping.
   2. Size saddles and shields for exact fit to mate with pipe insulation. 1/2 round, 18 gauge, minimum 12-inches in length (4-inch pipe and larger to be three times longer than pipe diameter).

G. Riser Clamps: Steel, UL listed. MSS Type 8. Erico 510 or 511. Copper coated; Erico 368.

H. Pipe Slides: Anvil, reinforced Teflon slide material (3/32-inch minimum thickness) bonded to steel; highly finished steel or stainless steel contact surfaces to resists corrosion; 60-80

PSI maximum active contact surface loading; steel parts 3/16-inch minimum thickness; attachment to pipe and framing by welding.

I. Pipe Guides:
   1. Furnish and install pipe guides on continuous runs where pipe alignment must be maintained. Minimum two on each side of expansion joints, spaced per manufacturer's recommendations for pipe size. Fasten guides securely to pipe and structure. Contact with chilled water pipe not to permit heat to be transferred in sufficient quantity to cause condensation on any surface.
   2. Furnish and install guides approximately four pipe diameters (first guide) and 14 diameters (second guide) away from each end of expansion joints. Guides are not to be used as supports and are in addition to other pipe hangers and supports.

J. Pipe Roller Hangers: Adjustable roller hanger. Black steel yoke, cast iron roller. MSS Type 41.

K. Below Ground Pipe Supports:
   1. Pipe Hangers All Sizes: Adjustable Clevis type, Federal Specification WW-H-171 (Type 1), UL listed, stainless steel Type 304. MSS Type 1. Erico 406.
   2. Rod: 5/8-inch stainless steel Type 18-8.
   3. Eyebolt: Stainless steel Type 18-8.
   4. Nuts and Washers: Stainless steel Type 18-8.

L. Thermal Hanger Shield Inserts:
   1. 100-PSI (690-kPa) minimum compressive strength calcium silicate insulation, encased in sheet metal shield or polyisocyanurate rigid foam exceeding the load bearing weight of the pipe at the hanger point with a PVC vapor barrier.
   2. Material for Cold Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate with vapor barrier or polyisocyanurate rigid foam with a PVC vapor barrier.
   3. Material for Hot Piping: Water-repellent-treated ASTM C533, Type 1 calcium silicate or polyisocyanurate rigid foam with a PVC vapor barrier.
   4. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
   5. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
   6. Insert Length: Extend 2-inches beyond sheet metal shield for piping operating below ambient air temperature.
   7. Thermal Hanger Shield Insulation Operating Temperature: Meet or exceed fluid temperature in pipe.

M. Freestanding Roof Supports: Polyethylene high-density UV resistant quick "pipe" block with foam pad.

2.03 WALL AND FLOOR SLEEVES

A. Below Grade or High Water Table Areas:
   1. "Link-Seal" Pipe Sleeves: Neoprene gasket links bolted together around an interior sleeve forming a watertight seal.
   2. Provide Type S unless otherwise noted.

B. Pre-Engineered Firestop Pipe Penetration Systems: UL listed assemblies for maintaining fire rating of piping penetrations through fire-rated assemblies. Comply with ASTM E814.

C. Fabricated Accessories:
   1. Steel Pipe Sleeves: Fabricate from Schedule 40 black or galvanized steel pipe. Remove end burrs by grinding.

2. Sheet Metal Pipe Sleeves: Fabricate from G-90 galvanized sheets closed with lock-seam joints. Provide the following minimum gauges for the sizes indicated:
   a. Sleeve Size 4-inches in Diameter and Smaller: 18 gauge.
   b. Sleeve Sizes 5-6-inches: 16 gauge.
   c. Sleeve Sizes 7-inches and Larger: 14 gauge.
   d. Fire-Rated Safing Material.
      1) Rockwool Insulation: Complying with FS-HH-I-558, Form A, Class IV, 6 pounds per cubic foot density with melting point of 1985 degrees F and K value of 0.24 at 75 degrees F.
      2) Calcium Silicate Insulation: Noncombustible, complying with FS-HH-I-523, Type II, suitable for 100 degrees F to 1200 degrees F service with K value of 0.40 at 150 degrees F.

2.04 BUILDING ATTACHMENTS

A. Beam Clamps:
   1. MSS Type 19 and 23, wide throat, with retaining clip.
   2. Universal Side Beam Clamp: MSS Type 20.

B. Powder-Actuated Drive Pin Fasteners: Powder actuated type, drive pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

C. Anchor Bolts:
   1. Anchor supports to existing masonry, block and tile walls per anchoring system manufacturer's recommendations or as modified by project structural engineer. Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
   2. Anchor Bolts (Cast-In-Place): Steel bolts, ASTM A307. Nuts to conform to ASTM A194. Design values for shear and tension not more than 80 percent of the allowable listed loads.
   3. Anchor (Expansion) Bolts: Carbon steel to ASTM A307; nut to conform to ASTM A194; drilled-in type. Design values for shear and tension not more than 80 percent of the allowable listed loads.
   4. Anchor (Adhesive) Bolts: Consisting of two-part adhesive cartridge and zinc-plated Type A307 steel anchor bolt rod assembly with ASTM A194 nut.

2.05 FLASHING

A. Steel Flashing: 26 gauge galvanized steel.

B. Safes: 8 mil thick neoprene.

C. Caps: Steel, 22 gauge minimum, 16 gauge at fire-resistant structures.

2.06 MISCELLANEOUS METAL AND MATERIALS

A. General:
   1. Provide miscellaneous metal items specified, including materials, fabrication, fastenings and accessories required for finished installation, where indicated on drawings or otherwise not shown on drawings that are necessary for completion of the project. Contractor is responsible for their design.
   2. Fabricate miscellaneous units to size shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and

plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

B. Structural Shapes: Where miscellaneous metal items are needed to be fabricated from structural steel shapes and plates, provide members constructed of steel conforming with requirements of ASTM A36 or approved equivalent.

C. Steel Pipe: Provide seamless steel pipe conforming to requirements of ASTM A53, Type S, Grade A, or Grade B. Weight and size required as specified.

D. Fasteners: Provide fasteners of types as required for assembly and installation of fabricated items; surface-applied fasteners are specified elsewhere.

E. Bolts: Low carbon steel externally and internally threaded fasteners conforming with requirements of ASTM A307; include necessary nuts and plain hardened washers. For structural steel elements supporting mechanical material or equipment from building structural members or connection thereto, use fasteners conforming to ASTM A325.

F. Miscellaneous Materials: Provide incidental accessory materials, tools, methods, and equipment required for fabrication.

G. Provide hot dipped galvanized components for items exposed to weather. Cold galvanize field-welded joints and components. Use materials compatible with system being supported (i.e. aluminum for aluminum ductwork, stainless steel for stainless steel ductwork).

H. Use straps, threshold rods and wire with sizes required by SMACNA to support ductwork.

I. Grout:
1. ASTM C1107, Grade B, factory mixed and packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.
2. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
3. Properties: Nonstaining, noncorrosive, and non gaseous.
4. Design Mix: 5000-PSI (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Verify building materials to have hangers and attachments affixed in accordance with hangers to be used. Provide supporting calculations.

B. Examine Drawings and coordinate for verification of exact locations of fire and smoke rated walls, partitions, floors and other assemblies. Indicate, by shading and labeling on Record Drawings such locations and label as "1-Hour Wall", "2-Hour Fire/Smoke Barrier", and the like. Determine proper locations for piping penetrations. Set sleeves in place in new floors, walls or roofs prior to concrete pour or grouting.

C. Install hangers, supports, anchors and sleeves after required building structural work has been completed in areas where the work is to be installed. Coordinate proper placement of inserts, anchors and other building structural attachments.

D. Equipment Clearances: Do not route ductwork, equipment, or piping through electrical rooms, transformer vaults, elevator equipment rooms, IT rooms, MPOE rooms, or other electrical or electronic equipment spaces and enclosures and the like. Within equipment rooms, provide minimum 3-feet lateral clearance from all sides of electric switchgear

panels. Do not route ductwork, equipment, or piping above any electric power or lighting panel, switchgear, or similar electric device. Coordinate with Electrical and coordinate exact ductwork, equipment or pipe routing to provide proper clearance with such items.

3.02 HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

A. Hang rectangular sheet-metal ducts with a cross sectional area of less than 7 SF with galvanized strips of No. 16 USS gauge steel 1-inch wide, and larger ducts with steel angles and adjustable hanger rods similar to piping hangers. Support at a maximum of 8-feet on center.

B. Support horizontal ducts within 24-inches of each elbow and within 48-inches of each branch intersection.

C. Provide aluminum supports for aluminum ductwork.

D. Provide stainless steel supports for stainless steel ductwork.

E. Support vertical ducts at maximum intervals of 16-feet and at each floor.

F. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

G. Use double nuts and lock washers on threaded rod supports.

H. Floor supports in mechanical rooms to be elevated 1-inch above finish floor and void space filled with masonry grout.

I. Anchor ducts securely to building in such a manner as to prevent transmission of vibration to structure. Do not connect duct hanger straps to roof deck. Do not support ducts from other ducts, piping or equipment.

J. Attach strap hangers installed flush with end of sheet-metal duct run to duct with sheet-metal screws.

K. Construct exterior ductwork or ductwork which is otherwise exposed to weather watertight and slope 1/4-inch per foot to avoid standing water.

L. Exposed ductwork hung in clean areas such as sanitary areas, pharmaceutical areas, wash down areas or food process areas to be installed using double end, food grade trapeze hanger rods suitable for use with food grade strut.

M. Channel Support System Installation:
   1. Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.
   2. Field assemble and install according to manufacturer's written instructions.

N. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

O. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

P. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

Q. Adjust hangers so as to distribute loads equally on attachments. Provide grout under supports to bring piping, ductwork and equipment to proper level and elevations.

R. Prime paint ferrous nongalvanized hangers, accessories, and supplementary steel which are not factory painted.

S. Horizontal Piping Hangers and Supports; Horizontal and Vertical Piping, and Hanger Rod Attachments:
1. Factory fabricated horizontal piping hangers and supports complying with MSS SP-58, to suit piping systems and in accordance with manufacturer's published product information.
2. Use only one type by one manufacturer for each piping service.
3. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping.
4. Pipe support spacing (pipe supported in ceiling or floor-supported) to meet latest applicable Code and manufacturer's requirements.
5. Provide copper-plated hangers and supports for uninsulated copper piping systems.

T. Plumber's Tape not permitted as pipe hangers or pipe straps.

U. Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure. For horizontally hung grooved-end piping, provide a minimum of 2 hangers per pipe section.

V. Pipe Ring Diameters:
1. Uninsulated and Insulated Pipe, Except Where Oversized Pipe Rings are Specified: Ring inner diameter to suit pipe outer diameter.
2. Insulated Piping Where Oversized Pipe Rings are Specified and Vibration Isolating Sleeves: Ring inner diameter to suit outer diameter of insulation or sleeve.

W. Oversize Pipe Rings: Provide oversize pipe rings of 2-inch and larger size.

X. Pipe Support Brackets: Support pipe with pipe slides.

Y. Steel Backing in Walls: Provide steel backing in walls to support fixtures and piping hung from steel stud walls.

Z. Pipe Guides:
1. Install on continuous runs where pipe alignment must be maintained. Minimum two on each side of expansion joints, spaced per manufacturer's recommendations for pipe size. Fasten guides to pipe structure. Contact with chilled water pipe does not permit heat to be transferred in sufficient quantity to cause condensation on any surface.
2. Install approximately four pipe diameters (first guide) and 14 diameters (second guide) away from each end of expansion joints. Do not use as supports. Provide in addition to other required pipe hangers and supports.

AA. Heavy-Duty Steel Trapeze Installation:
1. Arrange for grouping of parallel runs of horizontal piping and support together on field fabricated, heavy-duty trapezes.
2. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

3. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

AB. Group parallel runs of horizontal piping to be supported together on trapeze-type hangers. Maximum spacings: MSS SP-58.

AC. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe.

AD. Do not support piping from other piping.

AE. Fire protection piping will be supported independently of other piping.

AF. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated.

AG. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping" is not exceeded.

AH. Insulated Piping:
1. Attach clamps and spacers to piping.
   a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating Below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
2. Do not exceed pipe stress limits according to ASME B31.9.
3. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
4. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields to span arc of 180 degrees.
5. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.
6. Shield Dimensions for Pipe, not less than the following:
   a. NPS 1/4 to NPS 3-1/2 (DN8 to DN 90): 12-inches long and 0.048-inch thick.
   b. NPS 4 (DN100): 12-inches long and 0.06-inch thick.
   c. NPS 5 and NPS 6 (DN125 and DN150): 18-inches long and 0.06-inch thick.
   d. NPS 8 to NPS 14 (DN200 to DN350): 24-inches long and 0.075-inch thick.
   e. NPS 16 to NPS 24 (DN400 to DN600): 24-inches long and 0.105-inch thick.
7. Pipes NPS 8 (DN200) and Larger: Include wood inserts.
   a. Insert Material: Length at least as long as protective shield.
8. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

AI. Pipe Anchors: Provide anchors to fasten piping which is subject to expansion and contraction, and adjacent to equipment to prevent loading high forces onto the equipment.

AJ. Pipe Curb Assemblies:
1. Provide prefabricated units for roof membrane and insulation penetrations related to equipment. Coordinate with roofing system. Set supports on the structural

deck. Do not set supports on insulation or roofing. Provide level supports by prefabricated pitch built into the curb.

2. Provide for piping and electrical conduit which penetrates the structural roof deck to service equipment above the roof level (i.e., piping, electrical power and control wiring). Meet requirements of roof warranty.

AK. Escutcheon Plates: Install around horizontal and vertical piping at visible penetrations through walls, partitions, floors, or ceilings, including penetrations through closets, through below ceiling corridor walls, and through equipment room walls and floors.

AL. Vertical Piping:

1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
2. Riser clamps to be directly under fitting or welded to pipe.
   a. Riser to be supported at each floor of penetration.
   b. Provide structural steel supports at the base of pipe risers. Size supports to carry forces exerted by piping system when in operation.

AM. Piping above roof to be supported with freestanding roof pipe supports unless detailed otherwise.

3.03 WALL AND FLOOR SLEEVES

A. "Link-Seal" Pipe Sleeves: Install at floor/below grade piping penetrations. Provide manufacturer's sleeve appropriate to seal type for pre-cast penetrations.

B. Fabricated Pipe Sleeves:

1. Provide either steel or sheet metal pipe sleeves accurately centered around pipe routes. Size such that piping and insulation, if any, will have free movement within the sleeve, including allowance for thermal expansion. Sleeve diameter to be determined by local seismic clearance requirements, and by waterproofing requirements.
2. Length: Equal to thickness of construction penetrated, except extend floor sleeves 1-inch above floor finish.
3. Provide temporary support of sleeves during placement in concrete and other work around sleeves. Provide temporary end closures to prevent concrete and other materials from entering pipe sleeves.
4. Seal each end airtight with a resilient nonhardening sealer, UL listed, fire rated ASTM 814.

C. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:

1. Install fabricated pipe sleeve.
2. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve identification with specified material.
3. Seal each end airtight with a resilient nonhardening UL listed fire resistant ASTM 814.

D. Piping Penetrations Through Fire-Rated (One to Three Hour) Assemblies:

1. Select and install pre-engineered pipe penetration system in accordance with the UL listing and manufacturer's recommendation.
2. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814.

3.04 BUILDING ATTACHMENTS

A. Factory fabricated attachments complying with MSS SP-58, selected to suit building substructure conditions and in accordance manufacturer's published product information.

B. Select size of building attachments to suit hanger rods.

C. Space attachments within maximum piping span length indicated in MSS SP-58.

D. Install building attachments within concrete slabs or attach to structural steel or wood. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.

E. Attachment to Wood Structure: Anvil side beam bracket Figure 202 for attachment to wooden beam or approved attachment for a wood structure.

F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Install concrete inserts before concrete is placed; fasten inserts to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top in inserts.

H. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Test powder-actuated insert attachments with a minimum load of 100 pounds.

I. Do not use powder-actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4-inches thick.

J. Bolting: Provide bored, drilled or reamed holes for bolting to miscellaneous structural metals, frames or for mounts or supports. Flame cut, punched or hand sawn holes will not be accepted.

K. Anchor Bolts:
   1. Install anchor bolts for mechanical equipment, piping and ductwork as required. Tightly fit and clamp base-supported equipment anchor bolts at equipment support points. Provide locknuts where equipment, piping and ductwork are hung.
   2. Anchor Bolts (Cast-In-Place): Embed anchor bolts in new cast-in-place concrete to anchor equipment. Install a pipe sleeve around the anchor bolt for adjustment of the top 1/3 of the bolt embedment; sizes and patterns to suit the installation conditions of the equipment to be anchored.

3.05 FLASHING

A. Flash and counterflash where piping, ductwork and equipment passes through weather or waterproofed walls, floors, and roofs.

B. Provide 12-inch minimum height curbs for roof-mounted mechanical equipment. Flash and counter flash with galvanized steel, soldered and waterproofed.

3.06 MISCELLANEOUS METAL AND MATERIALS

A. General: Verify dimensions prior to fabrication. Form metal items to accurate sizes and configurations as indicated on drawings and otherwise required for proper installation; make with lines straight and angles sharp, clean and true; drill, countersink, tap, and otherwise prepare items for connections with work of other trades, as required. Fabricate to detail of structural shapes, plates and bars; weld joints where practicable; provide bolts and other connection devices required. Include anchorages; clip angles, sleeves, anchor plates, and similar devices. Hot dipped galvanize after fabrication items installed in exterior locations. Set accurately in position as required and anchor securely to building construction. Construct items with joints formed for strength and rigidity, accurately machining for proper fit; where exposed to weather, form to exclude water.

B. Finishes:
   1. Ferrous Metal: After fabrication, but before erection, clean surfaces by mechanical or chemical methods to remove rust, scale, oil, corrosion, or other substances detrimental to bonding of subsequently applied protective coatings. For metal items exposed to weather or moisture, galvanize in manner to obtain G90 zinc coating in accordance with ASTM A123. Provide other non-galvanized ferrous metal with 1 coat of approved rust-resisting paint primer, in manner to obtain not less than 1.0 mil dry film thickness. Touch-up damaged areas in primer with same material, before installation. Apply zinc coatings and paint primers uniformly and smoothly; leave ready for finish painting as specified elsewhere.
   2. Metal in Contact with Concrete, Masonry and Other Dissimilar Materials: Where metal items are to be erected in contact with dissimilar materials, provide contact surfaces with coating of an approved zinc-chromate primer in manner to obtain not less than 1.0 mil dry film thickness, in addition to other coatings specified in these specifications.
   3. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

C. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required. Avoid cutting concrete reinforcing when drilling for inserts. Reference structural drawings and reinforcing shop drawings and determine locations of stirrups prior to drilling into concrete.

E. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items, which are to be built into concrete masonry or similar construction.

F. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

G. Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

H. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.

I. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

J. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.

K. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

L. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

M. Provide galvanized components for items exposed to weather.

END OF SECTION

SECTION 23 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Vibration Isolation
   2. Seismic-Bracing/Restraint Devices/Systems for Equipment, Piping and Ductwork

B. General:
   1. Vibration isolation for mechanical ductwork, piping and equipment.
   2. Seismic restraint for mechanical ductwork, piping and equipment.
   3. Seismic Certification for equipment, hangers and systems
   4. Special inspections for systems.

C. Scope of Work:
   1. Vibration isolation and seismic restraint of new equipment and systems within project boundary defined in architectural drawings.
   2. Vibration isolation and seismic restraint of new equipment and systems in existing buildings to points of connection with existing systems.
   3. Provide supplementary structural steel for seismic restraint systems. No hanging from roof deck is permitted on this project, unless specifically allowed by Structural Engineer of Record in writing prior to bid.

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Vibration Isolation:
      a. Product Data: Provide catalog data indicating size, type, load and deflection of each isolator; and percent of vibration transmitted based on lowest disturbing frequency of equipment.
      b. Shop Drawings: Showing complete details of construction for steel and concrete bases including:
         1) Fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment and cantilever loads.
         2) Equipment mounting holes.
         3) Dimensions.
         4) Size and location of concrete and steel bases and curbs.
         5) Isolation selected for each support point.

6) Details of mounting brackets for isolator.
7) Weight distribution for each isolator.
8) Details of seismic snubbers.
9) Code number assigned to each isolator.

c. Design calculations: Provide calculations for selecting vibration isolators and for designing vibration isolation bases.

2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
3. Seismic Restraint:
   a. Shop Drawings: Show compliance with requirements of Quality Assurance article of this Section. Shop drawings to be stamped by a professional Structural or Civil Engineer licensed in State of California.
   b. Calculations: Submit seismic calculations indicating restraint loadings resulting from design seismic forces. Include anchorage details and indicate quantity, diameter and depth of penetration of anchors. Calculations certified by professional Structural or Civil Engineer licensed in State of California.
4. Seismic Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter and depth of penetration of anchors.
5. Submittals for Interlocking Snubbers: Include load deflection curves up to 1/2-inch deflection in x, y and z planes.
6. Welding certificates.
7. Equipment Certification: Provide seismic certification for equipment as noted in Seismic Design Summary or schedules on Drawings.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
1. Vibration Isolation:
   a. Except for packaged equipment with integral isolators, single manufacturer selects and furnishes isolation required.
   b. Deflections indicated on drawings are minimum actual static deflections for specific equipment supported.
   c. Isolator Stability:
      1) Size springs of sufficient diameter to maintain stability of equipment being supported. Spring diameters not less than 0.8 of compressed height at rated load.
      2) Springs have minimum additional travel to solid equal to 50 percent of rated defection.
      3) Springs support 200 percent of rated load, fully compressed, without deformation or failure.
   d. Maximum Allowable Vibration Levels: Peak vibration velocities not exceed 0.08 in/sec. Correct equipment operating at vibration velocities that exceed this criteria.
2. Seismic Restraint:
   a. Code and Standard Requirements:
      1) Seismic restraint of equipment, piping and ductwork to be in accordance with latest enacted version of CBC Chapter 16.
      2) Seismic restraint of equipment, piping and ductwork to be in accordance with Office of Statewide Health Planning and

Development (OSHPD) requirements for State of California including Code Application Notices (CAN) and Policy Intent Notices (PIN). Specifically adhere to CAN 2-1708A.5, CBC Sections 1708A.2, 1708A.5, 1702A and 1707A.9.

b. Confirm Seismic Control requirements in Division 01, General Requirements and Structural documents.

c. Certification: See Seismic Design Table or schedules on Drawings for equipment, systems and seismic-restraint devices designated to have seismic certification/qualification. Horizontal and vertical load testing and analysis performed according to ASCE 7-10. Anchorage systems to bear anchorage preapproval number from an agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing or calculations, if preapproved ratings are not available. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be sealed by qualified licensed professional engineer in State of California. Testing and calculations must include both shear and tensile loads and one test or analysis at 45 degrees to weakest mode.

d. Seismic restraint and anchorage of permanent equipment and associated systems listed below to building structure be designed to resist total design seismic force prescribed in local building code:
   1) Floor- or roof-mounted equipment weighing 400 pounds or greater.
   2) Suspended, wall-mounted or vibration isolated equipment weighing 20 pounds or greater.
   3) In-line duct devices connected to ductwork weighing 75 pounds or greater.
   4) Housekeeping slabs: provide reinforcement and anchorage to building structure.

e. Where required, seismic sway bracing of suspended duct and piping meet following:
   1) Pipe and duct runs requiring seismic bracing have minimum of two traverse braces and one longitudinal brace. Longitudinal (or traverse) brace at 90 degree change in direction may act as traverse (or longitudinal) brace if located within 2-feet of change in direction.
   2) Seismic bracing may not pass through seismic separation joint. Pipe or duct runs that pass through seismic separation joint must be restrained within 5-feet of both sides of separation.
   3) Seismic brace assembly spacing not to exceed 40-feet transverse and 80-feet longitudinal.

f. Seismic restraints may be omitted from suspended piping and duct if following conditions are satisfied:
   1) For piping or ducts supported by rod hangers 12-inches or less in length from top of duct to bottom of structural support. Top connections to structure have swivel joints, eye bolts, or vibration isolation hangers for entire length of system run.
   2) Lateral motion of system will not cause damaging impact with surrounding systems or cause loss of system vertical support.
   3) System must be welded steel pipe, brazed copper pipe, sheet metal duct or similar ductile material with ductile connections.

C. Seismic restraints, including anchors to building structure, be designed by registered professional Structural or Civil Engineer licensed in State of California. Design includes:

1. Number, size, capacity and location of anchors for floor- or roof-mounted equipment. For curb-mounted equipment, provide design of attachment of both unit to curb and curb to structure.
2. Number, size, capacity and location of seismic restraint devices and anchors for vibration-isolation and suspended equipment. Provide calculations and test data verifying horizontal and vertical ratings of seismic restraint devices.
3. Number, size, capacity and location of braces and anchors for suspended piping and ductwork on as-built plan drawings.
4. Maximum seismic loads to be indicated on drawings at each brace location. Drawings bear stamp and signature of registered professional Structural Engineer who designed layout of braces.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Seismic Snubber Units: Furnish replacement neoprene inserts for snubbers.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Vibration Isolation:
1. Kinetics Noise Control, Inc.
2. Mason Industries Inc.
3. M.W. Sausse - Vibrex
4. Where Mason numbers are specified, equivalent products by listed manufacturers are acceptable.

B. Seismic-Bracing/Restraint Devices/Systems for Equipment, Piping and Ductwork:
1. Cooper B-Line, Inc.
2. Hilti, Inc.
3. Mason Industries, Inc.
4. Kinetics Noise Control.
5. Unistrut
6. ISAT, Inc.
7. Where Mason numbers are specified, equivalent products by listed manufacturers are acceptable.

2.02 VIBRATION ISOLATION

A. Type 1 - Neoprene Pad: Natural rubber waffle pads, arranged in single or multiple layers, 3/4-inch thick per layer with pattern repeating on 1/2-inch centers; 50 durometer hardness; maximum loading 60 PSI. Minimum 1/4-inch thick steel load distribution plate and 1/16-inch shim plates between layers, factory cut to sizes matching requirements of supported equipment. Molded bridge with neoprene anchor bolt bushing and flat washer face to prevent metal to metal contact. Number of layers required for equipment scheduled. Mason Type: Super WMH.

B. Type 2 - Neoprene Mount: Double-deflection type, with ductile-iron housing containing two separate and opposing, oil-resistant natural rubber or bridge bearing neoprene elements, factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Neoprene elements to prevent metal to metal contact during normal operation. Minimum static deflection of 0.20-inches. Mason Type: BR. Use appropriate OSHPD OPM number.

C. Type 4b - Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.
   1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint with neoprene acoustical cup, spring inspection ports and rebound adjustment ports.
   2. Base: Factory drilled for bolting to structure.
   3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel before contacting a resilient collar.
   4. Brackets: Manufacturer's standard bracket, utilize height saving brackets to accommodate height restrictions.
   5. Mason Type: SSLFH.

D. Type 5c - Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.
   1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 15 degrees of angular hanger-rod misalignment from vertical without binding or reducing isolation efficiency.
   2. Outside Spring Diameter: Not less than 80 percent of compressed height of spring at rated load.
   3. Minimum Additional Travel: 50 percent of required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
   7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
   8. Mason Type: RW30.

E. Type FC-1, Flexible duct connectors. See Specification Section 23 33 00 Air Duct Accessories.

2.03 SEISMIC-BRACING/RESTRAINT DEVICES/SYSTEMS FOR EQUIPMENT, PIPING AND DUCTWORK

A. General Requirements for Restraint Components: Rated strengths, features and applications to be as defined in reports by agency acceptable to authorities having jurisdiction.

B. Structural Safety Factor: Allowable strength in tension, shear and pullout force of components be at least four times maximum seismic forces to which they will be subjected.

C. Anchor bolts for attaching to concrete to be seismic-rated, drill-in and stud-wedge or female-wedge type.

D. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.

E. Maximum 1/4-inch air gap and minimum 1/4-inch thick resilient cushion.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Set floor-mounted equipment with steel base rails on minimum 4-inch-high concrete housekeeping pads. Extend pad minimum 6-inches beyond footprint of equipment in each direction, but not less than twice the embedment depth of concrete anchors.

B. Provide mounts for equipment installed outdoors for wind loads of 30 lbs. psf applied to any exposed surface of isolated equipment.

C. Do not install equipment or pipe which makes rigid contact with building slabs, beams, studs, walls, etc.

D. Anchor baseplate to floor or structure. Provide rubber grommets and washers to isolate bolt from base plate. Under no circumstances is isolation efficiency to be destroyed when bolting isolators to floor.

E. Building Penetrations: Isolate water piping and ductwork penetrating wall, ceilings, floors or shafts from structure by piping isolator or by 3/8-inch thick foamed rubber insulation. Install units flush with finished structure face, using one for each side as required. Cut units to length if longer than structure thickness. Caulk around pipe or duct at equipment room wall.

F. Provide roof curbs, equipment supports and roof penetrations. Work to maintain roof warranty. Coordinate location, size, structural connections/requirements and flashing prior to installation.

G. Vibration isolators must not cause change of position of equipment or piping which would stress piping connections or misalignment shafts or bearings. Isolated equipment is to be level and in proper alignment with connecting ducts and pipes.

H. Pipe Hangers in Equipment Rooms: Support water and gas piping connected to rotating equipment within equipment rooms on spring and neoprene hangers. The first three hangers from a piece of vibrating equipment are to have a minimum of 1/2 static deflection of equipment isolators. Other isolators should have a minimum of 1/4 static deflection of equipment isolators.

I. Examination:
   1. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements, installation tolerances and other conditions affecting performance.
   2. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

J. Testing: Perform following field quality-control testing:
   1. Isolator seismic-restraint clearance.
   2. Isolator deflection.
   3. Snubber minimum clearances.

K. Adjusting:
   1. Adjust snubbers according to manufacturer's written recommendations.
   2. Torque anchor bolts according to equipment manufacturer's written recommendations to resist seismic forces.

L. Cleaning: After completing equipment installation, inspect vibration isolation and seismic-control devices. Remove paint splatters and other spots, dirt and debris.

M. Demonstration: Engage factory-authorized service representative to train Owner's maintenance personnel to adjust, operate and maintain air-mounting systems. Reference Division 01, General Requirements.

3.02 VIBRATION ISOLATION

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Vibration isolators must be installed in strict accordance with manufacturer's written instructions and certified submittal data.

D. Install isolation as indicated on drawings by type and location and where indicated below.

E. Equipment Vibration Isolation Schedule:

Equipment	Size	Vibration Isolator Type	Minimum Deflection (in)
Fan-coils, Unit Heaters, Fan-Powered Terminal Units	All	Type 5C, FC-1	0.75
Axial, Cabinet, Centrifugal Inline Fans	0 to 23.5-inch diameter	Type 4B, or 5C, FC-1	0.75

F. Isolation Mounts:
1. Install minimum of four seismic snubbers on isolated equipment. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts.
3. Provide flexible piping connection and flexible ductwork connection to equipment with isolation mounts or bases.

G. Isolating Hangers:
1. Support piping and ductwork connected to isolated equipment within equipment rooms on isolating hangers as scheduled on drawings. Unless otherwise noted, first three hangers from isolated equipment to have a minimum of 1/2 static deflection of equipment isolators. Other isolating hangers to have a minimum of 1/4 static deflection of equipment isolators.
2. Position isolating hanger elements as high as possible in hanger rod assembly, but not in contact with building structure. Install hangers so that hanger housing may rotate full 360 degrees about rod axis without contacting any object.
3. Unless otherwise noted, air supply units with internally isolated fans do not require isolating hangers for connecting pipes and ductwork.
4. Where parallel running pipes are hung together on an isolated trapeze, provide isolator deflections for largest determined by provisions for pipe isolation. Do not mix isolated and non-isolated pipes in same trapeze.
5. Install limit stops so they are out of contact during normal operation.

H. Adjusting:
   1. Adjust isolators after piping systems have been filled and equipment is at operating weight.
   2. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.03 SEISMIC-BRACING/RESTRAINT DEVICES/SYSTEMS FOR EQUIPMENT, PIPING AND DUCTWORK

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Plastic Nameplates
   2. Tags
   3. Plastic Pipe Markers
   4. Ceiling Tags

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Schedules:
      a. Submit valve schedule for each piping system, in tabular format using Microsoft Word or Excel software. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shutoff and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for maintenance manuals.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
   2. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23, HVAC Sections. Where more than a single type is specified for application, provide single selection for each product category.

B. Plastic Nameplates:
1. Brady Corporation
2. Brimar
3. Champion America
4. Craftmark
5. Seton
6. Or approved equivalent.

C. Tags:
1. Brady Corporation
2. Brimar
3. Champion America
4. Craftmark
5. Seton
6. Or approved equivalent.

D. Plastic Pipe Markers:
1. Brady Corporation
2. Brimar
3. Champion America
4. Craftmark
5. Seton
6. Or approved equivalent.

E. Ceiling Tags:
1. Brady Corporation
2. Brimar
3. Champion America
4. Craftmark
5. Seton
6. Or approved equivalent.

2.02 PLASTIC NAMEPLATES

A. Description: Engraving stock melamine plastic laminate in the size and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color), punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Provide 1/8-inch thick material.
1. Letter Color: White.
2. Letter Height: 1/2-inch.
3. Background Color: Black.
4. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
5. Access Panel Markers: Manufacturer's standard 1/16-inch thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding

to concealed valve or devices/equipment. Include center hole to allow attachment.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 2-inch diameter.

B. Metal Tags: Polished Brass with stamped letters; tag size minimum 2-inch diameter with smooth edges.

C. Valve designations to be coordinated with existing valve identifications to ensure no repetitive designations are utilized.

D. Chart/Schedules: Valve Schedule Frames. For each page of a valve schedule, provide glazed display frame with removable mounting as appropriate for wall construction upon which frame is to be mounted. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

E. Valve Tag Fasteners: Solid brass chain (wire link or beaded type), or solid brass S-hooks.

F. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.
   1. Size: Approximately 4 by 7-inches.
   2. Fasteners: Brass grommet and wire.
   3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
   4. Color: Yellow background with black lettering.

2.04 PLASTIC PIPE MARKERS

A. Color: Conform to ASME A13.1 and ANSI Z535.1.

B. Plastic Pipe Markers (for external diameters of 6-inches and larger including insulation): Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers (for external diameters less than 6-inches including insulation): Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Lettering:
   1. 3/4-inch to 1-1/4-inch Outside Diameter of Insulation or Pipe: 8-inch long color field, 1/2-inch high letters.
   2. 1-1/2-inch to 2-inch Outside Diameter of Insulation or Pipe: 8-inch long color field, 3/4-inch high letters.
   3. 2-1/2-inch to 6-inch Outside Diameter of Insulation or Pipe: 12-inch long color field, 1-1/4-inch high letters.
   4. 8-inch to 10-inch Outside Diameter of Insulation or Pipe: 24-inch long color field, 2-1/2-inch high letters.
   5. Over 10-inch Outside Diameter of Insulation or Pipe: 32-inch long color field, 3-1/2-inch high letters.

2.05 CEILING TAGS

A. Description: Steel with 3/4-inch diameter color coded head.

B. Color code as follows:
   1. Yellow - HVAC equipment.
   2. Red - Fire dampers/smoke dampers.
   3. Blue - Heating/cooling valves.
   4. Ceiling tile labels, machine generated, adhesive backed tape labels with black letters, clear tape.

PART 3 - EXECUTION

3.01 GENERAL - INSTALLATION

A. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates riveted to equipment body.

B. Identify ductwork with plastic ductmarkers.

C. Identify piping, concealed or exposed, with plastic pipe markers.

D. Coordinate names, abbreviations and other designations used in mechanical identification work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.

E. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples: Chiller No. 3, Air Handling Unit No. 42, Standpipe F12, and the like).

F. Degrease and clean surfaces to receive adhesive for identification materials.

G. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

H. Coordinate with the facility maintenance personnel to ensure consistency with the existing tagging system.

I. Install all products in accordance with manufacturer's instructions.

J. Manual Balancing Dampers: Provide 12-inch long orange marker ribbon to end of balancing damper handle.

3.02 PLASTIC NAMEPLATES

A. Install plastic nameplates with corrosive-resistant mechanical fasteners.

B. Identify control panels and major control components outside panels with plastic nameplates riveted to equipment body.

C. Identify thermostats with nameplates.

3.03 TAGS

A. Use metal tags on piping 3/4-inch diameter and smaller.

B. Tag balancing valves and major dampers with balanced GPM or CFM indicated after balancing is completed and accepted.

C. Install tags with corrosion resistant chain.

D. Small devices, such as in-line pumps, may be identified with tags.

E. Identify valves in main and branch piping with metal tags. Indicate valve function and the normally open or closed positions on the valve tag.

F. Identify air terminal units and radiator valves with numbered plastic tags.

G. Tag automatic controls, instruments, and relays. Key to control schematic.

H. Install valve schedule at each mechanical room.

3.04 PLASTIC PIPE MARKERS

A. Install plastic pipe markers complete around pipe in accordance with manufacturer's instructions.

B. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20-feet (reduced to 10-feet in congested areas and mechanical equipment rooms) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction. Locate near branches, valves, control devices, equipment connections, access doors, floor/wall penetrations.

3.05 CEILING TAGS

A. Provide ceiling tags to locate valves, dampers, and equipment above accessible ceilings. Locate in corner of ceiling tee grid closest to equipment.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. General Requirements and Procedures
   2. Pre-Construction Balance (Existing Systems)
   3. Fundamental Air Systems Balancing Procedures
   4. Temperature Control Verification
   5. Constant Volume Air Systems Balancing Procedures
   6. Pre-Balance Reporting
   7. Final Reports:
      a. Report Requirements
      b. General Report Data
      c. System Diagrams
      d. Air Handling Units
      e. Fans
      f. Duct Traverses
      g. Diffusers/Registers/Grilles
      h. Instrument Calibration
   8. Additional Tests

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Quality-Assurance Submittals: Submit two copies of evidence that the Testing, Adjusting, and Balancing (TAB) Agent and this Project's TAB team members meet the qualifications specified in the "Quality Assurance" Article below.
   2. Pre-Construction Phase Report:
      a. Provide a pre-construction phase TAB Plan at least two weeks prior to the commencement of TAB work. This report is to include:
         1) A complete set of report forms intended for use on the project, with data filled in except for the field readings. Forms to be Project-specific.
         2) Marked up shop drawings identifying all HVAC equipment to be balanced, and associated outlets and terminal devices.
         3) Identification of the type, manufacturer, and model of the actual instruments to be used, and clear indication of which instrument

will be used to take each type of reading. Calibration certifications are to be included.

4) A narrative of any project specific and/or non-standard TAB procedures to be used, and the equipment or systems they apply to.

3. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit two copies of the Contract Documents review report as specified in Part 3 of this Section.
4. Strategies and Procedures Plan: Submit two copies of the TAB strategies and step-by-step procedures as specified in Part 3 below. Include a complete set of report forms intended for use on this Project.
5. Specify reports required because of editing procedures in Part 3 of this Section.
6. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by the TAB Agent.
7. Sample Report Forms: Submit two sets of sample TAB report forms.
8. Test Instrument Calibration: Submit proof of calibration within the last 6 months.
9. Final Report.
10. Provide additional submittals to commissioning authority as dictated in commissioning specifications.

1.05 QUALITY ASSURANCE

A. Quality Assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
1. Acceptable Manufacturers:
a. California:
1) Raglen System Balance
2) Pacific Test & Balance, Inc.
3) Air Test & Balance, Inc.
4) RSAnalysis, Inc.
5) Air Balance Co. Inc.
6) Total Air Balance Co. Inc.
7) National Air Balance Company (NABCO)
8) Mesa 3
2. Acceptable Balance Firm:
a. General:
1) Procure services of independent TAB agency to balance, adjust and test water circulating and air moving equipment and air distribution or exhaust systems. Minimum experience: 5 years.
b. Industry Standards: Testing and Balancing will conform to NEBB, American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), and American National Standards Institute (ANSI) as follows:
1) NEBB: Comply with Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
2) ASHRAE: Comply with recommendations pertaining to measurements, instruments, and TAB.
3) ANSI:
(a) S1.4 Specifications for sound level meters.
(b) S1.11 Specifications for Octave-Band and Fractional-Octave-Band analog and digital filters.
(c) ANSI S1.13 Methods for the Measurement of Sound Pressure Levels.

c. Test Observation: If requested, conduct tests in the presence of the Architect or the Architect's representative.

3. Allowable Vibration Tolerances for Rotating, Non-Reciprocating Equipment: Not to exceed a self-excited vibration maximum velocity of 5 mm per second (0.20 inch per second) RMS, filter in, when measured with a vibration meter on bearing caps of machine in vertical, horizontal and axial directions or measured at equipment mounting feet if bearings are concealed. Measurements for internally isolated fans and motors may be made at the mounting feet.
4. Provide proof of testing agency having successfully completed at least five projects of similar size and scope.
5. Code Compliance: Perform tests in the presence of the Authority Having Jurisdiction (AHJ) where required by the Authority Having Jurisdiction (AHJ).
6. Owner Witness: Perform tests in the presence of the Owners representative.
7. Engineer Witness: The engineer or engineer's representative reserves the right to observe tests or selected tests to assure compliance with the specifications.
8. Simultaneous Testing: Test observations by the AHJ, the Owner's Authorized Representative and the engineer's representative need not occur simultaneously.
9. Do not perform TAB work until heating, ventilating, and air conditioning equipment has been completely installed and is operating continuously as required.
10. Conduct air testing and balancing with clean filters in place. Clean strainers prior to performing hydronic testing and balancing.
11. Agent Qualifications: Engage a TAB agent certified by AABC or NEBB.
12. TAB Conference: Meet with the Owner's and the Architect's representatives on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days advance notice of scheduled meeting time and location.
    a. Agenda Items: Include at least the following:
        1) Submittal distribution requirements.
        2) Contract Documents examination report.
        3) TAB plan.
        4) Work schedule and Project site access requirements.
        5) Coordination and cooperation of trades and subcontractors.
        6) Coordination of documentation and communication flow.
13. Certification of TAB Reports: This certification includes the following:
    a. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
    b. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
14. TAB Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing" and NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
15. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards and NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
16. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. TAB Agency provides warranty for a period of 90 days following submission of completed report, during which time, Owner may request a recheck of up to 10 percent of total number of terminals, or resetting of any outlet, coil, or device listed in the final TAB report.
2. Guarantee: Meet the requirements of the following programs:
    a. Provide a guarantee on AABC or NEBB forms stating that the agency will assist in completing the requirements of the Contract Documents if the TAB Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:
        1) The certified Agent has tested, adjusted, and balanced systems according to the Contract Documents.
        2) Systems are balanced to optimum performance capabilities within design and installation limits.

1.07 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a persons skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. TAB: Testing, Adjusting, and Balancing.

K. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

L. Test: A procedure to determine quantitative performance of a system or equipment.

M. Testing, Adjusting, and Balancing (TAB) Agent: The entity responsible for performing and reporting the TAB procedures.

N. AABC: Associated Air Balance Council.

O. AMCA: Air Movement and Control Association.

P. CTI: Cooling Tower Institute.

Q. NEBB: National Environmental Balancing Bureau.

R. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.08 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide 7 days advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS AND PROCEDURES

A. Project Conditions:
1. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire TAB period. Cooperate with the Owner during TAB operations to minimize conflicts with the Owner's operations.
2. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during TAB operations to minimize conflicts with the Owner's operations.
3. Non-Owner Occupancy: Complete balancing of building systems prior to Substantial Completion and owner occupancy.

B. General Requirements:
1. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and controls, coordinate scheduling and testing and inspection procedures with authorities having jurisdiction.
2. Perform TAB work with doors, closed windows, and ceilings installed etc., to obtain simulated or project operating conditions. Do not proceed until systems scheduled for TAB are clean and free from debris, dirt and discarded building materials.
3. Where Owner occupies building during the testing period, cooperate with Owner to minimize conflicts with Owner's operations.

C. Examination:
1. Examine Contract Documents to become familiar with project requirements and existing building record documents (if available) to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
   a. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
   b. Verify that balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are

accessible and appropriate for effective balancing and for efficient system and equipment operation.

2. Examine approved submittal data of HVAC systems and equipment.
3. Examine project record documents described in Division 01, General Requirements.
4. Examine Architect's and Engineer's design data, including Basis of Design, HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
5. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
6. Coordinate requirements in system and equipment with this Section.
7. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
8. Examine system and equipment test reports.
9. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
10. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
11. Examine equipment for installation and for properly operating safety interlocks and controls.
12. Report deficiencies discovered before and during performance of TAB procedures.
13. Beginning of work means acceptance of existing conditions.

D. Preparation:
   1. Prepare a TAB plan that includes strategies and step-by-step procedures.
   2. Complete system readiness checks and prepare system readiness reports. Verify the following:
      a. Permanent electrical power wiring is complete.
      b. Hydronic systems are filled, clean, and free of air.
      c. Automatic temperature-control systems are operational.
      d. Equipment and duct access doors are securely closed.
      e. Balance, smoke, and fire dampers are open.
      f. Isolating and balancing valves are open and control valves are operational.
      g. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
      h. Windows, doors and other portions of the building envelope can be closed so design conditions for system operations can be met.
   3. Hold a pre-balancing meeting at least one week prior to starting TAB work.
      a. Attendance is required by installers whose work will be tested, adjusted, or balanced.

4. Provide instruments required for TAB operations. Make instruments available to Architect to facilitate spot checks during testing.

E. General TAB Procedures:
1. Perform TAB procedures on each system according to the procedures contained in AABC national standards or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
2. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.
3. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

F. Adjustment Tolerances:
1. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.
2. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
3. Hydronic Systems: Adjust to within plus or minus 10 percent of design at coils and plus or minus 5 percent at system pumps and equipment.
4. Adjust supply, return, and exhaust air quantities to maintain pressurization in spaces indicated on Drawings. Note and document room-to-room pressurization and maintain these relationships. Adjust pressure controlled spaces to within plus or minus 0.01 in WC.

G. Recording and Adjusting:
1. Field Logs: Maintain written logs including:
   a. Running log of events and issues.
   b. Discrepancies, deficient or uncompleted work by others.
   c. Contract interpretation requests.
   d. Lists of completed tests.
2. Ensure recorded data represents actual measured or observed conditions.
3. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
4. Mark on drawings locations where traverse and other critical measurements were taken and cross reference location in final report.
5. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
6. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
7. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner's Authorized Representative, or Commissioning Agent.

3.02 PRE-CONSTRUCTION BALANCE (EXISTING SYSTEMS)

A. Pre-Construction Balance - Air Systems
1. Prior to start of construction or demolition; read and record airflow to establish “as-found” conditions. Provide pitot traverse of supply, return and exhaust

ductwork at locations indicated on drawings and, as minimum, at central air handlers, main branch ductwork and at each floor.
2. Read and record static pressure conditions across existing filters, coils and fans.
3. Read and record amp draw and motor data from each existing air handler and fan that will be modified during project.

B. Pre-Construction Balance - Hydronic Systems
1. Prior to start of construction or demolition; read and record flow of hydronic systems to establish "as-found" conditions.
2. Read and record head loss and flow at existing coils, heat exchangers, air control devices, and pumps.
3. Read and record amp draw and motor data from each existing pump.

C. Pre-Construction Balance - Steam Systems
1. Prior to start of construction or demolition; read and record flow of existing steam and condensate system devices to establish "as-found" conditions.
2. Read and record at existing coils, heat exchangers, sterilizers, and boilers where manufacturers data is not available. Measure steam flow via ultrasonic meter.
3. Read and record name plate data for the existing condensate receivers and boilers.

D. Pre-Construction Balance - Plumbing
1. Prior to start of construction or demolition; read and record flow of existing plumbing hot water heaters, hot water recirculation pump and recirculation branch lines.
2. Read and record name plate data for existing water heaters, domestic hot water heat exchangers, and hot water recirculation pump.

E. Report data and observations to Architect.

3.03 FUNDAMENTAL AIR SYSTEMS BALANCING PROCEDURES

A. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

B. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.

C. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

D. Prepare test reports for both fans and inlets and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross check the summation of required outlet volumes with required fan volumes.

E. Prepare schematic diagrams of systems' "as-built" duct layouts.

F. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

G. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

H. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

I. Verify that motor starters are equipped with thermal protection, sized for the connected load.

J. Check dampers for proper position to achieve desired airflow path.

K. Check for airflow blockages.

L. Check that condensate drains are installed, trapped and primed and routed to drain.

M. Check for readily observable leaks in air-handling unit components and ductwork.

N. Use sheaves and pulleys to adjust the speed of belt drive fans to achieve design flow with motors running at 60 Hertz unless noted otherwise.

3.04 TEMPERATURE CONTROL VERIFICATION

A. Examine automatic temperature system components to verify the following:
   1. Dampers, valves, and other controlled devices operate by the intended controller.
   2. Dampers and valves are in the position indicated by the controller.
   3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
   4. Automatic modulating and shutoff valves, including 2-way valves and 3-way mixing and diverting valves, are properly connected.
   5. Thermostats and humidistats are located to avoid adverse effects of sunlight, equipment, drafts, and cold walls.
   6. Sensors are located to sense only the intended conditions.
   7. Sequence of operation for control modes is according to the Contract Documents.
   8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
   9. Interlocked systems are operating.
   10. Changeover from heating to cooling mode occurs according to design values.

B. Verify that controllers are calibrated and commissioned.

C. Check transmitter and controller locations and note conditions that would adversely affect control functions.

D. Record controller settings and note variances between set points and actual measurements.

E. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

F. Verify free travel and proper operation of control devices such as damper and valve operators.

G. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.

H. Confirm interaction of electrically operated switch transducers.

I. Confirm interaction of interlock and lockout systems.

J. Verify main control supply-air pressure and observe compressor and dryer operations.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.05 CONSTANT VOLUME AIR SYSTEMS BALANCING PROCEDURES

A. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer. Adjust fans to deliver design airflow at the lowest possible speed.
   1. Measure fan static pressures to determine actual static pressure as follows:
      a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
      b. Measure static pressure directly at the fan outlet or through the flexible connection.
      c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
      d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
   2. Measure static pressure across each air-handling unit component under final balanced condition.
   3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Recommend corrective action to align design and actual conditions.
   4. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
   5. Do not make fan-speed adjustments that result in motor loading greater than full load amps. Do not increase fan speed beyond fan class rating. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.
   6. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.
   7. Calibrate airflow measuring stations.

3.06 PRE-BALANCE REPORTING

A. Pre-Construction Phase Report:
   1. Provide a pre-construction phase TAB Plan at least 2 weeks prior to the commencement of TAB work. This report is to include:
      a. A complete set of report forms intended for use on the project, with all data filled in except for the field readings. Forms to be project specific.
      b. Marked up shop drawings identifying all HVAC equipment to be balanced, and associated outlets and terminal devices.
      c. Identification of the type, manufacturer, and model of actual instruments to be used, and clear indication of which instrument will be used to take each type of reading. Calibration certifications are to be included.
      d. A narrative of any project specific and/or non-standard TAB procedures to be used, and the equipment or systems they apply to.

B. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

C. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced.

3.07 FINAL REPORTS

A. Report Requirements:
   1. General:
      a. Computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.
      b. Include a certification sheet in front of binder signed and sealed by the certified TAB engineer.
         1) Include a list of the instruments used for procedures, along with proof of calibration.
      c. Final Report Contents: In addition to the certified field report data, include the following:
         1) Pump curves.
         2) Fan Curves
         3) Manufacturers Test Data
         4) Field test reports prepared by system and equipment installers.
         5) Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

B. General Report Data:
   1. In addition to the form titles and entries, include the following data in the final report, as applicable:
      a. Title Page
      b. Name and Address of TAB Agent
      c. Project Name
      d. Project Location
      e. Architect's Name and Address
      f. Engineer's Name and Address
      g. Contractor's Name and Address
      h. Report Date
      i. Signature of TAB Agent who Certifies the Report
      j. Summary of Contents, Including the Following:
         1) Design versus Final Performance
         2) Notable Characteristics of Systems
         3) Description of System Operation Sequence if it varies from the Contract Documents
      k. Nomenclature Sheets for Each Item of Equipment
      l. Data for Terminal Units, including Manufacturer, Type Size, and Fittings
      m. Notes to explain why certain final data in the body of reports vary from design values.
      n. Test Conditions for Fans and Pump Performance Forms, Including the Following:
         1) Settings for Outside-, Return-, and Exhaust-air Dampers
         2) Conditions of Filters
         3) Cooling Coil, Wet- and Dry-bulb Conditions
         4) Face and Bypass Damper Settings at Coils
         5) Fan Drive Settings, including Settings and Percentage of Maximum Pitch Diameter
         6) Inlet Vane Settings for Variable-Air-Volume Systems
         7) Settings for Supply-air, Static-pressure Controller

8) Other System Operating Conditions that affect Performance

C. System Diagrams:
1. Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:
a. Quantities of Outside, Supply, Return, and Exhaust Airflows
b. Water and Steam Flow Rates
c. Duct, Outlet, and Inlet Sizes
d. Pipe and Valve Sizes and Locations
e. Terminal Units
f. Balancing Stations

D. Air Handling Units:
1. For air-handling units, split systems, fan coils, pumps, and evaporator units with coils, include the following:
a. Unit Data: Include the following:
1) Unit Identification
2) Location
3) Make and Type
4) Model Number and Unit Size
5) Manufacturer's Serial Number
6) Unit Arrangement and Class
7) Discharge Arrangement
8) Sheave Make, Size in inches, and Bore
9) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches
10) Number of Belts, Make, and Size
11) Number of Filters, Type, and Size
b. Motor Data: Include the following:
1) Make and Frame Type and Size
2) Horsepower and rpm
3) Volts, Phase, and Hertz
4) Full-load Amperage and Service Factor
5) Sheave Make, Size in Inches, and Bore
6) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches
c. Test Data: Include design and actual values for the following:
1) Total Airflow Rate in cfm (L/s)
2) Total System Static Pressure in Inches wg (Pa)
3) Fan rpm
4) Discharge Static Pressure in Inches wg (Pa)
5) Filter Static-pressure Differential in Inches wg (Pa)
6) Preheat Coil Static-pressure Differential in Inches wg (Pa)
7) Cooling Coil Static-pressure Differential in Inches wg (Pa)
8) Heating Coil Static-pressure Differential in Inches wg (Pa)
9) Outside Airflow in cfm (L/s)
10) Return Airflow in cfm (L/s)
11) Outside-air Damper Position
12) Return-air Damper Position
13) Vortex Damper Position

E. Fans:
1. Fan Test Reports: For supply, return, and exhaust fans, include the following:
a. Fan Data: Include the following:
1) System Identification
2) Location

3) Make and Type
4) Model Number and Size
5) Manufacturer's Serial Number
6) Arrangement and Class
7) Sheave Make, Size in Inches, and Bore
8) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches.

b. Motor Data: Include the following:
1) Make and Frame Type and Size
2) Horsepower and rpm
3) Volts, Phase, and Hertz
4) Full-load Amperage and Service Factor
5) Sheave Make, Size in Inches, and Bore
6) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches
7) Number of Belts, Make, and Size

c. Test Data: Include design and actual values for the following:
1) Total Airflow Rate in cfm
2) Total System Static Pressure in Inches wg
3) Fan rpm
4) Discharge Static Pressure in Inches wg
5) Suction Static Pressure in Inches wg

F. Duct Traverses:
1. Include a diagram with a grid representing the duct cross-section and record the following:
a. Report Data: Include the following:
1) System and Air-handling Unit Number
2) Location and Zone
3) Traverse Air Temperature in Degrees F
4) Duct Static Pressure in Inches wg
5) Duct Size in Inches
6) Duct Area in SF
7) Design Airflow Rate in cfm
8) Design Velocity in fpm
9) Actual Airflow Rate in cfm
10) Actual Average Velocity in fpm
11) Barometric Pressure in PSIG

G. Diffusers/Registers/Grilles:
1. For diffusers, registers and grilles, include the following:
a. Unit Data: Include the following:
1) System and Air-handling Unit Identification
2) Location and Zone
3) Test Apparatus Used
4) Area Served
5) Air-terminal-device Make
6) Air-terminal-device Number from System Diagram
7) Air-terminal-device Type and Model Number
8) Air-terminal-device Size
9) Air-terminal-device Effective Area in SF

b. Test Data: Include design and actual values for the following:
1) Airflow Rate in cfm
2) Air Velocity in fpm
3) Preliminary Airflow Rate as Needed in cfm
4) Preliminary Velocity as Needed in fpm

5) Final Airflow Rate in cfm
6) Final Velocity in fpm
7) Space Temperature in Degrees F

H. Instrument Calibration:
1. For instrument calibration, include the following:
a. Report Data: Include the following:
1) Instrument Type and Make
2) Serial Number
3) Application.
4) Dates of Use
b. Dates of Calibration.

3.08 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 0700

HVAC INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
1. Type A, Flexible Glass Wool Blanket
2. Type B, Duct Liner
3. Type 1, Glass Wool Pipe Insulation
4. Type 2, Flexible Elastomeric Pipe Insulation
5. Jacketing
6. Accessories
7. Duct Insulation Accessories
8. Duct Insulation Compounds
9. Outdoor Ducting Cover

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
1. Piping and duct insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
1. Installer qualifications.
2. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any) for each type of product indicated.
3. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
4. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.
5. Submit manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Formaldehyde Free: Should be third-party certified with UL Environment Validation.
2. Recycled Content: A minimum of 40 percent post-consumer recycled glass content certified and UL validated.
3. Low Emitting Materials: For all thermal and acoustical applications of Glass Mineral Wool Insulation products, provide materials complying with the testing and products requirements of UL GREENGUARD Gold Certification.
4. Installer to have minimum 5 years' experience in the business of installing insulation.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 FIRE HAZARD CLASSIFICATION

A. Maximum fire hazard classification of the composite insulation construction as installed to be not more than a Flame Spread Index (FSI) of 25 and Smoke Developed Index (SDI) of 50 as tested by current edition of ASTM E84 (NFPA 255) method.

B. Test pipe insulation in accordance with the requirements of current edition of UL "Pipe and Equipment Coverings R5583 400 8.15".

C. Test duct insulation in accordance with current edition of ASTM E84, UL 723, NFPA 255, NFPA 90A and NFPA 90B.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Type A, Flexible Glass Wool Blanket:
1. Certainteed
2. Johns Manville
3. Knauf
4. Owens-Corning
5. Or approved equivalent.

B. Type B, Duct Liner:
1. Certainteed
2. Johns Manville
3. Knauf
4. Owens-Corning
5. Or approved equivalent.

C. Type 1, Glass Wool Pipe Insulation:
1. Certainteed
2. Johns Manville
3. Knauf
4. Owens-Corning
5. Or approved equivalent.

D. Type 2, Flexible Elastomeric Pipe Insulation:
1. Insulation:
   a. Armacell LLC Armaflex
   b. K-Flex

c. Or approved equivalent.

2. Glue:
   a. Armacell LLC Armaflex Low VOC Adhesive
   b. K-Flex
   c. Or approved equivalent.
3. Paint:
   a. Armacell LLC Armaflex
   b. K-Flex
   c. Or approved equivalent.

E. Jacketing:
1. ITW Insulation Systems
2. Or approved equivalent.

F. Accessories:
1. ITW Insulation Systems
2. Or approved equivalent.

G. Duct Insulation Accessories:
1. Certainteed
2. Johns Manville
3. Owens-Corning
4. Or approved equivalent.

H. Duct Insulation Compounds:
1. Certainteed
2. Johns Manville
3. Owens-Corning
4. Or approved equivalent.

I. Outdoor Ducting Cover:
1. Certainteed
2. Johns Manville
3. Owens-Corning
4. Or approved equivalent.

2.02 TYPE A, FLEXIBLE GLASS WOOL BLANKET

A. ASTM C553, Type 1, Class B-2; flexible blanket.

B. 'K' Value: 0.27 BTU*in/(hr*sf*F) at 75 degrees F installed, maximum service temperature: 250 degrees F.

C. Density: 0.75 pounds per cubic foot.

D. DBDE-free. UL/E validated to be formaldehyde-free.

E. Vapor Barrier Jacket: FSK aluminum foil reinforced with glass wool yarn and laminated to fire resistant Kraft, secured with UL listed pressure sensitive tape or outward clinched expanded staples and vapor barrier mastic as needed.

2.03 TYPE B, DUCT LINER

A. ASTM C1071; flexible blanket.

B. 'K' Value: ASTM C518, 0.25 BTU*in/(hr*sf*F) at 75 degrees F, maximum service temperature: 250 degrees F.

C. Noise Reduction Coefficient: 0.65 or higher based on ASTM C 423 "Type A mounting."

D. Maximum Velocity on Mat or Coated Air Side: 5,000 FPM.

E. Adhesive: UL listed waterproof type.

F. Fasteners: Duct liner galvanized steel pins, welded or mechanically fastened.

G. Erosion-Resistant Surfaces: UL 181.

H. ASTM G21 and ASTM G22 Microbial Growth Resistance.

I. UL GREENGUARD Certified does not support the growth of mold, fungi, or bacteria per ASTM C 1338 and meets UL Environment GREENGUARD Microbial Resistance Listing per UL 2824-“GREENGUARD Certification Program Method for Measuring Microbial Resistance”. DBDE-free. UL/E validated to be formaldehyde-free.

2.04 TYPE 1, GLASS WOOL PIPE INSULATION

A. Glass Wool: ASTM C547 Type I and IV; rigid molded, noncombustible.
   1. Thermal Conductivity Value: As indicated in the insulation tables below.
   2. Maximum Service Temperature: 850 degrees F to 1000 degrees F.

B. Vapor Retarder Jacket: White Kraft paper reinforced with glass wool and bonded to aluminum foil, secure with self-sealing longitudinal laps and butt strips or vapor barrier mastic.

2.05 TYPE 2, FLEXIBLE ELASTOMERIC PIPE INSULATION

A. Elastomeric Foam: ASTM C534; flexible, cellular elastomeric, molded or sheet.
   1. Thermal Conductivity Value: As indicated in the insulation tables below.
   2. Maximum Service Temperature of 220 degrees F.
   3. Maximum Flame Spread: 25.
   4. Maximum Smoke Developed: 50 (1-inch thick and below).
   5. Connection: Waterproof vapor retarder adhesive as needed.
   6. UV Protection: UV outdoor protective coating per manufacturer's requirements.

B. Glue: Contact adhesive specifically manufactured for cementing flexible elastomeric foam.

2.06 JACKETING

A. Canvas Jacket: UL listed fabric, 6 ounce/sq.yd., plain weave cotton treated with dilute fire retardant lagging adhesive.

B. PVC preformed molded insulation covers. Zeston or approved equivalent.

C. Aluminum Jacket: 0.016-inch-thick sheet, (smooth/embossed) finish, with longitudinal slip joints and 2-inch laps, die-shaped fitting covers with factory attached protective liner.

D. Stainless Steel Jacket: Type 304 stainless steel, 0.010-inch, smooth finish.

2.07 ACCESSORIES

A. Equipment Insulation Jacketing: Presized glass cloth, not less than 7.8 ounces/sq.yd., except as otherwise indicated. Coat with gypsum based cement.

B. Equipment Insulation Compounds: Provide adhesives, cement, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.

C. General: Provide staples, bands, wire, wire netting, tape corner angles, anchors, stud pins and metal covers as recommended by insulation manufacturer for applications indicated. Accessories, i.e., adhesives, mastics, cements and tape to have the same flame and smoke component ratings as the insulation materials with which they are used. Shipping cartons to bear a label indicating that flame and smoke ratings do not exceed those listed above. Provide permanent treatment of jackets or facings to impart flame and smoke safety. Provide nonwater soluble treatments. Provide UV protection recommended by manufacturer for outdoor installation.

2.08 DUCT INSULATION ACCESSORIES

A. Staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.

2.09 DUCT INSULATION COMPOUNDS

A. Cements, adhesives, coatings, sealers, protective finishes and similar accessories as recommended by insulation manufacturer for applications indicated.

2.10 OUTDOOR DUCTING COVER

A. Aluminum Jacket: 0.016-inch-thick sheet, smooth/embossed finish, with longitudinal slip joints and 2-inch laps.

B. Nonwater vapor retarder, nonburning, weatherproof coating for use over insulation where "breathing" is required.

C. UV resistant polyvinyl chloride covering with joints secured and sealed.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Verification of Conditions:
   1. Do not apply insulation until pressure testing and inspection of ducts and piping has been completed.
   2. Examine areas and conditions under which duct and pipe insulation will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Preparation: Clean and dry surfaces to be insulated.

C. Installation:
   1. Insulation: Continuous through walls, floors and partitions except where noted otherwise.
   2. Piping and Equipment:
      a. Install insulation over clean, dry surfaces with adjoining sections firmly butted together and covering surfaces. Fill voids and holes. Seal raw edges. Install insulation in a manner such that insulation may be split, removed, and reinstalled with vapor barrier tape on strainer caps and unions. Do not install insulation until piping has been leak tested and has passed such tests. Do not insulate manholes, equipment manufacturer's

nameplates, handholes, and ASME stamps. Provide beveled edge at such insulation interruptions. Repair voids or tears.

b. Cover insulation on pipes above ground, outside of building, with aluminum jacketing. Position seam on bottom of pipe.

D. Provide accessories as required. See Part 2 Article "Accessories" above.

E. Protection and Replacement: Installed insulation during construction. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

F. Labeling and Marking: Provide labels, arrows and color on piping and ductwork. Attach labels and flow direction arrows to the jacketing per Section 23 05 53, Identification for HVAC Piping, Ductwork and Equipment.

G. Ductwork:

1. Install insulation in conformance with manufacturer's recommendations to completely cover duct.
2. Butt insulation joints firmly together and install jackets and tapes smoothly and securely.
3. Apply duct insulation continuously through sleeves and prepared openings, except as otherwise specified. Apply vapor barrier materials to form complete unbroken vapor seal over insulation.
4. Coat staples and seals with vapor barrier coating.
5. Cover breaks in jacket materials with patches of same material as vapor barrier. Extend patches not less than 2-inches beyond break or penetration on all directions and secure with adhesive and staples. Seal staples and joints with vapor barrier coating.
6. Fill jacket penetrations. i.e., hangers, thermometers and damper operating rods, and other voids in insulation with vapor barrier coating. Seal penetration with vapor barrier coating. Insulate hangers and supports for cold duct in un-conditioned spaces to extent to prevent condensation on surfaces.
7. Seal and flash insulation terminations and pin punctures with reinforced vapor barrier coating.
8. Continue insulation at fire dampers and fire/smoke dampers up to and including those portions of damper frame visible at outside of the rated fire barrier. Insulating terminations at fire dampers in accordance with this Section.
9. Do not conceal duct access doors with insulation. Install insulation terminations at access door in accordance with this Section.

H. Insulated Pipe Exposed to Weather: Where piping is exposed to weather, cover insulation with aluminum jacket. Seal watertight jacket per manufacturer's recommendations. Install metal jacket with 2-inch overlap at longitudinal and butt joints with exposed lap pointing down. Secure jacket with stainless-steel draw bands 12-inches on center and at butt joints.

I. Insulation Shields: Provide hangers and shields (18 gauge minimum) outside of insulation for cold piping (<60 degrees F). Hot water piping hangers may penetrate insulation to contact pipe directly. Provide 18-inch long, noncompressible insulation section at insulation shields for lines 2-inches and larger (hot and cold) piping.

J. Ductwork Surfaces to be Insulated:

Item to be Insulated	System Insulation Type	Duct Size	Insulation Thickness

Supply ductwork where duct is not specified to be lined.	A	All	1.5-inch
Return ductwork where duct is not specified to be lined.	--	All	None

1. Note: Insulation thickness shown is a minimum. If state codes require additional thickness, then provide insulation thickness per code requirements.

K. Piping Surfaces to be Insulated:

Item to be Insulated	System Insulation Type	Conductivity Range (Btu-inch per hour per SF per degrees F)	Pipe Size (Inches)	Insulation Thickness (Inches)
Refrigerant Suction Piping (40F to 60F)	2	0.21-0.27 at a mean rating temperature of 75 degrees F	<1 1 to <1.5 1.5 to <4 4 to <8 >= 8	0.75 0.75 1.0 1.0 1.0
Refrigerant Suction Piping (<=40F)	2	0.20-0.26 at a mean rating temperature of 50 degrees F	<1 1 to <1.5 1.5 to <4 4 to <8 >= 8	1.0 1.5 1.5 1.5 1.5

1. Note: Insulation thickness shown is a minimum. If state code requires additional thickness, then provide insulation thickness per code requirements.

3.02 TYPE A, FLEXIBLE GLASS WOOL BLANKET

A. Install insulation in conformance with manufacturer's recommendations and requirements.

B. Duct Wrap: Cover air ducts per insulation table except ducts internally lined where internal duct lining is adequate to achieve adequate insulating values to meet local Energy Codes (indicate on shop drawings, locations where duct wrap is planned to be omitted and indicate internal duct lining insulating values to confirm they will meet the Energy Code.) Wrap tightly with circumferential joints butted and longitudinal joints overlapped minimum of 2-inches. On ducts over 24-inches wide, additionally secure insulation with suitable mechanical fasteners at 18-inches on center. Circumferential and longitudinal joints stapled with flare staples 6-inches on center and covered with 3-inch wide, foil reinforced tape.

3.03 TYPE B, DUCT LINER

A. Install insulation in conformance with manufacturer's recommendations and requirements.

B. Duct Liners: Mat finish surface on air stream side. Secure insulation to cleaned sheet metal duct with continuous (minimum 90) percent coat of adhesive. Secure liner with mechanical fasteners 15-inches on center or per manufacturer requirements. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom Sections of insulation overlap sides. Factory/field coat exposed edges. Metal nosing for exposed leading or transverse edges and when velocity exceeds 3500 FPM or manufacturer rating on exposed edges. Keep duct liner clean and free from dust. At completion of project, vacuum duct liner if it is dirty or dusty. Do not use small pieces. If insulation is installed without horizontal, longitudinal, and end joints butted together, installation will be rejected and work removed and replaced with work that conforms to this Specification.

3.04 TYPE 1, GLASS WOOL PIPE INSULATION

A. See General Installation Requirements above.

B. Install insulation in conformance with manufacturer's recommendations and requirements.

C. Lap seal insulation with waterproof adhesive. Do not use staples or other methods of attachment which would penetrate vapor barrier. Apply fitting covers with seated tacks and vapor barrier tape.

D. Apply insulation to pipe and seal with self-sealing lap. Use self-sealing butt strips to seal butt joints. Insulate fittings, valves and unions with single or multiple layers of insulation and cover to match pipe or use preformed PVC molded insulation covers.

3.05 TYPE 2, FLEXIBLE ELASTOMERIC PIPE INSULATION

A. Flexible Elastomeric Insulation:
   1. Slip insulation on pipe prior to connection. Butt joints sealed with manufacturer's adhesive. Insulate fitting with miter-cut pieces. Cover insulation exposed to weather and below grade with two coats of finish as recommended by manufacturer.

B. Flexible Elastomeric Tubing:
   1. Flexible Elastomeric Tubing: Slip insulation over piping or, if piping is already installed, slit insulation and snap over piping. Joints and butt ends must be adhered with 520 adhesive.

C. See General Installation Requirements above.

D. Install insulation in conformance with manufacturer's recommendations and requirements.

E. Slip insulation on pipe prior to connection. Butt joints sealed with manufacturer's adhesive. Insulate fitting with miter-cut pieces. Cover insulation exposed to weather and undergrade with two coats of finish as recommended by manufacturer.

3.06 JACKETING

A. See General Installation Requirements above.

B. Install in accordance with manufacturer's instructions.

3.07 ACCESSORIES

A. Install insulation in conformance with manufacturer's instructions, recommendations and requirements.

B. See General Installation Requirements above.

C. Provide and install accessories for all insulation types listed in this Section.

3.08 DUCT INSULATION ACCESSORIES

A. Install insulation in conformance with manufacturer's recommendations and requirements.

3.09 DUCT INSULATION COMPOUNDS

A. Install insulation in conformance with manufacturer's recommendations and requirements.

3.10 OUTDOOR DUCTING COVER

A. Install insulation in conformance with manufacturer's recommendations and requirements.

B. Outdoor Duct Exposed to Weather:
   1. Install jacket with brakes/slope to prevent standing water on duct. Use weatherable components.
   2. Weatherproof seal at joints and seams. Minimum 2-inch overlap.
   3. Label jacket every 6-feet and within 2-feet of building penetrations and equipment connections: "Do not stand or place equipment on duct."

END OF SECTION

SECTION 23 0900

INSTRUMENTATION AND CONTROL PERFORMANCE SPECIFICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Communications
   2. Controller Software
   3. Web Based Access
   4. BAS Graphics
   5. Building Controllers
   6. Application Specific Controllers
   7. Input/Output Interface
   8. Power Supplies and Line Filtering
   9. Control Panels
   10. Auxiliary Control Devices
   11. Wiring and Raceways
   12. Smoke Detection for Projects with a Building Fire Alarm System

B. This is a performance specification and Contractor is responsible for design tasks and engineering.

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Current edition of ANSI/ASHRAE Standard 135 and addendum, BACnet.
   2. Current edition of UL 916 Underwriters Laboratories Standard for Energy Management Equipment, Canada and the US.
   3. Current edition of FCC Part 15, Subpart J, Class A.
   4. Current edition of BACnet Testing Laboratories (BTL).

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Prepare and submit a detailed schedule of work. Schedule to identify milestones such as equipment submittals, control panel diagrams, color graphic panel displays, Interlock.
   2. Wiring diagrams, control program sequence software flow chart diagrams, conduit layout diagrams, device location diagrams, equipment and component deliveries, installation sequencing, controller startup, point to point startup, control programming, sequence testing, commissioning/acceptance testing and training.
   3. Submit design drawings, sequences of operation, program listings, software flow charts and details for each typical piece of equipment and system being

controlled. No work to be initiated or fabrication of any equipment started prior to the Owner's Authorized Representatives return of REVIEWED submittals.

a. Sequence of Operation: The sequence of operation included in the design documents is intended only to communicate the Engineers' general control intent and is not to be used as a direct reference for programming of the EMS system. Verbatim duplication of the Engineer's Sequence of Operation on the submittals is discouraged and may result in non-approval of the submittal. Sequence of operation on submittals to accurately detail the system's intended programming, and include details of enhancements, adjustments, or deviations from the Engineer's sequence of operation. Submitted sequence of operation to be written with a logical and organized format and flow. Provide detailed, clear and unambiguous sequence of operation language. Point descriptors and point nomenclature referenced in the submitted sequence of operation to match those (to be) actually programmed. As-built submittal Sequence of Operation to include modifications to the programming made as a result of any addendum, bulletins, RFI's, change orders, and commissioning.

4. Format: Make each submittal in one complete and contiguous package. Partial or unmarked submittals will be rejected without review.
5. Submit Manufacturers Data as Follows:
   a. Complete materials list of items proposed to be furnished and installed. A complete Bill of Materials, listing materials, components, devices, wire and equipment are required for this work. The Bill of Materials to be separate for each controller on its own page(s) and to contain the following information for each item listed:
      1) Manufacturer's Name and Model number with furnished options highlighted.
      2) Quantity of each by controller location.
      3) Description of product (generic).
      4) Specified item.
      5) Operating range or span.
      6) Operating point or setpoint.
   b. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements, including but not limited to: Catalog cuts, technical data and descriptive literature on hardware, software, and system components to be furnished.
   c. The data to be clearly marked and noted to identify specific ranges, model numbers, sizes, and other pertinent data. Submit printed manufacturer's technical product data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials and including printed installation instructions and start-up instructions.
   d. Unless specifically called for otherwise, provide bound copies of catalog cuts for standard products, not requiring specifically prepared Shop Drawings, for the following:
      1) Wire and Cable, Class II
      2) Face Plates for Devices
      3) Disconnect Switches for Power Control
   e. Where more than one item, size, rating or other variations appear on a catalog cut sheet, clearly identify items to be provided. These items to be properly indexed and referenced to identification numbers, designations and/or details on the Drawings.
6. Shop Drawings: Submit shop drawings for each controlled system, depicting the following information:

a. Schematic flow diagram of system showing fans, pumps, coils, dampers, valves and other control/monitoring devices.
b. Label each control device with initial setting or adjustable range of control. Label points in schematic diagrams with termination at corresponding controller.
c. Electrical Wiring: Clearly differentiate between portions of wiring that are factory installed and portions of be field-installed.
d. Details of control panel faces, including controls, instruments, and labeling.
e. Interfaces to equipment furnished under other Specification Sections identifying numbers of wires, termination location, voltages and pertinent details. Responsibility for each end of the interfaces to be noted on these drawings whether or not they are a part of this Section.
f. System architecture diagram showing the global connectivity of new controllers and any existing systems that will be connected to.

7. Equipment locations, wiring and piping schematics, details, panel configurations, sizes, damper motor mounting details, valve schedules, and a points list keyed to specific hardware submittals. Control wiring depicted as fully annotated ladder diagrams with terminations identified, completely configured as to the exact panel, wiring, relay, switch, and component configuration.
8. Tag Number Lists: Develop instruments tag number system and submit list for approval. Coordinate methods and number block with the Owner's Authorized Representative.
9. Format the Shop and Field Drawings to Include:
   a. A Title Sheet containing a drawing list, abbreviations list, symbols list, site and vicinity maps for project location and schedules.
   b. Floor Plans showing proposed device locations and device nomenclatures.
   c. A Riser Diagram illustrating conduit relationships between devices shown on the Floor Plans. Show device nomenclatures.
   d. A Single-Line Diagram for each system showing signal relationships of devices within the system. Show device nomenclatures.
   e. A Wiring Diagram for each assembly, enclosure or free standing device, showing:
      1) The Devices Within
      2) Wiring Connections
      3) Wire Identification
      4) Voltage Levels
      5) Fuse Ratings
   f. Operations and Maintenance Manuals:
      1) Following approval of Shop Drawings of control equipment and prior to acceptance of control work, prepare Operating and Maintenance manuals describing operating, servicing, and maintenance requirements of control systems and equipment installed under this Section, in accordance the General and Special Conditions of these Specifications.
      2) Information contained in the manual for the above equipment to include the following:
         (a) Manufacturer's catalog cuts and printed descriptive bulletins.
         (b) Manufacturer's installation, operating, and maintenance instruction booklets. Complete instructions regarding the operation and maintenance of equipment involved.
         (c) Instrument calibration certificates.
         (d) Parts list and costs.

(e) Complete nomenclature of replaceable parts, list of recommended spare parts for 12 months operation, their part numbers, current cost and name and address of the nearest vendor of replacement parts.
(f) Name, address and telephone number for closest source of spare parts.
(g) Wiring and schematic diagrams.
(h) Include final record copies of shop drawings.
(i) Copy of guarantees and warranties issued for the various items of equipment, showing dates of expiration.
(j) Reduced plans, diagrams, and control schematics.
(k) Copies of test results.
(l) Control System Operating Manual including: point of summary and point data base; complete printout of program listings; magnetic tape CD or DVD backup of Field Control Cabinet programs; cabinet layout; hard copy of graphic screens; hard copy of specified reports.

g. A final Bill of Quantities including a separate schedule for portable equipment, if delivered as part of this work.
h. Performance, Test and Adjustment Data: Comprehensive documentation of performance verification according to parameters specified in these specifications.
i. Record Drawings: Comply with Division 01, General Requirements and Section 23 00 00, HVAC Basic Requirements. Provide complete as-built submittals including "as-programmed" sequence of operation as well as final occupancy schedules.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
1. Installer Qualifications: Company specializing in performing work of the type specified in this Section with minimum five years' experience in the local area. Installers required to have successfully completed manufacturer's control system factory training.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 SYSTEM DESCRIPTION

A. Control system referenced throughout specifications and drawings as Building Automation System (BAS), Building Management System (BMS), or Energy Management System (EMS) interchangeably consists of high-speed, peer-to-peer network of DDC controllers, control system server, and operator workstation.

B. System software based on server/thin-client architecture, designed around open standards of web technology. Control system server accessed using a web browser over control system network, Owner's local area network, and remotely over Internet (through Owner's WAN). Intent of thin-client architecture is to provide operators complete access to control system via web browser. No special software other than web browser required to access graphics, point displays, and trends.

C. Local Area Network (LAN) either 10 or 100 Mpbs Ethernet network.

D. System will consist of open architecture that is capable of:
   1. EMS Contractor shall utilize Owner's IT WAN for connection from BACnet Server to all Global Controllers furnished and installed as part of this project. Owner shall furnish and maintain IT WAN infrastructure.
   2. EMS Contractor shall provide and install a dedicated MS/TP LAN extending from all Global Controller's to distributed field level controller BACnet devices.
   3. Distributed field level controllers are responsible for directly controlling and monitoring HVAC and Electrical system points throughout the facility.
   4. The BACnet Server hosts system configurations, programming databases and stores all trendlog data. The Server maintains all backup files for system configuration and programming located on Global Controller's and field level controllers and is capable of directly uploading or downloading information from the controllers.

E. Complete temperature control system to be DDC with electronic sensors and electronic/electric actuation valves and dampers.

F. Prepare individual hardware layouts, interconnection drawings, building riser/architecture diagram and sequence of control from the project design data. Any architecture diagrams on design drawings have been included as schematics only and are not meant to portray quantity of devices or power/data requirements.

G. Design, provide, and install equipment cabinets, panels, data communication network infrastructure (including cables, conduits, outlets, connections, etc.) needed, and associated hardware.

H. Provide complete manufacturer's specifications for items that are supplied. Include vendor name and model number of every item supplied.

I. Provide a comprehensive operator and technician training program as described in these Specifications.

J. Provide as-built documentation, operator's terminal software, diagrams, and other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

K. Provide 120V power, low voltage power, transformers, etc. for control panels, transformer panels, and BAS devices. Install per Division 26, Electrical Specifications. Power for devices within this Specification Section is solely the responsibility of the BAS Contractor.

L. Conduit and raceway systems. Provide per Division 26, Electrical Specifications.

M. Devices, components, controllers, and software to be manufacturer's most current version at the time of installation.

1.08 SYSTEM PERFORMANCE

A. Performance Standards - System conforms to following minimum standards over network connections:
   1. Graphic Display: Graphic with 20 dynamic points display with current data within 10 seconds.
   2. Graphic Refresh: Graphic with 20 dynamic points update with current data within 8 seconds.

3. Object Command: Devices react to command of binary object within 2 seconds. Devices begin reacting to command of analog object within 2 seconds.
4. Object Scan: Data used or displayed at controller or workstation have been current within previous 6 seconds.
5. Alarm Response Time: Object that goes into alarm is annunciated at workstation within 45 seconds.
6. Program Execution Frequency: Custom and standard applications are capable of running as often as once every 5 seconds. Select execution times consistent with mechanical process under control.
7. Performance: Programmable controllers are able to completely execute DDC PID control loops at frequency adjustable down to once per second. Select execution times consistent with mechanical process under control.
8. Multiple Alarm Annunciation: Each workstation on network receive alarms within 5 seconds of other workstations.

B. Reporting Accuracy: System reports values with minimum end-to-end accuracy listed in Reporting Accuracy Table below.
   1. Reporting Accuracy Table:

Measure Variable	**Reported Accuracy**
Space Temperature	Plus or Minus 1 degree F
Ducted Air	Plus or Minus 1 degrees F
Outside Air	Plus or Minus 2 degrees F
Dew Point	Plus or Minus 3 degrees F
Water Temperature	Plus or Minus 1 degree F
Delta-T	Plus or Minus 0.25 degree F
Relative Humidity	Plus or Minus 5 percent RH
Water Flow	Plus or Minus 2 percent of full scale

   2. Note 1: Accuracy applies to 10 percent-100 percent of scale
   3. Note 2: For both absolute and differential pressure
   4. Note 3: Not including utility-supplied meters

C. Control Stability and Accuracy. Control loops maintain measured variable at setpoint within tolerances listed in Control Stability and Accuracy Table below.
   1. Control Stability and Accuracy Table:

Controlled Variable	**Control Accuracy**	**Range of Medium**
Air Pressure	Plus or minus 0.2 inch wg	0-6 inch wg
	Plus or minus 0.01 inch wg	-0.1 to 0.1 inch wg
Airflow	Plus or minus 10 percent of full scale	
Space Temperature	Plus or minus 2.00 degrees F	
Duct Temperature	Plus or minus 3.0 degrees F	
Humidity	Plus or minus 5 percent RH	
Fluid Pressure	Plus or minus 1.5 PSI	1-150 PSI
	Plus or minus 1.0 inch wg	0-50 inch wg differential

PART 2 - PRODUCTS

2.01 NORTHERN CALIFORNIA MANUFACTURERS

A. Alerton – Ascent Compass; no substitution – Contact Syserco: 510.498.1171 for further bid coordination.

B. Duct/Spot-Type Smoke Detectors (Project with Fire Alarm System):
   1. See Division 28 for Products.

2.02 COMMUNICATIONS

A. Each controller to have communication port for connection to operator interface.
   1. Internetwork operator interface and value passing to be transparent to internetwork architecture.
   2. Operator interface connected to controller to allow operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, reports, system software, and custom programs to be viewable and editable from each internetwork controller.

B. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers to be readable by each controller on internetwork.

C. Operator Workstation to be capable of simultaneous direct connection and communication with BACnet/IP, OPC and TCP/IP networks without use of interposing devices such as PC or gateway with hard drive.

D. Workstations, Building Control Panels and Controllers with real-time clocks use time synchronization service. System automatically synchronizes system clocks daily from operator-designated device via internetwork. System automatically adjusts for daylight savings and standard time as applicable.

E. Wireless Network Communications:
   1. Wireless communications take place using modular wireless transceivers at each device, which eliminates need for communication cabling.
   2. Wireless transceiver utilizes 2.4 GHz in license free global Industrial Scientific and Medical (ISM) band.
   3. Wireless transceiver is encased in plenum-rated enclosure. If application dictates, wireless transceiver is able to be installed in metal enclosure utilizing remote mounted antenna.
   4. Wireless transceiver channel is factory set and capable of being field set to different channel if interference with IEEE 802.11 devices or other 2.4 GHz products is encountered.
   5. Wireless transceiver is 24 VAC powered.
   6. Wireless transceiver gives a visual indication that it is powered and communicating.
   7. Wireless transceiver has a field-settable network identifier that allows multiple networks to occupy same channel for maximum scalability.

2.03 CONTROLLER SOFTWARE

A. Furnish following applications software for building and energy management. Software applications reside and operate in system controllers. Software to be manufacturer's most current version at the time of installation. Software and associated functions (scheduling, optimum start/stop, etc.) noted in this specification are to be configured and enabled for

this project. Incorporate into sequence of operation submittals for review prior to installation.

B. Scheduling: Provide capability to schedule each object or group of objects in system. Coordinate schedule with Owner and program accordingly. Each schedule consists of:
   1. Operator's workstation to show information in easy-to-read daily format. Priority for scheduling: Events, holidays and daily with events being the highest.
   2. Holiday and special event schedules to display data in calendar format. Operator able to schedule holidays and special events directly from these calendars.
   3. Operator able to change information for a given weekly or exception schedule if logged on with the appropriate security access.

C. Optimum Start/Stop: Provide software and program system to start equipment on sliding schedule based upon indoor and outdoor conditions. Determine minimum time of HVAC system operation needed to satisfy space environmental requirements and also determine earliest possible time to stop mechanical systems (i.e. shut down cooling/heating and only provide ventilation one hour prior to scheduled unoccupied period.). Optimum start/stop program operates in conjunction with scheduled start/stop and night setback programs.

D. Alarms:
   1. Operator's workstation to provide visual means of alarm indication. The alarm dialog box to always become the top dialog box regardless of the application(s), currently running.
   2. System to provide log of alarm messages. Alarm log to be archived to the hard disk of the system operator's terminal. Each entry to include a description of the event-initiating object generating the alarm. Entry to include time and date of alarm occurrence.
   3. Alarm messages in user-definable text and entered either at the operator's terminal or via remote communication.
   4. Each binary object set to alarm based on operator-specified state.
   5. Each analog object have both high and low alarm limits.
   6. Alarms must be able to be automatically and manually disabled.
   7. Alarms are routed to appropriate workstations based on time and other conditions. An alarm is able to start programs, print, be logged in event log, generate custom messages, and display graphics.
   8. System have ability to dial out in event of alarm.
   9. Alarm Levels:
      a. Provide 5 levels of alarm as follows, and program alarm levels for every required and specified alarm:
         1) Level 1: Critical/life safety.
         2) Level 2: Significant equipment failure.
         3) Level 3: Non-critical equipment failure/operation.
         4) Level 4: Energy conservation monitor.
         5) Level 5: Maintenance indication, notification.
      b. Prior to training of Owner’s Authorized Representative, submit the complete Points List and suggested Alarm Levels to the Owner.
      c. During training of Owner’s Authorized Representative(s):
         1) Discuss Alarm Levels and the alarms currently included in the BAS.
         2) Provide additional alarms without addition of new hardware points, as required by Owner’s Authorized Representative.
         3) Agree with the Owner’s Authorized Representative on action(s) to be taken for each alarm level and implement same for each alarm. Said action to include visual and/or audible alarm(s) at the Operator workstation including whether Operator

acknowledgement is required or not, email messages, and text messages.

E. Maintenance Management: System monitors equipment status and generate maintenance messages based upon user-designated run-time, starts, and/or calendar date limits. Coordinate settings with Owner.

F. Sequencing: Provide application software based upon sequences of operation specified to properly sequence designated systems. Provide points to achieve specified sequences.

G. Staggered Start: This application prevents controlled equipment from simultaneously restarting after a power outage. Order in which equipment (or groups of equipment) is started, along with time delay between starts to be user-selectable.

H. Anti-Short Cycling: Binary output objects protected from short cycling by allowing minimum on-time and off-time to be selected.

I. On/Off Control with Differential: Provide algorithm that allows binary output to be cycled based on controlled variable and setpoint. Algorithm direct-acting or reverse-acting and incorporate adjustable differential.

J. Run-Time Totalization: Provide software to totalize run-times for binary input objects.

2.04 WEB BASED ACCESS

A. General Description: BAS supplier to provide web-based access to the system as part of standard installation. Provide access to user of displays of real-time data that are part of the BAS via a standard Web browser. Web browser to tie into the network via Ethernet network connection. Provide web-page host that resides on the BAS network. Web-page software not to require a per user licensing fee or annual fees. The web-page host must be able to support at least 50 simultaneous users with the ability to expand the system to accommodate an unlimited number of users. Software to be manufacturer's most current version at time of installation.

B. Browser Technology: Browser to be standard version of Microsoft Internet Explorer (latest edition). No special vendor-supplied software needed on computers running browser. Displays viewable and the Web-page host to directly access real-time data from the BAS network. Data displayed in real time and update automatically without user interaction. User able to change data on displays if logged in with the appropriate user name and password.

C. Display of Data: Web page graphics shown on browser to be replicas of the BAS displays. User to need no additional training to understand information presented on Web pages when compared to what is shown on BAS displays. Web page displays to include animation just as BAS displays. Fans to turn, pilot lights to blink, and coils to change colors, and so on. Real-time data shown on browser Web pages. This data must be directly gathered via the BACnet network and automatically updated on browser Web page displays without any user action. Data on the browser to automatically refresh as changes are detected without re-drawing the complete display. User to be able to change data from browser Web page to if the user is logged on with the appropriate password. Clicking on a button or typing in a new value to change digital data. Using pull-down menus or typing in a new value to change analog data. Data displays navigated using pushbuttons on the displays that are simply clicked on with the mouse to select a new display. Alternatively, the standard back and forward buttons of the browser can be used for display navigation.

D. Web Page Generation: Web pages generated automatically from the BAS displays that reside on the BAS server. User to access Web-page host via the network and initiate a web page generation utility that automatically takes the BAS displays and turns them into Web pages. The Web pages generated are automatically installed on the Web page host for access via any computer's standard browser. Any system that requires use of an HTML editor for generation of Web pages will not be considered.

E. Password Security and Activity Log: Access via Web browser to utilize the same hierarchical security scheme as BAS system. User asked to log in once the browser makes connection to Web-page host. Once the user logs in, any changes that are made to be tracked by the BAS system. User able to change only those items that the user has authority to change. A user activity report to show any activity of the users that have logged in to the system regardless of whether those changes were made using a browser or via the BAS workstation.

F. Communication: Web-page host to communicate using the specified protocol standard to devices on the BAS network.

2.05 BAS GRAPHICS

A. Develop customized graphics showing the project building(s) and their floor plans, mechanical, and electrical equipment, flow and control diagrams, and other relevant features on Workstation graphic screens. Associated input, output, and virtual objects (e.g., temperature and pressure setpoints) listed in the Sequence of Operation, and shown on the Input/Output Objects List included in the graphic screens and bound to the database. Real-time value of objects updated on the display of each graphic automatically. For projects where existing campus and/or building controls systems exist, replicate graphics used in the existing BAS graphics screens.

B. Graphics to have links to the Print function and to display a Standard Legend in the corner of the graphic. Graphics, except pop-ups, to have the date and time displayed in the upper corner of the graphic. Each graphic titled.

C. Alarms: System and component summary alarms located near the top of each relevant graphic screen. Provide links to the associated system/component as part of these tags to assist trouble shooting. Other alarms placed near the associated system/device as depicted in the graphic. Provide text and color of information tags that describe each object and alarm value consistent with a graphics color legend.

D. The Following Graphics Provided as a Minimum:
   1. A building graphic, typically a photograph of the building, with links to each floor plan and other links as defined below.
   2. A central plant graphic with equipment (chillers, boilers, pumps, heat exchangers, storage tanks, etc.), temperature sensors, pressure sensors, flow sensors and refrigeration leak detectors. The central plant graphic to have links to each building on the campus.
   3. Central equipment such as air handler, package rooftop equipment, supply fans, exhaust fans, and smoke control systems.
   4. Floor plans of each floor, with temperature sensors, pressure sensors, temperature control zones, heating/cooling zones, ventilation zones, and supply air zones identified. Rooms grouped on a graphic only to the extent that detailed and complete sensing information can be comfortably viewed by an operator and the bound points updated in less than 10 seconds. Each zone to have a temperature symbol that changes color over the range from low (blue) through normal (green) to high (red) and indicate an alarm (flashing red). The zone

temperature and or pressure symbol(s) to be a link to a zone control pop-up graphic. Individual floor plan graphics to provide links to related mechanical systems. The mechanical room plan graphics to show the relative location of, and provide links to, either the equipment pop-up or flow and control graphic for mechanical equipment monitored or controlled by the BAS.

5. Pop-up graphics provided for each zone control system showing a flow diagram and related monitoring and control points and system parameters. Pop-up graphics provided for each piece of equipment that is not shown on a flow and control graphic.
6. Flow and control diagrams for each system including but not limited to fan coils, combination fire and smoke damper status, and ventilation systems. The flow and control graphics to have parameters grouped in the lower portion of the graphics. Standard equipment graphics used. Pumps, fans, dampers and other elements to dynamically indicate their state (i.e. pumps and fans to rotate when on and damper positions to dynamically adjust and be shown in their current position, etc.). System flow and control graphics displayed in a general left to right flow or loop arrangement. Return and exhaust air flow shown on top and return water shown on the bottom of the graphic.
7. Individual equipment/component screens showing sensing and control information available for each device provided.

E. Penetration: The graphic interface to consistently apply a convention whereby a left-click to always penetrate to more detailed information. The text windows to represent the deepest level of penetration. A right-click to always produce a menu of options that are specific to the item selected.

F. Navigation: Graphics organized to provide a "branching structure" that allows an operator to move from a "macro view" to a "micro view" and return. These links to other associated graphics, or allow a return to a previous macro view, provided and arranged horizontally along the bottom of each graphic screen. From left to right, the graphic links as follows: site/building map, building/trailer floor plans, and major mechanical systems at each building. Pop-up right click menus provided as needed on the lower button bar to allow for uncluttered navigation.

G. Clutter Minimization: Each graphic to have separate check boxes in the lower right corner that show/hide setpoints, alarms/safeties, and devices/equipment.

H. Templates: To the maximum extent possible, use standard graphics as templates to provide a consistent look throughout the interface.

I. Color Scheme: The graphics to use dynamic color changes to communicate equipment type, or object status consistent with the graphics color legend.

J. Symbols and Animations: Fans, pumps, dampers, coils, and generation equipment to be dynamic symbols indicating rotation, state, or position, movement, flow, etc.

K. Macros: When macros are used to add functionality to the graphics, detailed documentation provided.

L. Configure Mode: Access to “Configure Mode” for editing of the graphics password protected to prevent unauthorized changes to the graphics. This password supplied to the appropriate personnel.

M. Graphics Version: Graphics provided in the most current format available at time of control system programming.

N. Points and graphics checked for the proper binding and graphic programming, settings to ensure that the correct system, location, point values and dynamics are shown in the proper location and rotate in the proper directions.

O. After graphics have been accepted, provide, on a CD ROM in an agreed upon file structure. If the graphics have active-x controls or other files that must be placed outside the graphics folder structure a set-up program provided on the disk to place the files in the correct locations.

2.06 BUILDING CONTROLLERS

A. General Requirements
   1. Provide a minimum of one Alerton “ACM” per building.

B. BACnet MS/TP
   1. BACnet MS/TP LAN must be software-configurable from 9.6 to 115.4Kbps
      a. Each BACnet MS/TP LAN shall support 64 BACnet devices at a minimum.
      b. Provide sufficient installed LAN for 10% spare capacity on each LAN.

C. BACnet IP
   1. The building controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN.
   2. Must support interoperability on WANs and CANs and function as a BACnet Broadcast Management Device (BBMD).
   3. Each controller shall support at a minimum 128 BBMD entries
   4. BBMD management architecture shall support 3000 subnets at a minimum
   5. Shall support BACnet Network Address Translation
   6. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

D. Expansion Ports
   1. Controller shall support two expansion ports.
      a. Combining the two on-board EIA-458 ports with fully loaded expansion ports the controller shall support 6 EIA-485 trunks simultaneously
   2. Expansion cards that mate to the expansion ports shall include:
      a. Dual port EIA-485 card

2.07 APPLICATION SPECIFIC CONTROLLERS

A. Provide one Alerton native BACnet application controller (VLC) for each piece of unitary mechanical equipment that adequately covers all objects listed in object list for unit. All controllers shall interface to building controller through MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of unit.

B. BACnet Conformance
   1. Application controllers shall, as a minimum, support MS/TP BACnet LAN types. They shall communicate directly using this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as a native BACnet device. Application controllers shall be approved by the BTL as meeting the BACnet Application Specific Controller requirements

and support all BACnet services necessary to provide the following BACnet functional groups:
   a. Files Functional Group
   b. Reinitialize Functional Group
   c. Device Communications Functional Group
2. Please refer to Section 22.2, BACnet Functional Groups in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
3. Standard BACnet object types supported shall include, as a minimum, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File, and Program Object Types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 10-bit resolution that can accept 3K and 10K thermistors, 0-5VDC, 4-20mA, dry contact signals and a minimum of three (3) pulse inputs. Any input on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor. Controller shall include binary outputs on board with analog outputs as needed.

D. All program sequences shall be stored on board controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and shall be capable of multiple PID loops for control of multiple devices. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely through modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using same programming tools as building controller and as described in operator workstation section. All programming tools shall be provided and installed as part of system.

E. Application controller shall include support for intelligent room sensor (see Section 2.9.B.) Display on room sensor shall be programmable at controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

2.08 INPUT/OUTPUT INTERFACE

A. Input/output points protected such that shorting of point to itself, to another point, or to ground will cause no damage to controller. Input and output points protected from voltage up to 24 V.

B. Binary inputs (BI or DI) allow monitoring of On/Off signals from remote devices. Binary inputs sense “dry contact” closure without external power (other than that provided by controller) being applied.

C. Pulse accumulation input objects accept up to 10 pulses per second for pulse accumulation.

D. Analog inputs (AI) allow monitoring of low-voltage (0 to 10 VDC), current (4 to 20 mA), or resistance signals (thermistor, RTD).

E. Binary outputs (BO or DO) provide for On/Off operation or pulsed low-voltage signal for pulse width modulation control. Binary outputs on building and custom application controllers have three-position (On/Off/Auto) override switches and status lights. Outputs selectable for either normally open or normally closed operation.

F. Analog outputs (AO)provide a modulating signal for control of end devices. Outputs provide either a 0 to 10 VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs on building controllers have status lights and two-position (AUTO/MANUAL) switch and adjustable potentiometer for manual override. Analog outputs not exhibit drift of greater than 0.4 percent of range per year.

G. Tri-State Outputs. Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices limited to zone control and terminal unit control applications (VAV terminal units, duct-mounted heating coils, zone dampers, radiation, etc.). Control algorithms run zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

2.09 POWER SUPPLIES AND LINE FILTERING

A. Control transformers UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in both primary and secondary circuits. Limit connected loads to 80 percent of rated capacity.

B. DC power supply output match output current and voltage requirements. Unit operates between 32 degrees F and 120 degrees F.

C. Line voltage units UL listed and CSA approved.

D. Power line filtering. Provide transient voltage and surge suppression for workstations and controllers.

2.10 CONTROL PANELS

A. Control Panels:
1. Enclosures may be NEMA 1 when located in a clean, dry, indoor environment. Indoor enclosures to be NEMA 12 when installed in other than a clean environment. Outdoor enclosures must be NEMA 3R. Provide (hinged door) key-lock latch and removable subpanels. Single key common to field panels and subpanels. In existing campus or building settings, key lock to match existing keys.
2. Interconnections between internal and face-mounted devices prewired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections UL listed for 600 volt service, individually identified per control/ interlock drawings, with adequate clearance for field wiring. Control terminations for field connection individually identified per control drawings.
3. Provide ON/OFF power switch with overcurrent protection for control power sources to each local panel.
4. Provide laminated plastic nameplates for enclosures in any mechanical room or electrical room labeled with TCP number. Laminated plastic to be 1/8-inch thick sized appropriately to make label easy to read.

2.11 AUXILIARY CONTROL DEVICES

A. Temperature Sensors

1. All temperature sensors to be solid-state electronic, interchangeable with housing appropriate for application. Wall sensors to be installed as indicated on drawings. Mount 48 inches above finished floor. Duct sensors to be installed such that the sensing element is in the main air stream.

B. Intelligent Room Sensor with Touch Screen
   1. Alerton MS-4 No Substitutions.
      a. Room sensor shall include:
         1) Blank wall sensor
         2) Temperature sensor
         3) Humidity Sensor
         4) Programmable Status Light indicator
         5) CO2 Sensor (as scheduled on prints)
      b. Temperature sensor shall be a Uni-Cuve Type II thermstor with an accuracy of +/- 0.36 degrees F (0.2 degrees C) at calibration point over the range of 32-158 degrees F or better.

C. Humidity Sensors:
   1. Space Humidity Sensors: Operating range 10 to 95 percent relative humidity, accuracy plus or minus percent RH, surface mounted ventilated enclosure for wall mounting.
   2. Duct Humidity Transmitter: Capacitive type sensor and transmitter, linear output signal; automatic temperature compensating; air filter; plus or minus 2 percent RH accuracy from 0 to 100 percent RH.
   3. Humidity sensor's drift not exceed 1 percent of full scale per year.

D. Dewpoint Transmitter:
   1. Uninterrupted, accurate and stable dewpoint measurement in condensing environments. Provide with integral temperature sensor.
   2. Calculate:
      a. Relative Humidity
      b. Absolute Humidity
      c. Difference between ambient and dewpoint temperature.
      d. Mixing Ratio of Air
      e. Wet Bulb Temperature of Air
   3. Provide hand held field calibration.
   4. Provide with local display and connection to BAS (analog output signal from device to BAS 4-20 mA signal).
   5. Dust and Chemical Resistant
   6. NEMA 4 Housing
   7. NIST Traceable with Certificate
   8. Specifications:
      a. Dewpoint Measurement Range:-40 degrees F to 212 degrees F
      b. Response Time: 15 seconds
      c. Temperature Measurement Range:40 degrees F to 356 degrees F
      d. Accuracy: 0.18 degrees F
      e. Typical Ranges:
         1) Relative Humidity: 0 to 100 percent
         2) Dewpoint Difference: 0 to 90 degrees F
         3) Mixing Ration: 0 to 3500 gr/lb
         4) Absolute Humidity: 0 to 262 gr/ft^3
         5) Wet Bulb Temperature: 32 degrees F to 212 degrees F
   9. Manufacturers:
      a. Vaisala HMP243 with HMK41 field calibrator.
      b. Or approved equivalent.

E. Pressure Transmitters and Transducers:
   1. Transducer have linear output signal; field adjustable zero and span. Sensing elements withstand continuous operating conditions of positive or negative pressure 50 percent greater than calibrated span without damage.
   2. Differential Pressure Switch: Setpoint adjustable with operating range of 0.5 to 12-inch WG for fans, and 5 to 30-feet WC for pumps. Switches UL listed; SPDT snap-acting; pilot duty rated (125 VA minimum); NEMA 1 enclosure; scale range and differential suitable for intended application.
   3. Filter Differential Pressure Switch: Setpoint adjustable with operating range of 0.1 to 5-inch WG; auto reset. Contactor to close when pressure differential setting is met or exceeded. Provide mounting bracket, metallic tubing and appropriate fittings for connection to duct or air-handling unit.
   4. Duct Static Differential Pressure Transducer: Operating range 0 to 5-inch WC for duct mounted transmitter; ceramic capacitive sensing element with probe securely mounted in duct; digital input terminal and push button to zero output. Accuracy plus or minus 1 percent of full scale; maximum response time 2 seconds.
   5. Building Static Pressure Transducer: Operating range of -0.1 to 0.1-inch WC, linear signal. Sensing tubes located inside and outside building use shielding and/or surge tanks to minimize effects of wind. Accuracy plus or minus 1 percent of full scale.
   6. Piping Pressure Transmitter: Operating range 0 to 50 PSIG, linear signal; stainless steel diaphragm; digital input terminal and push button to zero output. Accuracy plus or minus 1 percent of full scale.

F. Motorized Control Dampers:
   1. Performance: Maximum leakage of 3 CFM/SF at 1-inch WG differential pressure, AMCA Class 1A, maximum pressure rating of 13-inch WG differential pressure, maximum velocity of 6,000 fpm, -72 degrees F to 275 degrees F temperature rating.
   2. Multi-blade type, except where either dimension is less than 10-inch single blade may be used. Maximum blade length to be 48-inch.
   3. Provide parallel blades for modulating mixing service and opposed blades for throttling service.
   4. Blades to be interlocking; minimum 16 gauge galvanized steel; compression type edge seals and side seating stops. In copper, aluminum and stainless steel duct work, damper material matches duct work material.
   5. Damper blades are reinforced, have continuous full length axle shafts, axle to axle linkage, and/or operating “jackshafts” as required to provide coordinated tracking of blades.
   6. Bearings: Self-lubricating stainless steel sleeve or Celcon bearing.
   7. Dampers over 25 SF in area to be in two or more sections, with interconnected blades.
   8. Provide remote damper blade position status with binary input.
   9. Tested in accordance with AMCA Standard No. 500.

G. Motorized Control Valves:
   1. Body pressure rating and connection type construction conforms to pipe, fitting and valve schedules.
   2. Fluid valve close-off ratings and spring ranges operate at maximum flows and maximum available pump heads scheduled without leakage.
   3. Screwed ends except 2-1/2-inch and larger valves with flanged ends.
   4. Steam valve close-off ratings operates at 150 percent of steam pressure without leakage.
   5. Motorized Control Valves (Pressure Independent Control Valves):

a. Description: Valve consists of pressure compensating cartridge, actuated ball or Y pattern globe valve, and multiple pressure/temperature test ports in a single valve housing.
b. Construction: Rated for no less than 125 PSI and 250 degrees F. 2-inch and Smaller: brass with threaded connections. 2-1/2-inch and larger: cast iron with flanged connections.
c. Performance: Flow rate controlled linearly to within 5 percent of target flow rate, for any actuator position (0 to 100 percent), over an operating differential pressure range of 6 to 50 PSI across the valve. Provide valve with integral test ports to verify pressure differential.
d. Manufacturers: Belimo, Danfoss, Flow Control Industries, Griswold, Tour and Andersson, or approved equivalent.

6. Fluid three-way valves globe valves with linear plug with composition disc for tight shutoff.
7. Pressure drop equal to twice pressure drop through heat exchanger (load), 50 percent of pressure difference between supply and return mains, or 5 PSI, whichever is greater, except two-position valves to be line size.
8. Bubble-tight line size butterfly valves acceptable on 2-1/2-inch lines and above for two-position action only; cast iron body; aluminum bronze disc; EPDM seat, 200 PSI wg
9. For modulating service that require valve sizes above 6-inch, butterfly or v-port ball valves are allowed.
10. Steam Valves: Body and trim materials in accordance with manufacturer's recommendations for design conditions and service with linear ports for modulating service. Sizing Criteria:
    a. Two-Position Service: Pressure drop 10 percent to 20 percent of inlet PSIG.
    b. Modulating Service: 15 PSIG or less; pressure drop 80 percent of inlet PSIG.
    c. Modulating Service: 16 to 50 PSIG; pressure drop 50 percent of inlet PSIG.
    d. Modulating Service: Over 50 PSIG; pressure drop as scheduled on Drawings.

H. Electric Damper/Valve Actuators:
1. Provide mechanical or electronic stall protection for each actuator.
2. Where indicated provide internal mechanical, spring-return mechanism or provide uninterruptible power supply (UPS). Non-spring-return actuators have external manual gear release to position damper/valve when actuator is not powered.
3. Proportional actuators accepts 0 to 10 VDC or 0 to 20 mA control signal and provide 2 to 10 VDC or 4 to 20 mA operating range.
4. Actuator sized for torque required plus 25 percent; UL or CSA listed; electronic current overload protection.
5. VAV Actuators: Actuators proportional 24 VAC actuators using a 4 to 20 mA range of control signals; stops automatically at end of travel; include permanently lubricated gear train.
6. Actuators for emergency generator damper control rated for 350 degree F. maximum operating temperature and capable to drive fully open and close within 15 seconds.

I. Air Flow Meters:
1. Fan Inlet Type: Self-supporting aluminum traverse probes housing thermal dispersion sensors. Probe spacing and sensor quantity as recommended by manufacturer. Provide factory calibrated electronic flow transmitter with CFM readout display and capability of providing 4 to 20 milliamp output for interface with direct digital controls. Ebtron GTx116-PC.

2. Fan Inlet Type: Self-supporting traverse probe type velocity pressure averaging station; stainless steel construction for exhaust fans; aluminum construction for air handler units. Provide factory calibrated electronic flow transmitter; CFM readout display; capable of providing 4 to 20 milliamp output. Air Monitor Volu-probe/FI; Paragon; Accutrol.
3. Duct Mounted Air Flow Station: Self-supporting aluminum alloy tube with stainless steel mounting brackets. Probe and sensor density quantity as recommended by manufacturer. Sensor use thermal dispersion technology with two “bead in glass,” hermetically sealed thermistor probes at each measuring point. Provide electronic flow transmitter with CFM readout display and capable of 4-20 mA output signal. Ebtron GTA116-PC.

J. Water Flow Meter:
1. Provide a Turbine Flow Meter (reference 23 05 19) complete with installation hardware necessary to enable insertion and removal of the meter without system shutdown. The flow meter hand-insertable up to 400 PSI. The flow meter to have two contra-rotating axial turbines, with electronic impedance-based sensing and an averaging circuit to reduce measurement errors due to swirl and flow profile distortion. Wetted metal components nickel-plated brass. Provide 316L SS construction for hot water applications operating over 250 degrees F, and for any application in non-metallic pipe. The maximum operating temperature 280 degrees F, 300 degrees F peak. Each flow meter individually wet-calibrated against a primary volumetric standard that is accurate to within 0.1 percent and traceable to NIST*. Manufacturer's certificate of calibration provided with each flow meter. Accuracy within plus or minus 0.5 percent of rate at the calibrated velocity, within plus or minus 1 percent of rate over a 10:1 turndown (3.0 to 30 ft/s) and within plus or minus 2 percent of rate over a 50:1 turndown (from 0.4 to 20 ft/s). The flow meter to include integral analog output(s), 4-20 mA, 0-10V, or 0-5V. Bi-directional meters to include an isolated contact closure output for direction. Flow meter covered by the manufacturer's two year warranty.
2. Retractable insertion vortex flow meter; accuracy plus 1.0 percent of full scale with 30 to 1 turndown capability; flow range 0.5 to 15 fps; analog output; 400 PSI operating pressure with 400 PSI ball valve; stainless steel shedder bar; rate/total display. Hydro-Flow (Emco) Model 3100.

K. Room Pressure Monitor: Active room pressure monitor and alarm which provides local audio alarm and analog and alarm signals to DDC system. Wall mounted panel with LED differential pressure readout; audible and visual alarm; mute button; range of -0.05 to +0.05-inch WC; accurate to 1 percent of full scale; repeatability plus or minus 1.0 percent of full scale per year, alarm delay ability between 0-30 seconds. Provide door switch to deactivate alarm when space door(s) are open. Input status from BAS to deactivate alarm in unoccupied or shutdown modes. Phoenix Controls APM100.

L. Duct Mounted Carbon Dioxide Sensor:
1. Duct mounted CO2 sensor consists of infrared sensing element with heated stannic dioxide semiconductor. Operating range 0-2000 ppm plus 50 ppm plus 2 percent of measured value; maximum duct velocity of 1500 fpm; duct mounting kit.

M. Wall Mounted Space Carbon Dioxide Sensor:
1. Sensor to employ non-dispersive infrared technology. (N.D.I.R.)
2. Sensor Repeatability: Plus or minus 20 ppm. 0-2000.
3. Sensor Accuracy: Less than or equal to 75 ppm over 0-1500 ppm range.
4. Sensor Response Time: Less than 1 minute.
5. Sensor to employ reference channel design for long-term stability.
6. Sensor to have field selectable 0-10VDC, or 4-20mA outputs.

7. Sensor power requirement less than 3W.
8. Sensor Input Voltage: 20 to 30VAC/DC.
9. Sensor Operating Temperature Range: 0 degrees C to 50 degrees C.
10. Sensor to have models for wall mounting or duct mounting.
11. Sensor to provide at least a 1-year factory warranty from date of purchase.
12. Sensor to match cover in color and look to temperature sensor.
13. Sensor to have display.
14. Manufacturers:
    a. Telaire
    b. Vaisala
    c. Veris

N. Carbon Monoxide Detector:
1. Microprocessor based CO sensor and controller with fan relay, pilot light indicators; comply with UL Standards 2034; self-supervision activates fan if system detects problems; calibration kit for project.
2. Relay to activate fan at sensing 35 ppm CO after 5 minutes. Minimum fan runtime to be 2-1/2 minutes. Relay to activate alarm at sensing 100 ppm CO after 30 minutes. Vulcain Electrochemical Type (Q1).

O. Nitrogen Dioxide Detector:
1. Microprocessor based NO2 sensor and controller with fan relay, pilot light indicators; comply with UL Standards 2034; self-supervision activates fan if system detects problems; calibration kit for project.
2. Relay to activate fan at sensing 10 PPM NO2 after 5 minutes. Minimum fan runtime to be 2-1/2 minutes. Relay to activate alarm at sensing 15 PPM NO2 after 30 minutes. Vulcain Electrochemical Type (Q1).

P. Occupancy Sensor: Dual technology infrared and ultrasonic sensing device, ceiling or wall mounted, built-in self-adjusting settings, timer settings of 30 seconds to 30 minutes, with manual and automatic modes. Provide multiple devices in parallel when area served is greater than a single device sensing capability. Provide integral power pack, 120 VAC input, 24 VDC output, with manual override switch. Leviton OSC-MOW series.

Q. Paddle Type Flow Switches: Paddle type switches (water service only) UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum) and have adjustable sensitivity with NEMA 1 enclosure.

R. Relays:
1. Control relays UL listed plug-in type with dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage to be suitable for application.
2. Time delay relays UL listed solid-state plug-in type with adjustable time delay. Delay adjustable plus or minus 200 percent (minimum) from setpoint or as indicated. Contact rating, configuration, and coil voltage to be suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

S. Override Timers: Override timers spring-wound line voltage, UL Listed, with contact rating and configuration as required by application. Provide 0-to-6-hour calibrated dial unless otherwise specified. Timer suitable for flush mounting on control panel face and located on local control panels or where shown.

T. Current Transmitters:
1. AC current transmitters are self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4 to 20 mA two-wire output. Unit range compatible with actual applied span of current

value, with internal zero and span adjustment and plus or minus 1 percent full-scale accuracy at 500 ohm maximum burden.
2. Transmitter meets or exceeds ANSI/ISA S50.1 requirements and UL/CSA recognized.
3. Unit split-core type for clamp-on installation on existing wiring.

U. Current Transformers: AC current transformers UL/CSA recognized and completely encased (except for terminals) in approved plastic material; plus or minus 1 percent accuracy at 5 A full-scale.

V. Voltage Transmitters: AC voltage; self-powered single-loop (two-wire) type; 4 to 20 mA output with zero and span adjustment; UL/CSA recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1. Ranges include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC full-scale, adjustable, with plus or minus 1 percent full-scale accuracy with 500 ohm maximum burden.

W. Voltage Transformers: AC voltage transformers UL/CSA recognized, 600 VAC rated; built-in fuse protection; suitable for ambient temperatures of 40 degrees F to 130 degrees F; plus or minus 0.5 percent accuracy at 24 VAC and a 5 VA load.

X. Power Monitors: Selectable rate pulse output for kWh reading; 4-20 mA output for kW reading; N.O. alarm contact; ability to operate with 5.0 amp current inputs or 0-0.33 volt inputs; plus 1.0 percent full-scale true RMS power accuracy; plus 0.5 Hz, voltage input range 120-600 V, and auto range select; NEMA 1 enclosure. Current transformers having a 0.5 percent FS accuracy, 600 VAC isolation voltage with 0-0.33 V output. If 0-5 A current transformers are provided, a three-phase disconnect/shorting switch assembly is required.

Y. Overflow Switch: Insertion flow sensor, brass, impeller flow design with analog transmitter unit. Data Industrial Model 220BR.

Z. Ultrasonic Level Transmitter: Non-contact measuring device for liquid level; distance ranges from 4-feet to 32-feet; fail-safe intelligence with diagnostic feedback for troubleshooting; automatic temperature compensation; 24VDC; accuracy plus 0.15 percent of span in air. Kele LU Series.

AA. Pressure-Electric (PE) Switches: Metal or neoprene diaphragm actuated; operating pressure rated 0-25 PSIG; calibrated scale setpoint range of 2-18 PSIG minimum; UL listed. Provide one- or two-stage switch action SPDT, DPST, or DPDT, as required by application. Electrically rated for pilot duty service (125 VA minimum) and/or for motor control. Permanent indicating gauge on each pneumatic signal line to PE switches.

AB. Electric Solenoid Operated Pneumatic (EP) Valve: EP valves three part operation - common, normally open, and normally closed; rated for 25 PSIG when used in control system operation at 20 PSIG or less or rated at 150 PSIG when used in control system operation from 25 to 100 PSIG.

AC. Electro-Pneumatic (E/P) Transducers: Electronic/pneumatic transducer provides proportional 3 to 15 PSIG output signal from either 4 to 20 mA or 0 to 10 VDC analog control input. E/P transducer equipped with following features:
1. Separate Span and Zero Adjustments
2. Manual Output Adjustments
3. Pressure Gauge Assembly
4. Feedback Loop Control
5. Air Consumption of 0.05 L/s (0.1 scfm) at Mid-Range

AD. Emergency Stop Switch: Red, mushroom type, pull out to operate.

AE. End Switches: Turret head Type SPDT. Schneider Electric/Square D Class 9007, Type C54B2, or approved equivalent.

AF. Water Detector: Cast aluminum enclosure with adjustable legs; gold plated probes for water detection; LED for water detection; SPDT alarm contacts; 24 VAC/VDC. Kele WD-1B, or approved equivalent.

AG. Tape Style Water Detector: Adhesive sensor tape with copper fiber electrodes and netted cover; tape integrity self-check feature; 24 VAC/VDC. Manufacturer: Kele WD-2-T.

AH. Spot Leak Water Detector: Polymer coated sensing probes; adjustable height; 24 VAC/VDC. Manufacturer: Kele SD-R01, or approved equivalent.

AI. Condensation Sensor:
1. Passive condensation sensor which will reliably and instantly indicate that condensation is occurring.
2. Sensor to be able to indicate condensation prior to the condensation being visually perceptible and to last as long as any trace of condensation remains on the surface.
3. Manufactured specifically for radiant cooling applications.
4. Not dependent on dew point, humidity, or temperature determinations.
5. Specifications (Based on Condenser):
    a. Mounting:
        1) The Model C condenser is mounted via its #8-32 x 3/8-inch non-metallic stud, nut and washer.
        2) A Pipe Adapter (Model PA-3) is available for mounting any condenser to a 1/8-inch to 3-inch OD pipe.
    b. Dimensions: Model C - Nom. 1.1-inch square footprint X 0.8-inch H from the mounting surface.
    c. Connection: Its 3 foot long cable is terminated in a MONO audio phone plug (1/8-inch / 3.5 mm for the Model C). Provide extensions to suit field conditions.
    d. Operating Temperatures: 5 to 70 degrees C.
    e. Humidity: Not a factor.
    f. Contaminants: Inert to materials other than plastic solvents. If it becomes contaminated with dust or other debris, typically, it is easily cleaned by flushing it with alcohol to restore it to service. Require no calibration.
    g. Provide circuit module to provide binary input to the EMS/BAS with a "SENSOR FAULT."
6. Manufacturers:
    a. Model CG-ICM, no known equal.
    b. Or approved equivalent.

AJ. Wind Speed Sensor:
1. Low starting threshold.
2. Solid state light source and electronics.
3. Low profile to minimize “Sensor Turbulence.”
4. Calibrated to NIST secondary standard.
5. Quick-disconnect connector.
6. Internal heater for long bearing life.
7. Built-in electrical field surge protection.
8. Performance Characteristics:
    a. Maximum Operating Range: 0-125 mph (0-60 m/s).
    b. Starting Speed: 0.5 mph (0.22 m/s).
    c. Calibrated Range: 0-99 mph (0-50 m/s).

d. Accuracy: Plus or minus 1 percent (0.15 mph).
e. Temperature Range: -50 degrees C to 67 degrees C.
f. Response: Distant constant less than 5-feet of flow.

9. Electrical Characteristics:
   a. Power Requirements: 12 VDC at 10 mA.
   b. Output Signal: 11 volt pulse.
   c. Output Impedance: 100 ohms maximum.
10. Physical Characteristics:
   a. Weight: 1.5 pounds (.68 kilogram).
   b. Finish: Anodized Aluminum.
   c. Mounting Fixtures: PN 191 Crossarm Assembly.
11. Accessories:
   a. PN 1953 Cable Assembly, vinyl jacketed shielded cable.
   b. Aluminum Cup Assembly, distance constant - 15-feet.
12. Manufacturers:
   a. Met One Instruments, Inc. - 010C
   b. Nova Lynx
   c. Or approved equivalent

AK. Wind Direction Sensor:
1. Airfoil shaped polyurethane van assembly.
2. Components: Stainless steel.
3. Electrical Components: Field replaceable without requiring recalibration.
4. Single potentiometer for either 360 degree or 540 degree applications.
5. Low profile to minimize sensor turbulence.
6. High damping ratio.
7. Short relay distance.
8. Orientation lock.
9. Quick disconnect connector.
10. Internal heater for long bearing life.
11. Wind direction translator module.
12. Electrical field surge protection.
13. Performance Characteristics:
   a. Azimuth: Electrical - 0-357 degrees
   b. Azimuth: Mechanical - 0-360 degrees
   c. Threshold: 0.5 mph
   d. Linearity: Plus or minus 1/2 percent of full scale
   e. Damping ratio: 0.25
   f. Delay distance: Less than 3-feet.
   g. Accuracy: Plus or minus 3 degrees
   h. Temperature Range: -50 degrees C to 65 degrees C
14. Electrical Characteristics:
   a. Power Requirements: 12 VDC at 10 mA, 12 VDC at 350 mA for heater
   b. Output Signal: 0-5V volt
   c. Output Impedance: 100 ohms maximum
15. Physical Characteristics:
   a. Weight: 1.5 pounds (.68 kilogram)
   b. Finish: Anodized Aluminum
   c. Mounting Fixtures: PN 191 Crossarm Assembly
16. Accessories: PN 1953 Cable Assembly, vinyl jacketed shielded cable.
17. Manufacturers:
   a. Met One Instruments, Inc. - 010C
   b. Nova Lynx.
   c. Or approved equivalent.

AL. Rain Sensor:

1. Sensor is to be used to detect the onset of rainfall. A gold plated grid sensor activates the circuit when water is deposited onto the grid. The presence of water activates an internal relay that may be used in a Building Automation System.
2. An internal heater constantly dries the grid to prevent relay activation during times of dew, fog, or light moisture that is not actual precipitation. During periods of normal precipitation the heater is unable to dry the grid and the relay is activated. The heater power may be disconnected allowing the detector to be operated as a leaf wetness sensor.
3. The solid state electronics are mounted in a sealed weatherproof enclosure. The precipitation detector may be tilted to allow water to drain off. A mounting bracket is provided with the sensor to allow mounting onto a 1-inch pipe by a U-bolt. The wind screen must be used to prevent premature drying of the grid during precipitation events accompanied by high winds.
4. The unit requires plus 12 Vdc power for operation. A 115 Vac power adapter is provided with each unit. Power adapters for voltages other than 115 Vac are available upon request.
5. Specifications:
    a. Sensor: Gold plated grid 4-inch diameter.
    b. Output: Relay (0.5 amps).
    c. Heater: Resistive element.
    d. Power: 12 Vdc (235 mA max.) 115 Vac 60 Hz adapter supplied.
    e. Size: Overall 4-inch diameter x 2-inch high.
    f. Weight/Shipping: 4 lbs/5 lbs (1.8 Kg/2.3 Kg).
6. Manufacturers:
    a. NovaLynx Model 260-2590 Precipitation Detector
    b. Or approved equivalent.

2.12 WIRING AND RACEWAYS

A. General: Provide copper wiring, plenum cable, and raceways as specified in applicable Sections of Division 26, Electrical.

B. Insulated wire to be copper conductors, UL labeled for 90 degrees C minimum service.

C. Field panels and controllers to be supplied by building emergency power system where systems being monitored or controlled are on emergency power.

D. Run control wiring as follows:
1. Mechanical Rooms: In conduit.
2. Exposed in Building Spaces: In conduit.
3. Concealed in Building Walls and Ceilings: Plenum rated cable.
4. Concealed in Building Ceilings: Plenum rated cable in cable tray.

E. Field and Subfield Panels: Voltage in panels not-to-exceed 120 volts.

F. Motor Control Centers: Responsibility for correct voltage of holding coils and starter wiring in pre-wired motor control centers interfacing with automatic controls is included hereunder.

G. Wiring for BAS systems communications buses two conductor minimum 18 gauge foil-shielded, stranded twisted pair cable rated at 300 VDC or more than 80 degrees C.

2.13 SMOKE DETECTION (FOR PROJECTS WITH A FIRE ALARM SYSTEM)

A. See Division 28 for Products.

PART 3 - EXECUTION

3.01 DEMOLITION

A. Graphics and Programming: Remove symbols from control system graphics associated with deleted terminal elements. Modify programming code to delete alarms, control loops, etc., associated with deleted terminal devices.

3.02 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Notify the Owner's Authorized Representative in writing of conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until unsatisfactory conditions are resolved.

3.03 CONTROL SYSTEM CHECKOUT AND TESTING

A. Testing completed before Owner's Authorized Representative is notified of system demonstration.

B. Calibrate and prepare for service of instruments, controls, and accessory equipment furnished under this specification.

C. Verify that control wiring is properly connected and free of shorts and ground faults.

D. Enable control systems and verify calibration and operation of input and output devices.

E. Verify that system operation adheres to sequences of operation.

F. Commissioning and Verification: In addition to commissioning requirements specified elsewhere, provide the following commissioning on the HVAC instrumentation and controls system:
   1. Control systems completely commissioned to ensure aspects of the system are operating as intended and at optimum tuning.
   2. Wiring connections verified and traced from field device to panel to ensure proper connections.
   3. Measured values verified by a hand held calibrated device to validate that value indicated by the control system is in fact the actual measured value.
   4. Loops properly tuned to obtain the desired control value. Each loop to be "upset" and put back in control to demonstrate its ability to stabilize quickly.
   5. Provide a final point-by-point report submitted that indicates the date of each verification, the results, and initialed on each page by the person performing the reading.

3.04 ACCEPTANCE TESTING AND TRAINING

A. Site Testing:
   1. Contractor provides personnel, equipment, instrumentation, and supplies necessary to perform testing. Owner or Owner's Authorized Representative will witness and sign off on acceptance testing.
   2. Contractor demonstrates compliance of completed control system with Contract Documents. Using approved test plan, physical and functional requirements of project demonstrated.

B. Training:

1. General: Contractor conducts training courses for up to three other designated personnel in operation and maintenance of system. Training manuals provided for each trainee, with two additional copies provided for archival at project site. Manuals include detailed description of subject matter for each lesson. Copies of audiovisuals delivered to Owner. Training day is defined as 8 hours of classroom instruction, including two 15-minute breaks and excluding lunch time, Monday through Friday, during normal first shift in effect at training facility. Notification of any planned training given to Owner's Authorized Representative at least 15 days prior to training.
2. Operator's Training I: First course taught at supplier's facility for period of one training day. Upon completion, each student should be able to perform elementary operations with guidance and describe general hardware architecture and functionality of system.
3. Operator's Training II: Second course taught at project site for a period of one training day after completion of contractor's field testing. Course includes instruction on specific hardware configuration of installed system and specific instructions for operating installed system. Upon completion, each student should be able to start system, operate the system, recover system after failure, and describe specific hardware architecture and operation of system.
4. Operator's Training III: Third course taught at project site for period of one training day no later than six months after completion of the acceptance test. Course will be structured to address specific topics that students need to discuss and to answer questions concerning operation of system. Upon completion, students should be fully proficient in system operation and have no unanswered questions regarding operation of installed system.

3.05 COMMUNICATION WIRING

A. Follow manufacturer's installation recommendations for communication cabling.

B. Verify integrity of network following cable installation.

C. Communication wiring unspliced length when that length is commercially available; labeled to indicate origination and destination data.

D. Grounding of coaxial cable in accordance with NEC regulations article on “Communications Circuits, Cable, and Protector Grounding.”

3.06 WIRING AND RACEWAYS

A. Provide electrical wiring required to control systems specified in this Section. Control and interlock wiring complies with national, state and local electrical codes and Division 26, Electrical of this specification.

B. Power wiring required for building control panel(s) to be dedicated circuit(s).

C. Verify location of operator work station with Owner prior to installation.

D. NEC Class 1 (line voltage) wiring UL Listed in approved raceway according to NEC and Division 26, Electrical requirements.

E. Low-voltage wiring meets NEC Class 2 requirements. (Low-voltage power circuits subfused when required to meet Class 2 current limit.)

F. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in raceway may be used provided that cables are UL listed for intended application.

G. Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for purpose of interfacing (e.g., relays and transformers).

H. Where Class 2 wiring is run exposed, wiring run parallel along surface or perpendicular to it and tied at 10 foot intervals.

I. Where plenum cables are used without raceway, support from structural members. Do not support cables with ductwork, electrical raceways, piping, or ceiling suspension systems.

J. Make wire-to-device connections at terminal block or terminal strip. Make wire-to-wire connections at terminal block.

K. Maximum allowable voltage for control wiring 24 V. If only higher voltages are available, provide step-down transformers.

L. Wiring installed as continuous lengths, with no splices permitted between termination points.

M. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at penetrations.

N. Include one pull string in each raceway 1-inch or larger.

O. Control and status relays are to be located in designated enclosures. Enclosures include packaged equipment control panels unless they also contain Class 1 starters.

P. Install raceway to maintain a minimum clearance of 6-inches from high-temperature equipment (e.g., steam pipes or flues).

Q. Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.

R. Install insulated bushings on raceway ends and openings to enclosures. Seal top end of vertical raceways.

S. Flexible metal raceways and liquid-tight, flexible metal raceways not-to-exceed 3-feet in length and be supported at each end. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways to be used.

T. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections joined with couplings. Terminations made with fittings at boxes.

U. Input and output terminations to be labeled at the controller to identify if they are AI, DI, AO, DO, and function (i.e. pump start, OM Sensor).

3.07 INSTALLATION OF AUXILIARY CONTROL DEVICES

A. General:

1. Install sensors and thermostats in accordance with manufacturer's recommendations.
2. Room sensors and thermostats installed at 48-inches AFF to midline of sensor on concealed junction boxes properly supported by wall framing at the locations shown on the Drawings.
3. Low-limit sensors used in mixing plenums installed in a serpentine manner horizontally across duct.

3.08 SMOKE DETECTION (FOR PROJECTS WITH A FIRE ALARM SYSTEM)

A. Smoke detector furnished and powered/wired under Division 28, Electronic Safety and Security. Coordinate with fire alarm equipment supplier. Installation of duct smoke detector housing and sampling tube under Division 23, HVAC.

B. Install smoke detectors in supply air systems greater than 2000 CFM.

C. Install smoke detectors at each story prior to connection to return air riser in systems greater than 15,000 CFM and serving more than one story.

3.09 SEQUENCES OF OPERATION AND POINTS LISTS

A. Where local energy code dictates certain sequences (such as night setback, night flush, pressure and temperature reset, terminal unit sequences, etc.), the sequences are not necessarily repeated in the documents. It is not the intent of this specification or documentation to reiterate the energy code. Provide energy code mandated sequences and document in sequence of operations submittals at no additional cost to the Owner. Provide required points to achieve the appropriate sequences.

B. See control diagrams and sequences on drawings.

C. Provide a real time clock and schedule controller with sufficient scheduling capability to schedule required controllers and sequences. Schedule functionality may reside in a controller. If a controller is used, document scheduling functionality including names and types on controller points list submittal. Set up initial schedules in coordination with Owner.

D. Scheduling Terminology: When air handlers are scheduled throughout the day, the following defines the terminology used:
1. Occupied Period: Period of time when the building is in use and occupied. Confirm schedule with Owner. Exclude all national holidays. Generally systems will be fully operational throughout this period and ventilation air to be continuously introduced. Space temperature setpoints will generally be in the “normal” range of 68 degrees to 78 degrees F.
2. Unoccupied period: Period of time when the building or zone is not in use and unoccupied. Ventilation air not to be introduced.
3. Preoccupancy Period: Time prior to the Occupied period when the systems are returning the space temperatures from setback to “normal” or occupied setpoints (warm-up and cool-down). Ventilation air shall not be introduced unless outside air conditions permit free-cooling or to support a pre-occupancy purge sequence. Time period to be determined by an optimum start strategy unless otherwise specified.
4. Setback Period: Setback will typically start with the end of the occupied period and end with the start of the preoccupancy period, however it shall be provided with its own schedule. Generally systems will be off except to maintain a “setback” temperature, economization may be enabled to maintain “setback” cooling setpoint when applicable.

E. Where any sequence or occupancy schedule calls for more than one motorized unit to start simultaneously, the BAS start commands to be staggered by 5 second (adj.) intervals to minimize inrush current.

F. Wherever a value is indicated as adjustable (adj.), it shall be modifiable, with the proper password level. For these points, it is unacceptable to have to modify programming statements to change the setpoint.

G. When a power failure is detected in any phase, the BAS start commands to be retracted immediately from electrically powered units served by the failed power source. If the associated controller is powered by normal or emergency power, it may monitor its own power source as an indication of power status. If the controller is powered by uninterruptible power supply (UPS), or if it is not capable of monitoring its own power for use in sequences, provide at least one voltage monitor (three phase when applicable) per building. When the BAS detects that normal or emergency power has been restored, all equipment for which the BAS start command had been retracted to be automatically restarted in an orderly manner on staggered 5 second intervals to minimize inrush current.

H. Where reset action is specified in a sequence of operation, but a reset schedule is not indicated on the drawings, employ one of the following methods:
   1. Determine a fixed reset schedule to result in stable operation and maintain the primary variable within the specified maximum allowable variance.
   2. Use a floating reset algorithm which increments the secondary variable setpoint (setpoint of control loop being reset) on a periodic basis to maintain primary variable setpoint. The recalculation time and reset increment to be chosen to maintain the primary variable within the specified maximum allowable variance.
   3. Primary variable to control the devices directly using a PID feedback control loop without resetting the secondary variable. However, the control devices to still modulate as necessary to maintain upper and lower limits on the secondary variable. Proportional band, integral gain, and derivative term to be selected to maintain the primary variable within the specified maximum allowable tolerance while minimizing overshoot and settling time. Gain prior approval for implementing this method of reset.

I. Where “prove operation” of a device (generally controlled by a digital output) is indicated in the sequence, it shall require that the BAS, after an adjustable time delay after the device is commanded to operate (feedback delay), confirm that the device is operational via the status input. If the status point does not confirm operation after the time delay or anytime thereafter for an adjustable time delay (debounce delay) while the device is commanded to run, an alarm to be enunciated audibly. Upon failure, run command to be removed and the device to be locked out until the alarm is manually acknowledged unless specified otherwise.

J. BAS to provide for adjustable maximum rates of change for increasing and decreasing output from the following analog output points:
   1. Speed control of variable speed drives
   2. Control Reset Loop
   3. Valve Travel Limit

K. Wherever a value is indicated to be dependent on another value (i.e., setpoint plus 5 degrees F) BAS to use that equation to determine the value. Simply providing a virtual point that the operator must set is unacceptable. In this case three virtual points to be provided. One to store the parameter (5 degrees F), one to store the setpoint, and one to store the value which is the result of the equation.

L. Trend points as identified in the points list. Trends to be grouped system specific and setup in two-axis (x,y) graphical format that display object values relative to time. Setup trends to record data in 5 minute increments.

END OF SECTION

SECTION 23 2113

HVAC PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Equipment Drains and Overflows
   2. Unions
   3. Refrigerant Piping

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Welding Certificates: Copies of certificates for welding procedures and personnel.
   2. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:
      a. Test procedures used.
      b. Test results that comply with requirements.
      c. Failed test results and corrective action taken to achieve requirements.
   3. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at project site.
   4. Buried piping manufacturer to submit thrust block (chilled water) and anchor plate (heating hot water) layout and details including anchorage and seismic calculations.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Installer Qualifications: Company specializing in performing work of the type specified in this Section, with documented experience.
   2. Welder Qualifications: Certify in accordance with ASME (BPV IX).
   3. ASME Compliance: Comply with ASME B31.9 "Building Services Piping" for materials, products, and installation. Provide safety valves and pressure vessels with the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 01.
   4. Refrigerant Piping:

a. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX "Welding and Brazing Qualifications."
b. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
c. ASME Standard: Comply with ASME B31.5, "Refrigeration Piping."
d. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Nonelectrical" or UL 429 "Electrically Operated Valves."

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements, General Requirements.

PART 2 - PRODUCTS

2.01 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), drawn.
1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
2. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.
3. Joints: Brazed, AWS A5.8, Classification BAg-1 (silver). Pipes 2-1/2-inch or larger or piping routed over food preparation centers, food serving facilities, food storage areas, computer rooms, telecommunications rooms, and electrical rooms.

2.02 UNIONS

A. Unions for Pipe 2-inches and Under:
1. Ferrous Piping: 150, 250, and 300 PSIG malleable iron, threaded, ASME B16.39.
2. Copper Pipe: Bronze, soldered joints, ASME B16.22.

B. Dielectric Connections: Provide dielectric waterway or brass nipple fitting with threaded ends. Dielectric unions are not allowed.

2.03 REFRIGERANT PIPING

A. Piping:
1. Copper Tube: ASTM B 280, Type ACR, drawn-temper tube, clean, dry and capped.
a. Fittings: ASME B16.22 wrought copper.
b. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy (15 percent Silver).
2. Copper Tube to 5/8-inch OD: ASTM B280. Tube ACR, annealed-temper copper tube, clean, dry and capped.
a. Fittings: ASME B16.26 cast copper.
b. Joints: Flared.

B. Valves:
1. Manufacturers:
a. Hansen Technologies Corporation.
b. Henry Technologies.
c. Danfoss Flomatic.

d. Substitutions: See Section 23 00 00, HVAC Basic Requirements, Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.

2. Packaged Ball Valves:
   a. Two piece bolted forged brass body with Teflon ball seals and copper tube extensions, brass seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of and maximum temperature of 300 degrees F.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install per manufacturer's written instructions and requirements.

B. Preparation:
1. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
2. Remove scale and dirt on inside and outside before assembly.
3. Prepare piping connections to equipment with flanges or unions.
4. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

C. Above Ground Piping Installation:
1. Install per manufacturer's written instructions and requirements.
2. Route piping in orderly manner, parallel to building structure, and maintain gradient.
3. Install piping to conserve building space and to avoid interference with use of space.
4. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
5. Sleeve pipe passing through partitions, walls and floors allowing adequate space for pipe insulation.
6. Slope piping as required by manufacturer's installation instructions.
7. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
8. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
9. Anchor piping for proper direction of expansion and contraction.
10. Pipe Hangers and Supports:
    a. Install in accordance with Division 23, HVAC, Hangers and Supports.
    b. Install hangers to provide minimum1/2-inch space between finished covering and adjacent work.
    c. Place hangers within 12-inches of each horizontal elbow.
    d. Use hangers with 1-1/2-inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
    e. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
    f. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.
11. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
12. Provide access where valves and fittings are not exposed.

D. Field Quality Control:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush system with clean water. Clean strainers.
4. Isolate equipment from piping. If a valve is used to isolate equipment, provide closure capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
6. Perform the following tests on hydronic piping:
    a. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
    b. While filling system, use vents installed at high points of system to release trapped air. Use drains installed at low points for complete draining of liquid.
    c. Check expansion tanks to determine that they are not air bound and that system is full of water.
    d. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design pressure. Test pressure not-to-exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A of ASME B31.9, "Building Services Piping."
    e. After hydrostatic test pressure has been applied for at least four hours, examine piping, joints and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
    f. Prepare written report of testing.

E. Flushing and Cleaning of Piping Systems:
1. Clean piping systems thoroughly. Purge pipe of construction debris and contamination before placing the piping systems in service. Provide temporary connections for cleaning, purging, and circulating fluids through the piping system.

3.02 REFRIGERANT PIPING INSTALLATION

A. Install systems in accordance with ASHRAE Standard 15.

B. All exterior refrigerant piping to be insulated and jacketed with aluminum jacketing.

C. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

D. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

E. Flood piping system with nitrogen when brazing.

F. Follow ASHRAE Standard 15 procedures for charging and purging of systems and for disposal of refrigerant.

G. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

H. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

I. Fully charge completed system with refrigerant after testing.

J. Field Quality Control:
   1. Test refrigeration system in accordance with ASME B31.5.
   2. Pressure test system with dry nitrogen to 200 PSI. Perform final tests at 27-inches vacuum and 200 PSI using electronic leak detector. Test to no leakage.

END OF SECTION

SECTION 23 3100

HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Ductwork, Joints and Fittings
   2. Insulated Flexible Duct
   3. Drain Pans
   4. Ductwork Joint Sealers and Sealants

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Section 23 05 29, Hangers and Supports for HVAC Piping, Ductwork and Equipment.
   2. Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Welding Certificates
   2. Field Quality Control Reports

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. NFPA Compliance:
      a. NFPA 90A Installation of Air Conditioning and Ventilating Systems.
      b. NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.
   2. Comply with NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Operations, Ch. 3, Duct System for range hood ducts, unless otherwise indicated.
   3. Comply with SMACNA's HVAC Duct Construction Standards - Metal and Flexible for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Provide sheet metal materials free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
   4. If required, provide ductwork pressure testing per Section 23 05 93, Testing, Adjusting and Balancing for HVAC.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and distribution equipment and other air system components. Duct design is generally diagrammatic and is not meant to be scaled. Major changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Ductwork, Joints, and Fittings:
   1. Ductmate
   2. Lindab Inc
   3. Nexus Inc
   4. SEMCO
   5. United McGill Corporation
   6. Ward Industries
   7. Or approved equivalent

B. Insulated Flexible Duct:
   1. ATCO
   2. Flexmaster
   3. J.P. Lamborn Co.
   4. Hart and Cooley
   5. Or approved equivalent

C. Ductwork Joint Sealers and Sealants
   1. Ductmate
   2. Durodyne
   3. Hardcast
   4. United McGill Corporation
   5. Vulkem
   6. Foster
   7. Childer
   8. Or approved equivalent

2.02 DUCTWORK, JOINTS AND FITTINGS

A. Materials:
   1. Galvanized Steel Ducts: Hot-dipped galvanized steel sheet, lock-forming quality, ASTM A 653/A 653M FS Type B, with G90/Z275 coating. Ducts to have mill phosphatized finish for surfaces exposed to view.

B. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
2. Deflection: Duct systems not-to-exceed deflection limits according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible.
3. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

C. Formed-On Flanges: construct according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible, Figure 1-4, using corner, bolt, cleat, and gasket details.
1. Duct Size: Maximum 30-inches wide and up to 2-inch wg pressure class.
2. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.
3. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19-inches and larger and 0.0359-inch thick or less, with more than 10 SF of nonbraced panel area unless ducts are lined.

D. Round, Spiral Lock-Seam Ducts: Fabricate supply ducts of material specified in this Section according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible.
1. Ducts up to 20-inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
2. Ducts 21- to 72-inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.
3. Ducts Larger than 72-inches in Diameter: Companion angle flanged joints per SMACNA HVAC Duct Construction Standards-Metal and Flexible, Figure 3-2.
4. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.

E. 90-Degree Tees and laterals and Conical Tees: Fabricate to comply with SMACNA's HVAC Duct Construction Standards-Metal and Flexible, with metal thicknesses specified for longitudinal-seam straight ducts.

F. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

G. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows to be 1.5 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:
1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's HVAC Duct Construction Standards-Metal and flexible, unless otherwise indicated.
2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg (minus 500 to plus 500 Pa):
    a. Ducts 3- to 36-inches in Diameter: 0.034-inch .
    b. Ducts 37- to 50-inches in Diameter: 0.040-inch.
    c. Ducts 52- to 60-inches in Diameter5: 0.052-inch.
    d. Ducts 62- to 84-inches in diameter: 0.064-inch.
3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:
    a. Ducts 3- to 26-inches in Diameter: 0.034-inch.
    b. Ducts 27- to 50-inches in Diameter: 0.040-inch.
    c. Ducts 52- to 60-inches in Diameter: 0.052-inch.
    d. Ducts 62- to 84-inches in Diameter: 0.064-inch.
4. 90-Degree, Two-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space

restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.

5. Round Elbows
   a. 8-inches and Less in Diameter: Fabricate die-formed elbows for 45 and 90-degree elbows and pleated elbows for 30, 45, 60 and 90 degrees only. Fabricate nonstandard bend-angle configurations or non-standard diameter elbows with gored construction.
   b. 9 through 14-inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60 and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
   c. Larger than 14-inches in Diameter and All Flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.
6. Die-Formed Elbows for Sizes through 8-inches in Diameter and Pressures 0.040-inch thick with two-piece welded construction.
7. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
8. Pleated Elbows for Sizes through 14-inches in Diameter and Pressures through 10-inch wg (2500 Pa): 0.022-inch.
9. Not acceptable:
   a. Corrugated or flexible metal duct.
   b. Adjustable elbows.

2.03 INSULATED FLEXIBLE DUCT

A. Construction: Standard factory fabricated product. Inner wall: Impervious vinyl or chlorinated polyethylene, permanently bonded to a vinyl or zinc-coated spring steel helix.

B. Insulation: Fiberglass blanket insulation covered by an outer wall of vinyl or fiberglass-reinforced metalized vapor barrier.

C. Listing: UL 181 listed Class 1 flexible air duct material. Overall thermal transmission: No more than 0.25 BTU/in or hr/sq. degrees F at 75 degrees F differential, per ASTM C335.

D. Vapor transmission value no more than 0.10 perm, per ASTM E96

E. Pressure Rating: 4-inch wg positive pressure and 1-inch wg negative pressure.

F. Performance Air Friction Correction Factor: 1.3 maximum at 95 percent extension. Working air velocity: Minimum 2000 FPM.

G. Flame Spread Rating: No more than 25.

H. Smoke Development Rating: No more than 50 as tested per ASTM E84.

I. Insertion Loss: Minimum attenuation of 29 DB for 10-foot straight length at 8-inch diameter at 500 Hz.

2.04 DRAIN PANS

A. Primary Drain Pans: Stainless Steel, Fabricated in accordance with ASTM A167 and A480.

B. Secondary Drain Pans: Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M FS Type B, with G90/Z275 coating.

2.05 DUCTWORK JOINT SEALERS AND SEALANTS

A. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

B. Low Emitting Materials Requirement: Adhesives, sealants and sealant primers must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168.

C. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure and leakage class of ducts.

D. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.

E. Water Based Sealant for Brush-On Application: Flexible, adhesive sealant, resistant to UV light, UL-181A, and UL-181-B listed, complying with NFPA requirements for Class 1 ducts. Min. 69 percent solids, nonflammable. Hardcast Versa-Grip 181; Childers CP-146; Foster 32-19 for SMACNA 1/2, 1, 2, 3, 4, 6, and 10-inch WG duct classes, and SMACNA Seal Class A, B, or C.

F. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use O.

G. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

H. Polyurethane Sealant: General-purpose, exterior use, non-brittle sealant for gunned application. Vulkem 616 or equal.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. General: Use the following pressure seal, and leakage class(es) in design of ductwork specified in this section unless otherwise noted on Drawings.

SYSTEM	PRESSURE CLASS (Inches of Water)	SEAL CLASS	LEAKAGE CLASS ROUND DUCTS	LEAKAGE CLASS RECTANGULAR DUCTS
Low pressure (downstream of terminal unit)	+ 1-inch	A	3	6
Return main (>24-inch)	0.5-inch more negative than return/exhaust fan pressure or -2-inch pressure class, whichever is more negative.	A	3	6
Return branch (<24-inch)	0.5-inch more negative than return/exhaust fan pressure or -2-inch pressure class, whichever is more negative.	A	3	6

General exhaust	0.5-inch more negative than return/exhaust fan pressure or -2-inch pressure class, whichever is more negative.	A	3	6

B. Ductwork Installation:

1. General: Install entire duct system in accordance with drawings, Specifications, and latest issues of local Mechanical Code, NFPA 90A, and SMACNA Duct Construction Manual. At Contractor's option, rectangular ductwork may be resized to maintain an equivalent air velocity and friction rate, while maintaining a maximum aspect ratio of 3. Remove markings and tagging from ductwork exterior surface in mechanical rooms and other locations where ductwork is exposed.
2. The duct layout shown on the Contract Drawings is diagrammatic in nature. Coordinate the ductwork routing and layout, and make alterations to the ductwork routing and layout to eliminate physical interferences. Where deviations in the ductwork routing as shown in the Contract Drawings are required, alterations may be made so as not to compromise the air flow, pressure drop, and sound characteristics of the duct fitting or duct run as shown on the Contract Drawings. In the event Architect determines that the installed ductwork is inconsistent with the above mentioned criteria, remove and replace at no additional cost to the Owner.
3. Install ducts with fewest possible joints.
4. Install fabricated fittings for changes in directions, size, shape, and for connections.
5. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12-inches, with a minimum of 3 screws in each coupling.
6. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
7. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
8. Install ducts with a clearance of 1-inch, plus allowance for insulation thickness. Allow for easy removal of ceiling tile.
9. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
10. Coordinate layout with suspended ceiling, air duct accessories, lighting layouts, and similar finish work.
11. Electrical and IT Equipment Spaces: route ducts to avoid passing through transformer vaults, electrical equipment spaces, IDF/MPOE rooms, and enclosures.
12. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2-inches.
13. Fire- and Smoke-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire, smoke or combination fire and smoke dampers as governed by Building Code and AHJ, including sleeves, and firestopping sealant.
14. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Reference SMACNA's Seismic Restraint Manual: Guidelines for Mechanical Systems,

Mason Seismic Restraint and Support Systems. Details to be provided with pre-approved OPM numbers.

15. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's Duct Cleanliness for New Construction Advanced Level.
16. Paint interiors of metal ducts, that do not have duct liner, for 24-inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible duct material.
17. Install ductwork in the location and manner shown and detailed. Review deviations required by job conditions with Architect prior to any fabrication. Provide fittings for construction per SMACNA.

C. Flanged Take-Offs:
1. Install at branch takeoffs to outlets using round or flex duct.
2. Flanged take-offs secured with minimum 8-inch screw spacing (three screws minimum).
3. Provide ductwork taps and branches off of main ducts at 45 degrees whether shown on Drawings or not (drawings are diagrammatic).

D. Cleaning:
1. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.
2. Grille and Exposed Duct Cleaning:
   a. After completion of ductwork installation, operate each fan system (excluding exhaust fans) for a minimum of 30 minutes prior to installation of ceiling grilles and diffusers. After grilles and diffusers are installed, clean out accumulation of particles from grilles and diffusers prior to acceptance.
   b. Clean exterior surface of ducts exposed to public view of chalk, pencil and pen marks, labels, sizing tags, dirt, dust, etc., so that upon completion of installation, ducts are left in clean and unblemished manufactured conditions.
   c. Exposed duct and grilles to remain free of dust entrained streaks due to leakage at joints and grille connections during warranty period. Clean leaks, seal and refinish to match existing if visible streaks develop.

3.02 DUCTWORK, JOINTS AND FITTINGS INSTALLATION

A. Duct Materials - Applied Locations:
1. General: Use the following materials in design of ductwork specified in this Section unless otherwise noted on the Drawings.

Location or Application	Material
Supply, Return, Transfer, and Exhaust - Low Pressure (downstream of terminal units)	Single Wall, Galvanized Steel

B. Ductwork Installation:
1. Fabricate radius elbows with centerline radius not less than 1-1/2 duct diameters.
2. Do not install duct size transition pitch angles which exceed 30 degrees for reductions in duct size in the direction of airflow, and 15 degrees for expansions in duct size in the direction of airflow.
3. Install fixed turning vanes in square throat rectangular elbows and in tees.
4. Fabricate duct turns with the inside (smallest) radius at least equal to the duct width (supply ducts) and 1.5 times radius (return and exhaust ducts). Where

necessary, square elbows may be used, with maximum available inside radius and with fixed turning vanes. In healthcare settings such as hospitals and medical office buildings, square elbows and turning vanes allowed on supply ductwork only.

3.03 INSULATED FLEXIBLE DUCT INSTALLATION

A. Provide sheet metal plenum or rigid elbow and connect to diffusers and grilles with ductwork connections. Refer to Drawings for more information. Provide straight section of flexible duct with minimum length of 2-feet and maximum length of 5-feet and connect to sheet metal plenums and rigid elbows connected to diffusers and grilles, unless noted otherwise.
   1. Provide round neck grilles/diffusers or square-to-round transitions. Flexible duct connections directly to diffuser and grilles is not allowed.
   2. Flexible duct allowed in concealed spaces above lay-in ceilings only.

3.04 DRAIN PANS INSTALLATION

A. Install where shown on Drawings. Drain provided by Division 22, Plumbing. Provide drain (sized per code) connection from each drain pan and pipe to nearest floor drain through trap and 10-inch air gap. Drain pans over 6-feet in length require drain connections from both ends. Pitch drain pans in direction of air flow and to drain. Support secondary drain pan independently from equipment.

3.05 DUCTWORK JOINT SEALERS AND SEALANTS INSTALLATION

A. Joints and Seam Joint Sealing:
   1. Seal duct seams and joints according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible, for duct pressure class indicated.
   2. Seal transverse joints, longitudinal seams and duct wall penetrations including screw, fastener, pipe, rod, and wire.
   3. Seal ducts before external insulation is applied.
   4. Fasteners such as sheet-metal screws, machine screws or rivets to be cadmium plated.
   5. Rectangular Ductwork: Where intermediate joint reinforcement is required for duct of negative pressure class, pre-drill stiffening flange and provide fastener maximum 8-inches on center. Where retaining flanges are welded to duct wall, paint welds with zinc coating.
   6. Single Wall Round Ductwork: Joint to incorporate beaded slip collar with minimum #8 sheet metal screws 8-inches on center. Seal ductwork as specified in this Section.
   7. Seal joints and seams. Apply sealant to make end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
   8. Double Wall Round Ductwork: Joint to incorporate beaded slip collar or flanged connection, with minimum #8 sheet metal screws 8-inches on center. Seal ductwork as specified in this Section.
   9. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
   10. Provide openings in ductwork where required to accommodate thermometers and control devices. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

11. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities as well as Code required clearances.

END OF SECTION

SECTION 23 3300

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Sheet Metal Materials
   2. Backdraft Dampers
   3. Dampers
   4. Concealed Damper Hardware
   5. Access Doors
   6. Duct Test Holes
   7. Combination Fire and Smoke Dampers
   8. Flexible Connectors

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Manufacturer's catalog data and fabrication/installation drawings for each factory fabricated duct accessory. Include leakage, pressure drop and maximum back pressure data.
   2. Shop Drawings: Indicate air duct accessories.
   3. Manufacturer's installation instructions: Provide instructions for each factory fabricated duct accessory.
   4. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
      a. See Division 01, General Requirements, Product Requirements for additional provisions.
      b. Extra Fusible Links: One of each type and size.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this Section, with minimum five years of documented experience.
   2. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

3. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.
4. AMCA 511 - Certified Ratings Program for Air Control Devices.
5. AMCA 611, latest edition - Certified Ratings Program - Product Rating Manual for Airflow Measurement Stations.
6. AMCA 610, latest edition - Laboratory Methods of Testing Airflow Measurement Stations for Performance Rating.
7. CSFM - California State Fire Marshal Listing for Fire Damper and Smoke Damper.
8. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
9. NFPA 92A - Smoke-Control Systems.
10. NFPA 92B - Smoke Control Systems in Atria, Covered Malls and Large Areas.
11. NFPA 101 - Life Safety Code.
12. UL 555 - Standard for Safety; Fire Dampers.
13. UL 555S - Standard for Safety; Leakage Rated Dampers for Use in Smoke Control Systems.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Backdraft Dampers:
1. Greenheck
2. Nailor
3. Ruskin

B. Dampers:
1. Greenheck
2. Nailor
3. Ruskin

C. Concealed Damper Hardware, Cable System:
1. Young Regulator Company
2. Or approved equivalent.

D. Access Doors:
1. Ductmate
2. Ruskin
3. Nailor
4. Outdoor Installation: Karp MX insulated exterior access door.

E. Duct Test Holes:
1. Ventlok
2. Or approved equivalent.

F. Combination Fire and Smoke Dampers:
1. Ruskin
2. Greenheck
3. Nailor
4. Pottorff

G. Flexible Connectors:

1. Duro Dyne Corp.
2. Ventfabrics Inc.
3. Ward Industries

2.02 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M. Galvanizing: 1-1/4 ounces per square foot total both sides; ducts to have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36-inches or less; 3/8-inch minimum diameter for lengths longer than 36-inches.

2.03 BACKDRAFT DAMPERS

A. Basis-of-Design: Ruskin CB D6.

B. Description: Multiple-blade gravity balanced with center pivoted blades with sealed edges, assembled in rattle free manner with 90-degree stop, adjustment device to permit setting for varying differential static pressure.

C. Frame: 0.125-inch thick 6063-T5 extruded aluminum channel with galvanized steel braces at mitered corners. Provide mounting flange.

D. Blades: Single piece, overlap frame, parallel action, horizontal orientation, minimum 0.07-inch 6063-T5 extruded aluminum material, maximum 6-inch width.

E. Bearings: Corrosion-resistant synthetic, formed as single piece with axles.

F. Blade Seals: Extruded vinyl, mechanically attached to blade edge.

G. Blade Axles: Corrosion-resistant, synthetic formed as single piece with bearings, locked to blade.

H. Tie Bars and Brackets: Galvanized steel.

I. Return Spring: Adjustable tension.

J. Damper Capacity:
1. Closed Position: Maximum back pressure of 16-inches water gauge.
2. Open Position: Maximum air velocity of 2,500-feet per minute.

K. Counterbalances: Adjustable zinc plated steel weights mechanically attached to blade. Must be capable of operating over wide range of pressures.

L. Finish: Mill aluminum.

M. Temperature Rating: -40 degrees F to 200 degrees F.

N. Operation of Blade:

1. Start to Open: 0.01-inch wg
2. Fully Open: 0.05-inch.

O. Pressure Drop: Maximum 0.15-inch wg at 1,500-feet per minute through 24-inch by 24-inch damper.

P. Factory Sleeve: Minimum 20 gauge thickness, 12-inches in length.

Q. Screen: At outdoor intake or discharge. 1/4-inch aluminum.

2.04 DAMPERS

A. Basis-of-Design: Ruskin MD 35.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
1. Pressure Classes of 3-Inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

C. Rectangular Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design with linkage concealed in frame and suitable for horizontal or vertical applications.
1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum 16 gauge thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
   a. Roll-Formed Steel Blades: 16 gauge thick, galvanized sheet steel.
   b. Aluminum Frames: Hat-shaped, 10 gauge thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
   c. Roll-Formed Aluminum Blades: 10 gauge thick aluminum sheet.
   d. Extruded-Aluminum Blades: 16 gauge thick extruded aluminum.
   e. Blade Axles: Minimum 1/2-inch diameter, plated steel, hex shaped, mechanically attached to blade.
   f. Bearings: Molded synthetic sleeve, turning in extruded hole in frame.
   g. Tie Bars and Brackets: Galvanized steel.
   h. Mill galvanized.
   i. Capacity:
      1) Closed Position: Maximum pressure of 3-inches wg.
      2) Open Position: Maximum air velocity of 1,500-feet per minute across 24-inch by 24-inch damper.

D. Round Volume Dampers: Single-blade suitable for horizontal or vertical applications.
1. Steel Frames: Galvanized, roll formed, minimum of 20 gauge thick with beads at each end.
2. Blades: Minimum 20 gauge thick, galvanized sheet steel, round, single-piece.
3. Aluminum Frames: Minimum 10 gauge thick aluminum sheet.
4. Aluminum Blades: Minimum 10 gauge thick aluminum sheet.
5. Extruded-Aluminum Blades: Minimum 16 gauge thick extruded aluminum.
6. Blade Axles: Minimum 3/8-inch square, plated steel, mechanically attached to blade.
7. Bearings: Molded synthetic sleeve, turning in hole in frame.
8. Finish: Mill galvanized.
9. Capacity:
   a. Closed Position: Maximum pressure of 3-inches wg

b. Open Position: Maximum air velocity of 1,500-feet per minute.

10. Leakage: Maximum 40 cfm at 1-inch wg for 20-inches diameter damper.
11. Pressure Drop: Maximum 0.02-inch wg at 1,500-feet per minute through 20-inch diameter dampers.

E. Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
   1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.
   2. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include 2-inch elevated platform for insulated duct mounting.

2.05 CONCEALED DAMPER HARDWARE

A. Concealed Damper Hardware: For dampers above non-removable ceilings (gyp, plaster, decorative, etc.) where access panels have not been shown on Architectural drawings or in locations where dampers are more than 2-feet above the ceiling, provide:
   1. Concealed Damper Regulator: Young Regulator Company Model 315 or approved equivalent.
   2. Cable System: Young Regulator Company or approved equivalent.
   3. Controller: Young Regulator Company 270-275 or approved equivalent.
   4. Control wrenches, wire stops, casing nuts, and stainless steel wire.
   5. Paint cover plate to match ceiling color or as directed by Architect.

2.06 ACCESS DOORS

A. Duct Pressure Class 2-inch WC and Greater: Sandwich-type design with threaded locking bolt assembly. Closed cell neoprene gasket permanently bonded to inside panel. Zinc-coated steel wing nuts or polypropylene molded knobs with threaded metal inserts - zinc coated bolts sealed to inner panel.

B. Duct Pressure Class 1-1/2-inch WC and Less: Galvanized steel assembly incorporating frame, door, hinges, and latch(es). Frame tabbed for attachment to duct panel. Double wall door panel with 1-inch insulation. Open cell neoprene gasket attached to frame. Cam latches for tight closure.

C. Plenum Doors: Extruded aluminum frames with extruded santoprene seals. Double-wall 20 gauge galvanized steel door panel with fiberglass insulation.

D. Size: Maximum size available to fit rectangular duct panel dimension or round duct diameter. Plenum doors minimum 2-feet wide by 4-feet high.

E. For outdoor installation, only provide waterproof access doors installed vertically.

2.07 DUCT TEST HOLES

A. Temporary Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

2.08 COMBINATION FIRE AND SMOKE DAMPERS

A. Basis-of-Design:
   1. Ruskin Model FSD25R, Leakage Class 1, 1-1/2 hour rated, for round ductwork up to 24-inch diameter.

2. Ruskin Model FSD60, Leakage Class I, 1-1/2 hour rated, for rectangular ducts or round ductwork larger than 24-inch diameter. Provide duct transition between round and rectangular connections. Pressure drop of a 24-inch by 24-inch damper at 1,000 and 2,000 fpm face velocity shall not exceed 0.03 and 0.16 in-wc., respectively.
3. - C, for use in tunnel corridor applications.
4. - FA, front access models.
5. - SS, Stainless Steel Models for use in stainless steel ductwork.
6. - M, modulating.
7. - VALR, for use in validated systems.
8. - XP, for use in explosion proof applications.
9. - 3, for use in 3-hour rated assemblies.

B. Ratings:
1. Fire Resistance: UL 555 classified and provide combination fire and smoke dampers with UL label for fire rating as appropriate for construction rating and in conformance with NFPA 90A.
2. Smoke Rating: Leakage Class Smoke Damper in accordance with UL555S. Leakage class at 4-inch wg
3. Elevated Temperature Rating: 250 degrees F.
4. Air Flow Rating: 2,000 feet per minute.
5. Differential Pressure Rating: 4-inch wg.

C. Construction:
1. Frame: 16 gauge roll formed, galvanized steel hat-shaped channel, reinforced at corners. Structurally equivalent to 13 gauge U-channel type frame.
2. Blades (Leakage Class II):
   a. Style: Single skin with 3 longitudinal grooves.
   b. Action: Opposed.
   c. Material: Minimum 16 gauge galvanized steel.
   d. Width: Maximum 6-inches.
3. Bearings: Self-lubricating stainless steel sleeve type, turning in extruded hole in frame.
4. Seals:
   a. Blade: Inflatable silicone fiberglass material to maintain smoke leakage rating to a minimum of 450 degrees F and galvanized steel for flame seal to 1,900 degrees F. Mechanically attached to blade edge (glue-on or grip type seals are not acceptable).
   b. Jamb: Stainless steel, flexible metal compression type.
5. Linkage: Concealed in frame.
6. Axles: Minimum 1/2-inch diameter plated steel, hex-shaped, mechanically attached to blade.
7. Mounting: Vertical or Horizontal, based on application.
8. Temperature Release Device: Heat actuated, Quick Detect.
   a. Close (in a controlled manner) and lock damper during test, smoke detection, power failure, or fire conditions through actuator closure spring. Actuator, at no time, to disengage from damper blades.
   b. Allow damper to be automatically and remotely reset after test or power failure conditions. After exposure to high temperature or fire, inspect damper before reset to ensure proper operation.
   c. Controlled closing and locking of damper in 7 to 15 seconds to allow duct pressure to equalize. Instantaneous closure is not acceptable.
9. Release Temperature: 165 degrees F.
10. Actuator: Electric, two-position, fail close.
11. Finish: Mill galvanized for installation in galvanized sheet metal and Type 304 stainless steel for installation in stainless steel ductwork.

12. Indicator or Auxiliary Switch Packages: Two position indicator switches linked directly to damper blade to remotely indicate damper blade position.

D. Factory mounting angles.

E. Factory Sleeve:
1. Minimum 20 gauge thickness.
   a. Silicone caulk factory applied to sleeve at damper frame to comply with leakage rating requirements.
   b. Factory breakaway connections.
   c. Factory Tests: Factory cycle damper and actuator assembly to assure proper operation.

2.09 FLEXIBLE CONNECTORS

A. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Metal-Edged Connectors: Factory fabricated with a fabric strip 4-inches wide attached to two strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Select metal compatible with ducts.

C. Provide a spring and bracket assembly to reinforce the fabric with sufficient tension to prevent connector collapse under negative or positive pressure. Number and positioning of spring-link fixture to be determined by the manufacturer to maintain straight axis and without kinks between two sections of duct, or between duct and the moving element. Hardcast Spring-Link SL-200, or equal.

D. Indoor System, Flexible Connector Fabric (FC-I): Glass fabric double coated with neoprene.
1. Minimum Weight: 26 ounces per square yard.
2. Tensile Strength: 480 pounds of force per in the warp and 360 pounds of force per inch in the filling.
3. Service Temperature: -40 degrees F to 200 degrees F.

PART 3 - EXECUTION

3.01 DUCT ACCESSORIES GENERAL INSTALLATION

A. Inspect areas to receive air duct accessories. Notify Engineer of conditions that would adversely affect the installation of the dampers. Do not proceed until conditions are corrected.

B. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.

C. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

D. Do not compress or stretch damper frames into duct or opening.

E. Handle dampers using sleeve or frame. Do not lift dampers using blades, actuators, or jack shafts.

F. Adjust duct accessories for proper settings.

3.02 SHEET METAL MATERIALS INSTALLATION

A. Install bracing for multiple sections to support assembly weights and hold against system pressure. Install bracing as needed.

3.03 BACKDRAFT DAMPERS INSTALLATION

A. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated. Provide at outside air intakes where motorized dampers are not shown on drawings.

3.04 DAMPERS INSTALLATION

A. Where installing volume dampers in ducts with liner, avoid damage to and erosion of duct liner.

B. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts for air balancing. Install at a minimum of two duct widths from each branch takeoff. Provide balancing dampers for all air inlets and outlets.

C. Install dampers square and free from racking with blade running horizontally.

3.05 CONCEALED DAMPER HARDWARE INSTALLATION

A. Coordinate location in Reflected Ceiling Plan and color of concealed damper hardware with Architect prior to installation.

3.06 ACCESS DOORS INSTALLATION

A. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
   1. On both sides of duct coils.
   2. Downstream from volume dampers, turning vanes and equipment.
   3. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
   4. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot (15-m) spacing.
   5. Install the following sizes for duct-mounting, rectangular access doors:
      a. One-Hand or Inspection Access: 8-inches by 5-inches.
      b. Two-Hand Access: 12-inches by 6-inches.
      c. Head and Hand Access: 18-inches by 10-inches.
      d. Head and Shoulders Access: 21-inches by 14-inches.
      e. Body Access: 25-inches by 14-inches.
      f. Body Plus Ladder Access: 25-inches by 17-inches.
   6. Install the following sizes for duct-mounting, round access doors:
      a. One-Hand or Inspection Access: 8-inches in diameter.
      b. Two-Hand Access: 10-inches in diameter.
      c. Head and Hand Access: 12-inches in diameter.
      d. Head and Shoulders Access: 18-inches in diameter.
      e. Body Access: 24-inches in diameter.
   7. Label access doors.

3.07 DUCT TEST HOLES INSTALLATION

A. Provide test holes at fan inlets and outlets where indicated and where required for air testing and balancing.

3.08 COMBINATION FIRE AND SMOKE DAMPERS INSTALLATION

A. Verify that electric power is available and of correct characteristics.

B. Coordinate combination fire and smoke dampers with fire alarm system.

C. Install combination fire and smoke dampers, with fusible links, and in accordance with manufacturer's UL-approved written instructions.

D. Adjust fire and smoke dampers for proper action.

3.09 FLEXIBLE CONNECTORS INSTALLATION

A. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators. Provide sheet metal weather cover over flexible connections located outdoors. Attach sheet metal to either equipment side or ductwork side, but not both.

B. Per NFPA, do not use flexible connectors on grease exhaust fans.

C. Securely attach spring-lock brackets to the metal strips of the connector collar using No. 8 sheet metal screws.

D. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

E. Adjust the following types in the following locations:
   1. FC-I: Indoors.

END OF SECTION

SECTION 23 3700

AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Grilles, Registers, Diffusers
   2. Louvers

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
   2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
   3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size and accessories furnished.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Air Distribution Diffuser, Register, and Grille Schedule lists Basis of Design, with any specialty accessories, construction, finish or other criteria noted on schedule. Submitted air distribution must match criteria of Basis of Design:
      a. Construction materials and appearance.
      b. Frame/installation method.
      c. Isothermal throw plus or minus 5 percent at design flows shown on drawings.
      d. Noise Criteria: NC value plus or minus 1 at design flows shown on drawings.
      e. Accessories: Equal to Basis of Design.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23, HVAC sections, where more than a single type is specified for the application, provide single selection for each product category.

B. Grilles, Registers, Diffusers:
1. Anemostat
2. Carnes
3. Environmental Air Products
4. Kruger
5. Metalaire
6. Nailor
7. Price Co.
8. Shoemaker
9. Titus
10. Tuttle & Bailey
11. Seiho
12. Or approved equivalent.

C. Louvers:
1. Ruskin Manufacturing
2. Pottorff
3. Carnes
4. Cesco
5. Greenheck
6. Or approved equivalent.

2.02 GRILLES, REGISTERS, DIFFUSERS

A. Diffuser, Register and Grille Schedule lists Basis of Design, with specialty accessories, construction, finish or other criteria noted on schedule. Submitted air distribution must match criteria of Basis of Design, including accessories and finish:
1. Matching construction materials and appearance. Equal installation method/frame.
2. Pressure drop equal to or less than Basis of Design at CFM on Drawings.
3. Throw: Isothermal jet throw plus or minus 5 percent of Basis of Design at CFM listed on Drawings.
4. Noise Criteria: Plus or minus 1 NC of Basis of Design at CFM listed on Drawings. If Basis of Design NC is below registered level, submitted must match. NC rating with 10 dB room factor or less.

B. Provide 1-, 2-, 3-, or 4-way deflection as indicated on Drawings.

C. Provide pattern controllers for linear supply air diffusers.

D. Register Dampers: Dampers utilized with grilles. Opposed blade dampers utilizing a side operated worm drive which provides external duct operation. Slot the end of the shaft to receive a screwdriver. Factory assembled side operator. Construct of the same material as the grille. Manufacturer same as grilles/diffuser.

E. Coordinate mounting frames with ceiling construction type. Verify per reflected ceiling plans.

2.03 LOUVERS

A. General: Frame and sill styles compatible with adjacent substrate, specifically manufactured to fit into construction openings with accurate fit and adequate support for weatherproof installation. Reference Drawings and Specifications for types of substrate which will contain each type of louver. Construct of aluminum extrusions, ASTM B221, Alloy 6063-T5. Weld units or use stainless steel fasteners. On inside face of exterior louvers, provide anodized aluminum wire bird screen mounted in removable extruded aluminum frames. AMCA licensed performance ratings.

B. Blades set 3 to 5-inches on center, 37.5 degree angle with rain hook on blade, minimum blade thickness 0.080-inch, drainable blade style. Minimum 57 percent free area for 48-by 48-inch unit. Maximum water penetration 0.01 ounce water psf free area at 1000 FPM. Maximum intake pressure drop of 0.10-inch wg at 750 FPM free velocity. Provide downspouts in jambs, designed to drain water from louver for minimum water cascade from blade to blade. Provide drain gutter in head frame and each blade.

C. Reference Drawings for free area required.

D. Provide access door in duct to clean birdscreen.

E. Finish: Factory Kynar 500 fluoropolymer spray finish; color to be selected by Architect. Conform to AAMA 605.2. Apply coating following cleaning, and pretreatment. Dry louvers before final finish application. 1.2 mils total dry film thickness when baked at 450 degrees F for ten minutes.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Install in accordance with manufacturer's instructions. Provide seismic supports, clips, and bracing per local code. Coordinate installation of framing. Provide complete coverage of rough openings by integral device flanges or auxiliary frames. Where above ceiling location is unconditioned space, caulk rough openings; repair and re-paint locations where dust entrainment streaks develop due to unsealed openings.

B. Damp locations, such as lockers, restrooms, showers, natatoriums, whirlpool/spas, to have aluminum construction even if scheduled otherwise; mounting hardware to be stainless steel.

C. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

D. Unless otherwise shown on drawings, for ceiling mounted air outlets with adjustable airflow pattern controllers mounted at a height of 12 feet or less, adjust the air outlets for horizontal air distribution, and adjust to vertical air distribution for ceiling height above 12 feet.

E. Exterior color of grilles per Architect. White finish if not otherwise scheduled or noted by Architect. Paint ductwork visible behind air outlets and inlets matte black.

F. Ceiling Membrane: Protect ceiling membrane per code. Fire caulk around openings. Provide listed radiation damper in rated roof/ceiling or floor/ceiling assemblies as required per code.

G. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

3.02 GRILLES, REGISTERS AND DIFFUSERS INSTALLATION

A. Coordinate with Architectural Reflected Ceiling Plan(s).

B. Install diffusers to ductwork with air tight connection. 18-inch straight duct section or acoustic plenum at connection. Provide square to round adapters where required for connection to round ducts.

C. Provide integral balancing dampers for diffusers, and grilles and registers where duct manual balancing dampers are not shown or specified.

D. Linear Slot Diffusers:
   1. Coordinate connection plenum dimensions with linear slot final dimensions to conform with manufacturer's recommendations, or as indicated. Total and active lengths as noted on drawings. Blank off unused sections. Coordinate frame type with Architect.
   2. Paint surfaces visible behind air outlets and inlets, including blank-off sections, matte black unless otherwise called for on drawings.

END OF SECTION

SECTION 23 4000

HVAC AIR CLEANING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Disposable Panel Filters
   2. Medium Efficiency Pleated Filters
   3. High Efficiency Pleated Filters
   4. Filter Gauges

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Division 01, General Requirements, Temporary Facilities and Controls: Filters for temporary heating and ventilating.
   2. Division 26, Electrical, Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. ANSI/AHRI 850 I-P - Performance Rating of Commercial and Industrial Air Filter Equipment.
   2. ASHRAE Std 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
   3. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
   4. Standard 52.2 - Method of testing general ventilation air-cleaning devices for removal efficiency by particle size.
   5. MIL-STD-282 - Filter Units, Protective Clothing, Gas-Mask Components, and Related Products: Performance-Test Methods; Military Specifications and Standards.
   6. UL 586 - High Efficiency, Particulate, Air Filter Units; Underwriters Laboratories Inc.
   7. UL 867 - Electrostatic Air Cleaners; Underwriters Laboratories Inc.
   8. UL 900 - Standard for Air Filter Units; Underwriters Laboratories Inc.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.
2. Shop Drawings: Indicate filter assembly and filter frames, dimensions, motor locations, and electrical characteristics and connection requirements.
3. Samples: Submit two samples of replacement filter media of each type and each filter frame.
4. Manufacturer's Installation Instructions: Indicate assembly and change-out procedures.
5. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.
6. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    a. See Division 01, General Requirements for additional provisions.
    b. Extra Filters: One set of each type and size.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
1. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 PERFORMANCE REQUIREMENTS

A. Conform to ANSI/AHRI 850 I-P - Performance Rating of Commercial and Industrial Air Filter Equipment, Section 7.4.
1. Dust Spot Efficiency: Plus or minus 5 percent.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Filters:
1. American Filtration Inc.
2. AAF International/American Air Filter
3. Camfil Farr Company
4. Eco-Air Products
5. Filtration Group
6. Flanders Corporation
7. Or approved equivalent.

B. Filter Gauges:
1. Dwyer Instruments
2. H.O. Treric Co.
3. Weiss Instruments
4. Or approved equivalent.

2.02 DISPOSABLE PANEL FILTERS

A. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.
   1. Nominal Size: 12 x 24-inches.
   2. Thickness: 1-inch.

B. Performance Rating:
   1. Face Velocity: 500 FPM.
   2. Face Velocity: 350 FPM (2.54 m/sec).
   3. Initial Resistance: 0.15-inch WG.
   4. Initial Resistance: 0.23-inch WG (37 Pa).
   5. Recommended Final Resistance: 0.50-inches WG.
   6. MERV Rating: 6.

C. Casing: Cardboard frame.

D. Holding Frames: 20 gauge minimum galvanized steel frame with expanded metal grid on outlet side and steel rod grid on inlet side, hinged with pull and retaining handles.

2.03 MEDIUM EFFICIENCY PLEATED FILTERS

A. Media: Blend of cotton and polyester fiber, pleated, support grid, enclosing frame, UL 900.
   1. Thickness 2-inch.

B. Performance Rating per ASHRAE Standard 52.2:
   1. MERV 7.
   2. Dust Spot Efficiency: 25 to 30 percent.
   3. Face Velocity: 500 FPM.
   4. Initial Resistance: 0.30-inch WG.
   5. Recommended Final Resistance: 0.90-inches WG.

C. Frame: Provide galvanized steel frame, including support hardware with air tight seal around frame, upstream servicing.

2.04 HIGH EFFICIENCY PLEATED FILTERS

A. Media: Microfine glass fiber laminated to reinforcing backing, pleated, support grid, mechanically and chemically bonded to enclosing frame, UL Class 1.
   1. Thickness: 12-inch.

B. Performance Rating per ASHRAE Standard 52.1 and Standard 52.2:
   1. MERV 9.
   2. Dust Spot Efficiency: 40 to 45 percent.
   3. Face Velocity: 500 FPM.
   4. Initial Resistance: 0.25 inch WG.
   5. Recommended Final Resistance: 1.50-inches WG.

C. Frame: Provide galvanized steel frame, including support hardware with air tight seal around frame, upstream servicing.

2.05 FILTER GAUGES

A. Direct Reading Dial: 3-1/2-inch diameter diaphragm actuated dial in metal case, vent valves, black figures on white background, front recalibration adjustment, range 0-0.5-inch WG, 2 percent of full scale accuracy.

B. Direct Reading Dial: 2-inch diameter diaphragm actuated dial in metal case, vent valves, black figures on white background, front recalibration adjustment, range 2.0-inch WG, 3 percent of full scale accuracy.

C. Inclined Manometer: One piece molded plastic with epoxy coated aluminum scale, inclined-vertical indicating tube and built-in spirit level, range 0-3-inch WG, 3 percent of full scale accuracy.

D. Accessories: Static pressure tips with integral compression fittings, 1/4-inch aluminum tubing, 2-way or 3-way vent valves.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install air cleaning devices in accordance with manufacturer's instructions.

B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.

C. Provide and install filter gauge static pressure tips upstream and downstream of filters. Mount filter gauges on outside of filter housing or filter plenum, in accessible position/location. Adjust and level.

D. Operation During Construction: If air handlers are operated during construction, provide treated 2-inch media construction filter in front of prefilters and replace periodically to prevent dirt carryover. Install clean prefilters prior to air balancing.

E. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

F. Provide filter gauges on filter banks, installed with separate static pressure tips upstream and downstream of filters.

3.02 SCHEDULES

A. Air Filter Schedule

B. Drawing Code

C. Location

D. Type

E. Number

F. Size

G. Air Flow

H. Face Velocity

I. Overall Height

J. Overall Width

K. Initial Resistance

L. Final Resistance

END OF SECTION

SECTION 23 6201

VARIABLE REFRIGERANT FLOW_VOLUME (VRF_VRV) SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Outdoor Unit (Non-Heat Recovery)
   2. Indoor Unit - Ceiling Concealed Ducted (High Static)
   3. Controls for VRV Systems

B. Variable capacity, heat pump air conditioning system.

C. System consists of an outdoor unit, branch circuit terminal or branch selector units, multiple indoor fan units and PID DDC (Direct Digital Controls). Each indoor unit or group of indoor units capable of operating in any mode independently of other indoor units or groups. System capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. Each indoor unit or group of indoor units independently controlled. Sum of connected capacity of indoor air handlers range from 50 percent to 130 percent of outdoor rated capacity.

D. Variable capacity heat pump system (non-heat recovery) system consist of outdoor unit, multiple indoor units and PID DDC (Direct Digital Controls). Sum of connected capacity of indoor air handlers range from 50 percent to 130 percent of outdoor rated capacity. Heating mode or cooling mode/no simultaneous operation.

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Facility manufacturing registered to ISO 9001 and ISO 14001.
   2. Full charge of R-410A provided in condensing unit from factory.
   3. Units to be listed by Electrical Laboratories (ETL) and bear the ETL label.
   4. Wiring in accordance with the National Electric Code (NEC).
   5. The system will bear the Energy Star label.
   6. The installing contractor to receive instruction and training from the equipment manufacturer prior to installation. Instruction to cover manufacturer's

recommended methods for piping, wiring, leak testing, etc. Documentation of the training is to be provided to the Architect for review.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Five year warranty on compressor(s).

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Daikin (latest series).

B. Mitsubishi (latest series).

C. LG (latest series).

2.02 OUTDOOR UNIT (NON-HEAT RECOVERY)

A. General:
   1. Outdoor unit with manufacturer components. Multiple circuit boards that interface to controls system to perform functions necessary for operation. Factory assembled, piped, wired and run tested.
   2. Outdoor unit will have a sound rating no higher than 60 dB(A) individually or 65 dB(A) twinned. Units to have a sound rating no higher than 50 dB(A) individually or 55 dB(A) twinned while in night mode operation.
   3. Refrigerant lines from outdoor unit to indoor units insulated.
   4. Outdoor unit have an accumulator with refrigerant level sensors and controls.
   5. Outdoor unit have a high pressure safety switch, over-current protection and DC bus protection.
   6. Heating mode operation down to minus 0 degrees F ambient temperature or cooling mode down to 23 degrees F ambient temperature, without additional low ambient controls.
   7. High efficiency oil separator plus additional logic controls to maintain adequate oil volume in compressor.
   8. The system will automatically restart operation after a power failure and will not cause any settings to be lost. System not to require re-programming in the event of power failure.
   9. The outdoor unit to be modular in design and to allow for side-by-side installation following manufacturer's recommended clearances.

B. Unit Cabinet:
   1. Casings to be completely weatherproof and fabricated of galvanized steel, bonderized and finished. withstand 960 hours per ASTM B117 criteria for seacoast protected models.

C. Fan:
   1. Direct drive, variable speed propeller type fan.
   2. Fan motor inherent protection, permanently lubricated bearings, and completely variable speed operation via a DC inverter.

3. Fan factory set for operation under 0-inch WG external static pressure, but capable of normal operation under a maximum of 0.24-inch WG external static pressure via dipswitch.
4. Fan motor mounted for quiet operation.
5. Raised guard to prevent contact with moving parts.
6. Outdoor unit to have vertical discharge airflow.

D. Refrigerant:
1. R410A refrigerant.

E. Outdoor Coil:
1. Nonferrous construction with lanced or corrugated plate fins on copper tubing.
2. Factory applied corrosion resistant finish.
3. Integral metal coil guard.
4. Inverter driven compressor refrigerant flow control.

F. Compressor:
1. Inverter driven scroll hermetic compressor.
2. Crankcase heater.
3. Outdoor unit compressor have inverter to modulate capacity. Variable capacity turndown of 18-4 percent of rated capacity, depending upon unit size.
4. Internal thermal overload.
5. The compressor(s) to be mounted on rubber-in-shear isolators to avoid the transmission of vibration.

G. Electrical:
1. The power supply to the outdoor unit to be as scheduled on the drawings.
2. The control voltage between the indoor and outdoor unit to be 16 VDC or 24 VDC non-shielded 2 conductor cable.
3. The control wiring to be a two-wire multiplex transmission system, connecting multiple indoor units to one outdoor unit with a single 2-cable wire.

2.03 INDOOR UNIT - CEILING CONCEALED DUCTED (HIGH STATIC)

A. General:
1. Ceiling-concealed, ducted indoor fan coil with fixed rear return and a horizontal discharge supply. Modulating linear expansion device. External static pressure settings up to 0.6-inch WC.
2. Factory assembled, wired and run tested. Factory wiring, piping electronic modulating linear expansion device, control circuit board and fan motor. Self-diagnostic function, 3-minute time delay mechanism, and auto restart function.
3. Indoor unit and refrigerant pipes precharged with dehydrated air before shipment from factory.

B. Unit Cabinet:
1. Ceiling-concealed, ducted.
2. Provisions for field installed, filtered, outside air intake.

C. Fan:
1. One or two fans direct driven by single motor.
2. Statically and dynamically balanced, motor with permanently lubricated bearings.
3. Minimum of two speed settings.
4. Fan motor to be thermally protected.

D. Filter:

1. Field-supplied return air filter.

E. Evaporator Coil:
1. Nonferrous construction with smooth plate fins on copper tubing with inner grooves for high efficiency heat exchange.
2. Brazed tube joints with phos-copper or silver alloy.
3. Pressure tested at factory.
4. Condensate pan and drain under coil. Provide with integral condensate pump.
5. Condensate gravity drained from fan coil, with available factory condensate pump.

F. Controls:
1. The unit to have PID controls provided by manufacturer to perform input functions necessary to operate the system. No third party building management system to be required, however, VRV/VRF system to be capable of communicating with third party BMS.
2. The unit to be compatible with interfacing with connection to BACnet networks.

2.04 CONTROLS FOR VRV SYSTEMS

A. General:
1. Provide devices required for fully operating system including but not limited to: Remote controllers, schedule timers, system controllers, centralized controllers, integrated web based interface, graphical user workstation, and system integration to Building Management Systems via protocol established in 23 09 00, Instrumentation and Control Performance Specifications.
2. General Electrical: 24 VDC controller power and communications via common, non-polar communications bus: Main system controller capable of being networked with other system controllers for web based control.
3. Wiring type: Wiring 2-conductor (16 AWG), twisted shielded pair, and stranded wire.
4. Install controls in accordance with 23 09 00, Instrumentation and Control Performance Specifications.

B. Controls Network:
1. Controls Network consists of remote controllers, schedule timers, system controllers, centralized controllers, and integrated web based interface communicating over high-speed communication bus. Controls network support operation monitoring, scheduling, error email distribution, personal browsers, tenant billing, online maintenance support, and integration with Building Management Systems. Provide interfaces to support communication protocols specified in Section 23 09 00.
2. Simple Remote Controller: Simple Remote Controller capable of controlling up to a minimum of 12 indoor units (defined as 1 group). Controller supports temperature display selection of Fahrenheit or Celsius. Controller will allow user to change on/off, mode (cool, heat, auto, dry, and fan), temperature setting, and fan speed setting. Controller able to limit set temperature range from Simple remote controller. Room temperature sensed at either Controller or Indoor Unit dependent on indoor unit dipswitch setting. Controller will display a four-digit error code in event of system abnormality/error.

C. System Integration
1. Control system capable of supporting integration with Building Management Systems (BMS) using protocol specified in Section 23 09 00.
2. Operation and monitoring points include, but are not limited to:
a. ON/OFF (setting).

b. ON/OFF (status).
c. Alarm Sign.
d. Error Code.
e. Operation Mode (setting).
f. Operation Mode (status).
g. Fan Speed (setting).
h. Fan Speed (status).
i. Measured Room Temperature.
j. Set Room Temperature.
k. Filter Limit Sign.
l. Filter Limit Sign Reset.
m. Remote Control Operation (ON/OFF).
n. Remote Control Operation (Operation Mode).
o. Remote Control Operation (Set Temperature).
p. Electrical Total Power.
q. Communication Status.
r. System Forced OFF.
s. Forced Thermostat OFF (setting).
t. Forced Thermostat OFF (status).
u. Compressor Status.
v. Indoor Fan Status.
w. Heater Operation Status.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. General:
1. Install all refrigerant piping and condensate tubing concealed inside wall at all wall mounted units.

B. Insulation:
1. Insulate refrigerant piping, condensate drains, drip pans, and other associated appurtenances.

C. Controls:
1. Wiring: Control wiring install in a system daisy chain configuration per manufacturer's installation instructions.
2. Control wiring for schedule timers, system controllers, and centralized controllers installed in a daisy chain configuration per manufacturer's installation instructions.
3. Control wiring for remote controllers from remote controller to first associated indoor unit then to remaining associate indoor units in a daisy chain configuration per manufacturer's installation instructions.

D. Indoor Units:
1. Connect refrigerant piping to unit, run piping so as not to interfere with access to unit. Install furnished field mounted accessories. Install per manufacturer's requirements and provide accumulator when required due to length of refrigerant piping. Install rigid, level and plumb.
2. Where manufacturer's standard condensate pump does not provide adequate lift, provide condensate pump that will meet lift requirements. Confirm unit shutdown upon failure of condensate pump.
3. Provide vibration isolation as indicated on drawings.
4. Provide condensate drainage from indoor units and branch selection devices. Provide secondary overflow pans and piping to observable location as required for concealed units.

E. Cleaning:
   1. Prior to acceptance, thoroughly clean equipment, remove shipping labels and traces of foreign substance. Touch up with factory matching paint on scratched surfaces.

F. Start-Up:
   1. Factory certified service representative to supervise start-up in accordance with manufacturer's instructions.
   2. Make final adjustments to assure proper operation of load system. Demonstrate final set up and programming to Owner.
   3. Test units in modes of operation and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

3.02 OUTDOOR UNIT (NON-HEAT RECOVERY)

A. Connect refrigerant piping to unit, run piping so as not to interfere with access to unit. Install furnished field mounted accessories. Install per manufacturer's requirements and provide accumulator when required due to length of refrigerant piping. Install rigid, level and plumb.

B. Install per manufacturer's written instructions and requirements.

3.03 INDOOR UNIT - CEILING CONCEALED DUCTED (HIGH STATIC)

A. Indoor Units:
   1. Connect refrigerant piping to unit, run piping so as not to interfere with access to unit. Install furnished field mounted accessories. Install per manufacturer's requirements and provide accumulator when required due to length of refrigerant piping. Install rigid, level and plumb.
   2. Where manufacturer's standard condensate pump does not provide adequate lift, provide condensate pump that will meet lift requirements. Confirm unit shutdown upon failure of condensate pump.
   3. Provide vibration isolation as indicated on drawings.
   4. Provide condensate drainage from indoor units and branch selection devices. Provide secondary overflow pans and piping to observable location as required for concealed units.

B. Install per manufacturer's written instructions and requirements.

3.04 CONTROLS FOR VRV SYSTEMS

A. Sequence of Operation
   1. Occupied Mode Operation: Indoor fan coil units operate to maintain space temperature set point. Enable associated energy recovery ventilators.
   2. Unoccupied Mode Operation: Indoor fan coil units operate to maintain unoccupied space temperature set point. Disable associated energy recovery ventilators.

END OF SECTION

SECTION 26 0000

ELECTRICAL BASIC REQUIREMENTS

PART 1 - GENERAL

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide like items from one manufacturer.

2.2 MATERIALS

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL approved or have adequate approval or be acceptable by state, county, and city authorities. Equipment/fixture supplier is responsible for obtaining State, County, and City acceptance on equipment/fixtures that are not UL approved or are not listed for installation.

B. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer.

C. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

D. Hazardous Materials:
1. Comply with local, State of California, and Federal regulations relating to hazardous materials.
2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

2.3 ACCESS PANELS

A. See Division 01, General Requirements and Division 08, Openings for products and installation requirements.

B. Confirm Access Panel requirements in Division 01, General Requirements, Division 08, Openings and individual Division 26, Electrical Sections. In the absence of specific requirements, comply with the following:
1. Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly.
   a. Ceiling access panels to be minimum of 24-inch by 24-inch.
   b. Wall access panels to be minimum of 12-inch by 12-inch.
   c. Provide screwdriver operated catch.
   d. Manufacturers and Models:
      1) Drywall: Karp KDW.

2) Plaster: Karp DSC-214PL.
3) Masonry: Karp DSC-214M.
4) 2 hour rated: Karp KPF-350FR.
5) Manufacturers: Milcor, Elmdor, Acudor, or approved equivalent.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Install equipment requiring access (i.e., junction boxes, light fixtures, power supplies, motors, etc.) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in passageways, doorways, scuttles or crawlspaces which would impede or block the intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.

D. Earthwork:
1. Confirm Earthwork requirements in Contract Documents. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork Sections. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E. Firestopping:
1. Confirm requirements in Division 07, Thermal and Moisture Protection. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F. Plenums:
1. In plenums, provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

G. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

H. Provide miscellaneous supports/metals required for installation of equipment and conduit.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 26 Electrical Sections.

B. General:
1. Earthquake resistant designs for Electrical (Division 26) equipment and distribution, i.e. power distribution equipment, generators, UPS, etc. to conform to regulations of jurisdiction having authority.
2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
3. Provide stamped shop drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for conduit and equipment. Submit shop drawings along with equipment submittals.
4. Provide stamped shop drawings from licensed Structural Engineer of seismic flexible joints for conduit crossing building expansion or seismic joints. Submit shop drawings along with seismic bracing details.
5. Provide means to prohibit excessive motion of electrical equipment during earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
1. Underground conduit installation prior to backfilling.
2. Prior to covering walls.
3. Prior to ceiling cover/installation.
4. When main systems, or portions of, are being tested and ready for inspection by AHJ.

C. Final Punch:
1. Prior to requesting a final punch visit from the Engineer, request from Engineer the Electrical Precloseout Checklist, complete the checklist confirming completion of systems' installation, and return to Engineer. Request a final punch visit from the Engineer, upon Engineer's acceptance that the electrical systems are ready for final punch.
2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CONTINUITY OF SERVICE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements in Division 01, General Requirements, comply with individual Division 26, Electrical Sections and the following:
   1. During remodeling or addition to existing structure, while existing structure is occupied, present services to remain intact until new construction, facilities or equipment is installed.
   2. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new wiring, and wiring to point of connection.
   3. Coordinate transfer time to new service with Owner. If required, perform transfer during off-peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum.
      a. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.
   4. No interruption of services to any part of existing facilities will be permitted without express permission in each instance from Owner. Requests for outages must state specific dates, hours and maximum durations, with outages kept to these specific dates, hours and maximum durations. Obtain written permission from Owner for any interruption of power, lighting or signal circuits and systems.
      a. Organize work to minimize duration of power interruption.
      b. Coordinate utility service outages with utility company.

3.05 CUTTING AND PATCHING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements in Division 01, General Requirements, comply with individual Division 26, Electrical Sections and the following:
   1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
   2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.
   3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
   4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and/or walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
   5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.06 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

3.07 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
   1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Products and/or materials that become damaged due to water, dirt, and/or dust as a result of improper storage and handling to be replaced before installation.
   2. Protect equipment to avoid damage. Close conduit openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
   3. Protect bus duct and similar items until in service.

3.08 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, and individual Division 26, Electrical Sections.

B. Upon completion of work and adjustment of equipment, test systems and demonstrate to Owner's Authorized Representative, Architect, and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.09 CLEANING

A. Confirm Cleaning requirements in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Upon completion of installation, thoroughly clean electrical equipment, removing dirt, debris, dust, temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 INSTALLATION

A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Install equipment and fixtures in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

D. Provide miscellaneous supports/metals required for installation of equipment.

3.11 PAINTING

A. Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
   1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces (i.e., hangers, hanger rods, equipment stands, etc.) with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
   2. In Electrical Room, on roof or other exposed areas, equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
   3. See individual equipment Specifications for other painting.
   4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
   5. Conduit: Clean, primer coat and paint interior/exterior conduit exposed in public areas with two coats paint suitable for metallic surfaces. Color selected by Architect.
   6. Covers: Covers such as manholes, vaults and the like will be furnished with finishes which resist corrosion and rust.

3.12 ACCESS PANELS

A. Confirm Access Panel requirements in Division 01, General Requirements. In the absence of specific requirements in Division 01, General Requirements, comply with individual Division 26, Electrical Sections and the following:
   1. Coordinate locations/sizes of access panels with Architect prior to work.

3.13 DEMOLITION

A. Confirm requirements in Division 01, General Requirements and Division 02, Existing Conditions. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
   1. It is the intent of these documents to provide necessary information and adjustments to electrical system required to meet code, and accommodate installation of new work.
   2. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas. Owner will cooperate to best of their ability to assist in coordinated schedule, but will remain final authority as to time of work permitted.
   3. Examination:
      a. Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to locate and preserve utilities. Replace damaged items with new material to match existing.
      b. Verify that abandoned wiring and equipment serve only abandoned facilities.
      c. Demolition drawings are based on casual field observation and existing record documents.
         1) Verify accuracy of information shown prior to bidding and provide such labor and material as is necessary to accomplish work.
         2) Verify location and number of electrical outlets, luminaires, panels, etc. in field.
      d. Report discrepancies to Architect before disturbing existing installation.
         1) Promptly notify Owner if utilities are found which are not shown on Drawings.
   4. Execution:

a. Remove existing luminaires, switches, receptacles, and other electrical equipment and devices and associated wiring from walls, ceilings, floors, and other surfaces scheduled for remodeling, relocation, or demolition unless shown as retained or relocated on Drawings.
b. Provide temporary wiring and connections to maintain electrical continuity of existing systems during construction. Remove or relocate electrical boxes, conduit, wiring, equipment, and luminaires, as encountered in removed or remodeled areas in existing construction affected by this work.
c. Remove and restore wiring which serves usable existing outlets clear of construction or demolition.
d. If existing junction boxes will be made inaccessible, or if abandoned outlets serve as feed through boxes for other existing electrical equipment which is being retained, provide new conduit and wire to bypass inaccessible junction boxes and abandoned outlets.
e. If existing conduits pass through partitions or ceiling which are being removed or remodeled, provide new conduit and wire to reroute clear of construction or demolition and maintain service to existing load.
f. Extend circuiting and devices in existing walls to be furred out.
g. Remove abandoned wiring to source of supply.
h. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
i. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
j. Disconnect and remove abandoned panelboards and distribution equipment.
k. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
l. Existing lighting which is to remain, leave luminaires in proper working order.
m. Repair adjacent construction and finishes damaged during demolition work.
n. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

3.14 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
a. Cleaning
b. Operation and Maintenance Manuals
c. Training of Operating Personnel
d. Record Drawings
e. Warranty and Guaranty Certificates
f. Start-up/Test Document and Commissioning Reports

3.15 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Tests:

1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in operation and maintenance manuals.
2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.16 LETTER OF CONFORMANCE

A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement that Electrical items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

3.17 SALVAGED EQUIPMENT AND RECYCLED MATERIAL

A. Salvage the following equipment not being reused and return to Owner:
1. Luminaires
2. Panelboards
3. Breakers
4. Transformers

B. Electrical equipment that cannot be salvaged for reuse, sell/give to recycling company. Recycle following excess, removed, or demolished electrical material:
1. Copper or aluminum conductors, buses, and motor/transformer windings.
2. Steel and aluminum from raceways, boxes, enclosures, and housings.
3. Acrylic and glass from luminaire lenses/refractors.

C. Provide separate on-site storage space for recycled and salvaged material. Clearly label space.

D. Confirm additional salvaged equipment and recycled materials in the Contract Documents.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Lugs and Pads
   2. Wires and Cables
   3. Connectors

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Lugs and Pads:
   1. Anderson
   2. Ilsco
   3. Panduit
   4. Thomas & Betts
   5. 3M
   6. Or approved equivalent.

B. Wires and Cables:
   1. General
      a. General Cable
      b. Okonite
      c. Southwire
      d. Or approved equivalent.
   2. Metal Clad Cable - Type MC:
      a. Alflex
      b. AFC
      c. General Cable
      d. Southwire
      e. Or approved equivalent.

C. Connectors:
   1. Anderson Power Products
   2. Burndy
   3. Ilsco
   4. 3M
   5. Thomas & Betts
   6. Or approved equivalent.

2.02 LUGS AND PADS

A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.

B. Copper Pads: Drilled and tapped for multiple conductor terminals.

C. Lugs: Compression type for use with stranded branch circuit or control conductors; mechanical lugs for use with solid branch and feeder circuit conductors.

2.03 WIRES AND CABLES

A. Copper, 600 volt rated throughout. Conductors 12 AWG and 10 AWG, solid or stranded. Conductors 8 AWG and larger, stranded. 12 AWG minimum conductor size. Minimum insulation rating of 90 degrees C. Insulation Type: THWN-2, XHHW-2 or THHN-2.

B. Fire Pumps: Provide copper conductors. Aluminum is not acceptable.

C. Annealed copper, Class "B" strand, designed to ensure tensile strength under fire conditions. 2-hour fire-resistive cable. 600 volt rated throughout. Conductors 8 AWG through 750 KCMIL. Insulation type: Thermoset, low smoke zero halogen (LS2H) silicone rubber. Jacket: Cross-linked polyolefin (XLPO), low smoke, zero halogen. UL 44 listed and certified to UL 2196.

D. Aluminum, 600 volt rated throughout. Conductors 4 AWG and larger, compact stranded. Aluminum Association 8000(AA-8000) Series alloy conductor material built to ASTM B801 specifications. Connectors and terminations to be those listed by Underwriters Laboratories Standard 486-B and marked “AL7CU” for 60C and 75C rated circuits. Connections and terminations to be installed strictly in accordance with manufacturers recommendations.

E. Phase color to be consistent at feeder terminations; A-B-C, top to bottom, left to right, front to back.

F. Color Code Conductors as Follows:

PHASE	**208 VOLT WYE**	**240 VOLT DELTA**	**480 VOLT**
A	Black	Black	Brown
B	Red	Orange (High Leg)	Orange
C	Blue	Blue	Yellow
Neutral	White	White	Gray or White w/colored strip
Ground	Green	Green	Green
Isolated Ground	Green w/yellow trace	N/A	N/A

G. MC Cable: Not allowed.

H. MC Cable: High strength galvanized steel flexible armor. Full length minimum size No. 12 copper ground wire, THHN 90C conductors, full length tape marker phase/circuit identification on cable armor. Short circuit throat insulators, mechanical compression termination.

I. AC Cable (Armored Cable): Not allowed.

J. AC Cable (Armored Cable): Continuous corrugated aluminum armor, black. PVC jacket, with grounding conductor, XHHW-2 90 degrees C conductors, full length tape marker on jacket.

K. NMB Cable: Not allowed.

L. NMB Cable: Annealed copper conductors, 600 volt rated. Minimum Size No. 12 or 14 with ground wire. 90C rated, PVC or nylon jacketed insulation.

M. SO Cord: Annealed copper conductors, 600 volt rated. Minimum size No. 12 AWG with ground wire. Maximum of six conductors and ground per cable. 90 degrees C rated thermoset jacket.

N. Service Entrance Cable: Copper conductor, 600 volt insulation, XHHW, Type SE.

2.04 CONNECTORS

A. Split bolt connectors not allowed.

B. Aluminum Cable Compression Connections:
1. Provide UL-listed compression lugs that are marked AL7CU or AL9CU and have passed UL 486B or UL 486C testing procedures.
2. Construction: Electro tin plated high conductivity aluminum. Connector marked with wire size, die index, color-coded and the proper number and location of crimps. Factory pre-filled with oxide inhibiting compound.
3. Aluminum cable connection to aluminum bus bar: Use 2-hole aluminum compression lug and aluminum hardware. Apply UL-listed lubricant to hardware and surfaces before tightening.
4. Aluminum cable connection to copper bus bar: Use 2-hole aluminum compression lug, plated steel hardware and Belleville washer. Apply UL-listed lubricant to hardware and surfaces before tightening.
5. Aluminum cable connection to mechanical lugs and equipment identified as not suitable for aluminum conductor termination: Provide aluminum compression lug with stranded copper wire/cable pigtail. Equip lug compression body with insulating cover.
6. Aluminum cable connection to dry-type transformer lugs.
7. Aluminum Termination Hardware:
   a. Bolts: Anodized alloy 2023-T4 and conforming to ANSI B18.2.1 and to ASTM B211 or B221 chemical and mechanical property limits.
   b. Nuts: Aluminum alloy 6061-T6 or 6262-T9 and conforming to ANSI B18.2.2.
   c. Washers: Flat aluminum alloy Alclad 2024-T4, Type A plain, standard wide series conforming to ANSI B27.2. SAE or narrow series washers are not permitted.

C. Conductor Branch Circuits: Wire nuts with integral spring connectors for conductors 12 AWG through 8 AWG. Push-in type connectors where conductors are not required to be twisted together are not acceptable.

D. Fluorescent Luminaire Disconnect: polycarbonate housing, tin-plated brass contacts, insulated 18 AWG, factory-installed solid copper leads, 105C temperature rating, UL94-V2 flammability, 4A, 600V. NEC Article 410 compliant. Finger-safe line side. Push-and-click connector.

END OF SECTION

SECTION 26 0533

RACEWAYS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
1. Rigid Metal Conduit (RMC)
2. Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Metal Conduit
3. Electrical Metallic Tubing (EMT)
4. Flexible Metal Conduit (FMC)
5. Liquidtight Flexible Metal Conduit (LFMC)
6. Electrical Polyvinyl Chloride (PVC) Conduit
7. Conduit Fittings

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Rigid Metal Conduit (RMC):
1. Allied Tube & Conduit
2. Beck Manufacturing Inc.
3. Picoma
4. Wheatland Tube Company
5. Or approved equivalent.

B. Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit:
1. Allied Tube & Conduit
2. Thomas & Betts Corporation
3. Robroy Industries
4. O'kote Inc.
5. Or approved equivalent.

C. Electrical Metallic Tubing (EMT):
1. Allied Tube & Conduit
2. Beck Manufacturing WL
3. Picoma
4. Wheatland Tube Company
5. Or approved equivalent.

D. Flexible Metal Conduit (FMC):
1. AFC Cable Systems Inc.
2. Electri-Flex Company
3. International Metal Hose
4. Or approved equivalent.

E. Liquidtight Flexible Metal Conduit (LFMC):

1. AFC Cable Systems Inc.
2. Electri-Flex Company
3. International Metal Hose
4. Or approved equivalent.

F. Electrical Polyvinyl Chloride (PVC) Conduit:
1. AFC Cable Systems Inc.
2. Electri-Flex Company
3. International Metal Hose
4. JM Eagle
5. Or approved equivalent.

G. Conduit Fittings:
1. Bushings:
a. Insulated Type for Threaded Raceway Without Factory Installed Plastic Throat Conductor Protection:
1) Thomas & Betts 1222 Series
2) O-Z Gedney B Series
3) Or approved Equivalent.
2. Raceway Connectors and Couplings:
a. Thomas & Betts Series
b. O-Z Gedney Series
c. Or approved Equivalent.
3. Expansion/Deflection Fittings:
a. EMT: O-Z Gedney Type TX
b. RMC: O-Z Gedney Type AX, DX and AXDX, Crouse & Hinds XD
c. PVC: O-Z Gedney Type DX with PVC adapters, Carlon E945 Series, Kraloy OPEJ Series
d. Or approved equivalent.

2.02 RIGID METAL CONDUIT (RMC)

A. UL 6, ANSI C80.1. Hot dipped galvanized steel conduit after thread cutting.
1. Fittings: NEMA FB2.10.

2.03 POLYVINYL CHLORIDE (PVC) EXTERNALLY COATED GALVANIZED RIGID METAL CONDUIT

A. Description: UL 6, ANSI C80.1, and NEMA RN 1; rigid steel conduit with external PVC coating.
1. PVC Coating: Minimum 40 mils in thickness.

B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.04 ELECTRICAL METALLIC TUBING (EMT)

A. Description: UL 797, ANSI C80.3; steel galvanized tubing.

B. Fittings: NEMA FB 1; steel, compression type.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Description: UL 1, Interlocked steel construction.

B. Fittings: NEMA FB 2.20.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: UL 360, inner core made from spiral wound strip of heavy gauge, hot dipped galvanized low carbon steel. 3/4-inch through 1-1/4-inch trade sizes to have a square lock core and contain an integral bonding strip of copper. 1-1/2-inch and larger to have fully interlocked core. Jacket material to be moisture, oil and sunlight resistant flexible PVC.

B. Fittings: NEMA FB 2.20.

2.07 ELECTRICAL POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: UL 651, NEMA TC 2; Schedule 40 PVC.

B. Fittings: NEMA TC 3.

2.08 CONDUIT FITTINGS

A. Bushings:
   1. Insulated type for threaded raceway connectors without factory-installed plastic throat conductor protection.
   2. Insulated grounding type for threaded raceway connectors.

B. Raceway Connectors and Couplings:
   1. Steel connectors, couplings, and conduit bodies, hot-dip galvanized.
   2. Connector locknuts to be steel, with threads meeting ASTM tolerances. Locknuts to be hot-dip galvanized.
   3. Connector throats (EMT, flexible conduit, metal clad cable and cordset connectors) to have factory installed plastic inserts permanently installed. For normal cable or conductor exiting angles from raceway, the cable jacket or conductor insulation to bear only on plastic throat insert.
   4. Steel gland, Tomic or Breagle connectors and couplings are recognized for this Contract as having acceptable raceway to fitting electrical conductance.
   5. Set screw connectors and couplings, without integral compression glands, are recognized for this Contract as not having acceptable raceway to fitting electrical conductance. A ground conductor sized per this Specification must be included and bonded within raceway assembly utilizing this type connector or coupling.

C. Provide expansion/deflection fittings for EMT.

END OF SECTION

SECTION 26 0534

BOXES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Outlet Boxes
   2. Floor Boxes and Poke-Thrus
   3. Pull and Junction Boxes
   4. Box Extension Adapter
   5. Weatherproof Outlet Boxes

B. Provide electrical boxes and fittings for a complete installation. Include but not limited to outlet boxes, junction boxes, pull boxes, bushings, locknuts and other necessary components.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Outlet Boxes:
   1. Hubbell
   2. Thomas & Betts
   3. Eaton/Crouse-Hinds
   4. Or approved equivalent.

B. Floor Boxes and Poke-Thrus:
   1. Legrand (Wiremold)
   2. FSR
   3. Hubbell
   4. Thomas & Betts
   5. MonoSystems
   6. Eaton/Crouse-Hinds
   7. Or approved equivalent.

C. Pull and Junction Boxes:
   1. Eaton/Crouse-Hinds
   2. Hoffman
   3. Or approved equivalent.

D. Box Extension Adapter:
   1. Hubbell
   2. Thomas & Betts
   3. Eaton/Crouse-Hinds
   4. Or approved equivalent.

E. Weatherproof Outlet Boxes:

1. Legrand (Pass & Seymour)
2. Hubbell
3. Thomas & Betts
4. Eaton/Crouse-Hinds
5. Intermatic
6. Or approved equivalent.

2.02 OUTLET BOXES

A. Luminaire Outlet: 4-inch octagonal box, 1-1/2-inches deep with 3/8-inch luminaire stud if required. Provide raised covers on bracket outlets and on ceiling outlets.

B. Device Outlet: Installation of one or two devices at common location, minimum 4-inches square, minimum 1-1/2-inches deep. Single- or two-gang flush device raised covers.

C. Telecom Outlet: Provide 4-inches square, minimum 2-1/8-inch deep box with two-gang plaster ring.

D. Multiple Devices: Three or more devices at common location. Install one-piece gang boxes with one-piece device cover. Install one device per gang.

E. Masonry Boxes: Outlets in concrete.

F. Construction: For interior locations, provide galvanized steel outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices.

G. Accessories: Provide outlet box accessories for each installation, including mounting brackets, wallboard hangers, extension rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

H. Noise Control: Provide acoustic putty pad to back side of each outlet box installed in acoustic rated walls.

2.03 FLOOR BOXES AND POKE-THRUS

A. Basis of Design: Floor boxes and poke-thrus are based on Legrand/Wiremold as the manufacturer. Manufacturers are approved for use on this project on condition of meeting or exceeding basis of design for conditions of use, box capacity, total allowed connecting conduit capacity, and available finishes. Products ordered or installed not meeting basis of design are subject to removal and replacement at no cost to Owner.

B. Floor Boxes:
1. Multi-Gang Box, Slab on Grade: Cast iron housing rated for slab on grade application, fully adjustable, accepts up to 1.25-inch conduits. Rubber gasket protects interior from water and debris. 2-gang. Provide with _____ duplex receptacle(s) and activations for _____ telecom/AV outlets. Provide with _____ duplex receptacle(s) and activations for _____ telecom/AV outlets. Rectangular activation, flanged, for use with matching carpet or tile insert. Finish: aluminum. Legrand/Wiremold RFB2-OG or approved.
2. Multi-Gang Box, Slab above Grade: Steel housing rated for fire rated slab above grade application, fully adjustable, accepts up to 1.25-inch conduits, fire rated for 2-hours. Rubber gasket protects interior from water and debris. 2-gang. Provide with _____ duplex receptacle(s) and activations for _____ telecom/AV outlets. Rectangular

activation, flanged, for use with matching carpet or tile insert. Finish: aluminum. Legrand/Wiremold EFB45-FC or approved.

3. Face-Up Floor Box, Slab on Grade: Cast-iron housing rated for slab on grade application, fully adjustable, accepts up to 1.25-inch for power and 2-inch for telecom. Rubber gasket protects interior from water and debris. 1-gang. Provide with_____duplex receptacle(s) and activations for_____telecom/AV outlets. Rectangular activation, flanged with Decora style flip cover. Finish: aluminum. Legrand/Wiremold 880CM series or approved.
4. Face-Up Floor Box, Slab above Grade: Steel housing rated for fire rated slab above grade application, fully adjustable, accepts up to 1.25-inch for power and 2-inch for telecom, fire rated for 2-hours. Rubber gasket protects interior from water and debris. 1-gang. Provide with_____duplex receptacle(s) and activations for _____ telecom/AV outlets. Rectangular activation, flanged with Decora style flip cover. Finish: aluminum. Legrand/Wiremold 8801S-FC series or approved.

C. Poke-Thrus: Fire rated for up to 2 hr rated floors. Suitable for air handling spaces. Meets ADA accessibility guidelines. Exceeds UL scrub water exclusion requirements for tile, carpet and wood covered floors. Where used, devices recessed below floor level.
1. Cover Finish: Aluminum.
2. Poke-thru for furniture feed for power and communications: One 0.75-inch and one 2-inch screw plug opening. Basis of Design: Legrand (Wiremold) 6ATCFF series or approved equivalent.
3. Poke-thru with devices for 6-inch diameter core hole. Capacity for 2.5 gangs of power and communications devices. Prewired with two duplex receptacles. Basis of Design: Legrand (Wiremold) 6AT series or approved.
4. Poke-thru with devices (including A/V) for 8-inch diameter core hole. Capacity for 4-gangs of power and communications devices. Prewired with two duplex receptacles. Designed to accept Extron Electronics AAP and MAAP Series devices. Basis of Design: Legrand (Wiremold) 8AT series.
5. Provide the following low voltage device mounting plates:
   a. Decorator Style Basis of Design: Legrand (Wiremold) 6DEC.
   b. Blank Basis of Design: Legrand (Wiremold) 6B.
   c. Any additional accessories.

2.04 PULL AND JUNCTION BOXES

A. Construction: Provide ANSI 49 gray enamel painted sheet steel junction and pull boxes, with screw-on covers; of type shape and size, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

B. Location:
1. Provide junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.
2. Provide junction boxes and pull boxes to facilitate installation of conductors and limiting accumulated angular sum of bends between boxes, cabinets and appliances to 270 degrees.

C. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:
1. Construction: Galvanized cast iron.
2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
3. Cover Legend: ELECTRIC.

D. Fiberglass Handholes: Die molded glass fiber hand holes:
1. Cable Entrance: Pre-cut 6- x 6-inch cable entrance at center bottom of each side.

2. Cover: Fiberglass weatherproof cover with nonskid finish.
3. Cover Legend: ELECTRIC.

2.05 BOX EXTENSION ADAPTER

A. Construction: Diecast aluminum.

B. Location: Install over flush wall outlet boxes to permit flexible raceway extension from flush outlet to fixed or movable equipment.

2.06 WEATHERPROOF OUTLET BOXES

A. Construction: Provide corrosion-resistant cast metal weatherproof outlet wiring boxes, of the type, shape and size, including depth of box, with threaded conduit ends, cast metal faceplate with spring-hinged waterproof cap suitably configured for each application, including faceplate, gasket, blank plugs and corrosion proof fasteners. Weatherproof boxes to be constructed to have smooth sides, gray finish.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Equipment Nameplates
   2. Device Labels
   3. Wire Markers
   4. Conduit Markers
   5. Underground Warning Tape

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Equipment Nameplates:
   1. B & I Nameplates
   2. Intellicum
   3. JBR Associates
   4. Or approved equivalent.

B. Device Labels:
   1. Kroy
   2. Brady
   3. Or approved equivalent.

C. Wire Markers:
   1. Brady
   2. Panduit
   3. Sumitomo
   4. Or approved equivalent.

D. Conduit Markers:
   1. Allen Systems
   2. Brady
   3. Or approved equivalent.

E. Underground Warning Tape:
   1. Allen Systems
   2. Brady
   3. Or approved equivalent.

2.02 EQUIPMENT NAMEPLATES

A. Engraved phenolic plastic, laminate, minimum 1/8-inch thick in the size indicated, with beveled edge border matching letter color. Federal specification L-P-387. All upper case letters in engraver standard letter style of the size and wording indicated. Punched for mechanical fastening, except where adhesive mounting is necessary due to substrate. Embossed tape style labels are not acceptable.

B. Color:
   1. Normal (Utility): White letters on black background.
   2. Life Safety/Critical (Emergency Systems): Black letters on orange background.
   3. Equipment Branch (Legally Required Standby Systems): Black letters on yellow background.

C. Letter Size:
   1. Use 1/2-inch letters minimum for identifying major equipment and loads, including switchgear, switchboards, etc.
   2. Use 1/4-inch or 1/2-inch letters minimum for identifying panels, breakers, etc.
   3. Use 3/16-inch minimum for identifying source, voltage, current, phase, and wire configurations.

D. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

E. The Architect, Engineer, Commissioning Agent and Owner reserve the right to make modifications to the nameplates as necessary.

F. Access Panel Markers: Manufacturer's standard 1/16-inch thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve or devices/equipment. Include center hole to allow attachment.

G. Locations:
   1. Switchgear, switchboards, sub-distribution switchboards, distribution panels, and branch panels.
   2. Main breakers and distribution breakers in switchgear, switchboards, and distribution panels.
   3. Equipment including, but not limited to, motor controllers, disconnects, and VFDs.
   4. Low-voltage equipment enclosures including, but not limited to, fire alarm panels, access control panels, and lighting control panels.
   5. Distribution transformers.

2.03 DEVICE LABELS

A. Extra strength, laminated, adhesive tape, with 3/16-inch black letters on clear background. Use only for identification of individual wall switches, receptacles, control device stations, etc. Indicate source panel and circuits. Wall switches with engraved buttons do not require labeling. Embossed tape style labels are not acceptable.

B. Extra strength, laminated adhesive tape, with 3/16-inch black letters on clear background. Use only for identification of individual wall switches and receptacles. Indicate device name, source panel, and source circuits. Panel and circuit designation written in permanent marker on the back of the plate and inside the back-box. Do not provide punch tape style labels.

C. Label all junction boxes to show system identification, source circuit, or raceway origin. In finished areas, utilize device label. In unfinished areas or above ceilings, use of permanent ink marker is acceptable.

D. Device plates to have panel and circuit designation engraved in face, and highlighted in a contrasting color, and the circuit written in permanent marker on the back of the plate and inside the back-box.

2.04 WIRE MARKERS

A. Description: Vinyl-cloth self-adhesive type wire markers.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, junction boxes, and each load connection.

C. Power and Lighting Circuits: Branch circuit or feeder number as indicated on drawings and source panel.

D. Control Circuits: control wire number indicated on schematic and interconnection diagrams on drawings or shop drawings.

2.05 CONDUIT MARKERS

A. Description: Self-sticking vinyl.

B. Location: Furnish markers for each conduit longer than 6-feet.

C. Spacing: 20-feet on center.

D. Color:
1. 480 Volt System: Black letters on Orange background
2. 208 Volt System: Black letters on Orange background
3. Fire Alarm System: Red
4. Telephone System: _____
5. _____System: _____

2.06 UNDERGROUND WARNING TAPE

A. Description: 6-inch wide inert polyethylene plastic tape, 4-mil thick, detectable type, colored per APWA recommendations unless otherwise noted with suitable warning legend describing buried electrical lines.

END OF SECTION

SECTION 26 08 00

COMMISSIONING OF ELECTRICAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Definitions, warranties, test equipment requirements, and electrical commissioning requirements as required for LEED Certification and by the Owner's Project Requirements.

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this section.

B. Reference Section 01 91 13, General Commissioning Requirements.

1.03 WARRANTY

A. Manufacturer's Warranty:
1. Commissioning, inspecting, and testing not to modify terms or time periods of electrical equipment, systems, and controls warranties including related equipment and systems, and adjacent work.
2. Electrical system warranties to start from date of Commissioning Agent acceptance.

1.04 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, reference:
1. ASHRAE Guideline 0, The Commissioning Process.
2. NECA 90, Commissioning Building Electrical Systems.
3. Title 24 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings Section 120.8 Nonresidential Building Commissioning.
4. LEED v4 Reference Manual.

1.05 SUBMITTALS

A. Reference Section 01 91 13, General Commissioning Requirements, for specific submittal requirements.

B. In addition, submit the following:
1. Certificates of readiness.
2. Certificates of completion of installation, prestart, and startup activities.
3. Operations and Maintenance (O&M) manuals.
4. Test reports.

1.06 COORDINATION

A. Reference Section 01 91 13, General Commissioning Requirements, for requirements pertaining to coordination during the commissioning process.

1.07 DEFINITIONS

A. Commissioning Authority: Commissioning Agent, representing the Owner and directing commissioning activities.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Provide testing equipment required to perform startup, initial checkout and functional performance testing for the equipment being tested under Division 26, Electrical. Furnish two-way radios for each testing participant.

B. Furnish special equipment, tools and instruments (specific to tested equipment and only available from vendor) required for testing. At conclusion of commissioning, turn equipment over to the Owner except for stand-alone data logging equipment that may be used by the Commissioning Authority.

C. Manufacturer: Furnish proprietary test equipment and software required by equipment manufacturer procedures for programming and/or start-up. Demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) to become the property of the Owner upon completion of the commissioning process.

D. Data logging equipment and software required to test equipment will be furnished by the Commissioning Authority during commissioning.

E. Testing equipment to be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

PART 3 - EXECUTION

3.01 GENERAL DOCUMENTATION REQUIREMENTS

A. With assistance from the installing contractors, the Commissioning Authority will prepare Pre-Functional Checklists for commissioned components, equipment, and systems.

B. Red-lined Drawings:
   1. Verify equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
   2. Record the red-lined drawing changes, as a result of Functional Testing and incorporate into the final as-built drawings.

C. Operation and Maintenance Data:
   1. Submit a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for commissioned equipment and systems.
   2. The Commissioning Authority will review the O&M literature once for conformance to project requirements.

3. The Commissioning Authority will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.

D. Demonstration and Training:
1. Provide demonstration and training as required by the specifications.
2. Submit complete training plan and schedule to the Commissioning Authority four weeks prior to training.
3. Submit training agenda for each training session to the Commissioning Authority one week prior the training session.
4. Notify the Commissioning Authority at least 72 hours in advance of scheduled tests so that testing may be observed by the Commissioning Authority and Owner's Authorized Representative. Submit copies of the test record to the Commissioning Authority, Owner, and Architect.
5. Engage a Factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specific equipment.
6. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.
7. Review data in O&M Manuals.

3.02 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the Commissioning Authority.

B. Attend construction phase controls coordination meetings.

C. Participate in Electrical systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the Commissioning Authority.

D. Provide information requested by the Commissioning Authority for final commissioning documentation.

E. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.

F. Prepare preliminary schedule for Electrical system orientation and inspections, operation and maintenance manual submissions, training sessions, equipment start-up and task completion for owner. Distribute preliminary schedule to commissioning team members.

G. Update schedule as required throughout the construction period.

H. During the startup and initial checkout process, execute the related portions of the prefunctional checklists for commissioned equipment.

I. Contractor to participate and complete checklists using the Commissioning Authority's web based commissioning software. A desktop, laptop, tablet, or iPad will be required.

J. Assist the Commissioning Authority in verification and functional performance tests.

K. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

L. Gather operation and maintenance literature on equipment, and assemble in binders as required by the specifications. Submit to Commissioning Authority 45 days after submittal acceptance.

M. Coordinate with the Commissioning Authority to provide 48-hour advance notice so that the witnessing of equipment and system start-up and testing can begin.

N. Participate in, and schedule vendors and contractors to participate in the training sessions.

O. Provide written notification to the CM/GC and Commissioning Authority that the following work has been completed in accordance with the Contract Documents, and that the equipment, systems, and sub-system are operating as required.
   1. Electrical equipment including switchgear, panel boards, motor control centers, lighting, receptacles, dimmers and other equipment furnished under this Division.
   2. Automatic Lighting Controls.
   3. Photovoltaic Energy Systems.

P. Obtain performance documentation from equipment supplier.

Q. Provide training of the Owner's operating staff using expert qualified personnel.

R. Equipment Suppliers
   1. Submit requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
   2. Assist in equipment testing per agreements with contractors.
   3. Provide information requested by Commissioning Authority regarding equipment sequence of operation and testing procedures.

3.03 TESTING PREPARATION

A. Certify in writing to the Commissioning Authority that Electrical systems, subsystems, and equipment have been installed and started and are operating according to the Contract Documents.

B. Certify in writing to the Commissioning Authority that Electrical instrumentation and control systems have been completed and that they are operating according to the Contract Documents.

C. Certify in writing that testing procedures have been completed and that testing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the Commissioning Authority.

3.04 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the Commissioning Authority.

B. Scope of Electrical testing includes the entire Electrical installation, from the incoming power equipment throughout the distribution system. Testing includes measuring, but is not limited to resistance, voltage, and amperage of system(s) and devices.

C. Test operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The Commissioning Authority along with the Electrical contractor and other contracted subcontractors, including the fire alarm Subcontractor to prepare detailed testing plans, procedures, and checklists for Electrical systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the Commissioning Authority and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The Commissioning Authority may direct that set points be altered when simulating conditions is not practical.

H. The Commissioning Authority may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. Sampling is permissible on the testing of occupancy sensors as long the minimum sample size is 20 percent but no less than 4 units fully tested. Refer to Specification Section 01 91 13, General Commissioning Requirements for acceptance criteria.

J. If tests cannot be completed because of a deficiency outside the scope of the Electrical system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

K. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.05 ELECTRICAL SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 26, Electrical Sections. Provide submittals, test data, inspector record and certifications to the Commissioning Authority.

B. Electrical Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 26, Electrical Controls Sections. Assist the Commissioning Authority with preparation of testing plans.

C. Emergency Generator Testing and Acceptance Procedures: Provide technicians, load banks, infrared cameras, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the Commissioning Authority.

D. Electrical Distribution System Testing: Provide technicians, load banks, infrared cameras, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the Commissioning Authority.

E. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of components, systems and sub-systems. Evaluate the following equipment and systems:
   1. Automatic Lighting Controls (LCP, Occupancy Sensors, Daylighting Controls)
   2. Photovoltaic Renewable Energy Systems

3.06 PHOTOVOLTAIC ENERGY SYSTEM TESTING AND ACCEPTANCE PROCEDURES

A. Provide technicians, tools, instrumentation and equipment to test performance of panels, inverters, combined panels and monitoring equipment of designated solar PV systems and components at the direction of the Commissioning Authority.

3.07 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

A. Reference Section 01 91 13, General Commissioning Requirements, for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.08 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The Operation and Maintenance Manuals to conform to Contract Documents requirements as stated in Division 26, Electrical.

3.09 TRAINING OF OWNER PERSONNEL

A. Electrical Contractor's training responsibilities:
   1. Provide the Commissioning Authority with a training plan two weeks before the planned training.
   2. Provide designated Owner personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.
   3. Training starts with classroom sessions, if necessary, followed by hands on training on each piece of equipment, which illustrates the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
   4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
   5. The appropriate trade or manufacturer's representative provides the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
   6. The training sessions follows the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
   7. Training includes:
      a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
      b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training includes start-up, operation in modes possible, shut-down, seasonal changeover and any emergency procedures.
      c. Discuss relevant health and safety issues and concerns.
      d. Discuss warranties and guarantees.
      e. Cover common troubleshooting problems and solutions.
      f. Explain information included in the O&M manuals and the location of plans and manuals in the facility.
      g. Discuss any peculiarities of equipment installation or operation.

8. Hands-on training includes start-up, operation in modes possible, including manual, shut-down and any emergency procedures and preventative maintenance of pieces of equipment.
9. Fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
10. Schedule training after functional testing is complete, unless approved otherwise by the Owner.

END OF SECTION

SECTION 26 09 23

OCCUPANCY AND VACANCY SENSORS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Occupancy/Vacancy Sensors (Ceiling Mounted)
   2. Combined Occupancy Sensor/Wall Switches ("Sensor/Switches")
   3. Automatic Switches

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Occupancy/Vacancy Sensors (Ceiling Mounted):
   1. Passive Infrared Occupancy/Vacancy Sensors:
      a. Sensor Switch
      b. WattStopper
      c. Leviton
      d. Hubbell
      e. Greengate
      f. Or approved equivalent.
   2. Ultrasonic Occupancy/Vacancy Sensors:
      a. WattStopper
      b. Leviton
      c. Hubbell
      d. Greengate
      e. Sensor Switch
      f. Or approved equivalent.
   3. Dual Technology Occupancy/Vacancy Sensors:
      a. WattStopper
      b. Leviton
      c. Hubbell
      d. Greengate
      e. Sensor Switch
      f. Or approved equivalent.

B. Combined Occupancy/Vacancy Sensor:
   1. Lutron
   2. Sensor Switch
   3. WattStopper
   4. Leviton
   5. Hubbell
   6. Greengate
   7. Or approved equivalent.

C. Automatic Switches:
   1. Sensor Switch
   2. WattStopper
   3. Leviton
   4. Hubbell
   5. Greengate
   6. Or approved equivalent.

D. Basis of Design: Occupancy/Vacancy sensor layout on Drawings are designed based on WattStopper product line. Approved manufacturers listed are allowed on condition of meeting the specified conditions including complete sensor coverage of the area controlled and switching of luminaires in the area controlled. Provide additional sensors and power switch packs as needed to provide the same level of functionality as shown on Drawings or required in Specifications. Remove and replace electrical equipment installed not meeting these conditions at no cost to Owner.

2.02 GENERAL

A. Occupancy sensor designation indicates sensors automatically turn lights ON when the sensor detects the presence of a person and will automatically turn lights OFF when no presence is detected for a specified amount of time (automatic-on and automatic-off).

B. Vacancy sensor designation requires someone to manually turn the lights ON. The sensor will then automatically turn the lights OFF when no presence is detected for a specified amount of time (manual-on and automatic-off). These sensors must meet California Title 24 requirements.

C. Provide occupancy sensors to sense presence of human activity within desired space and enable or disable on/off manual lighting control function provided by local switches.

D. Upon detection of human activity by detector, sensor initiates time delay to maintain lights on for present period of time. Field adjustable time delay setting from 30 seconds to 15 minutes.

E. Factory set sensors for maximum sensitivity.

F. LED lamp built into sensor indicates when occupant is detected.

G. Provide zero cross relay control with sensors and sensor/switched; relay contacts close and open with AC voltage signal is at zero.

H. Where line voltage sensors and sensor/switches are used, provide to match voltage of controlled circuit.

I. Line Voltage Sensors, Control Units, and Relays: UL listed.

2.03 OCCUPANCY/VACANCY SENSORS (CEILING MOUNTED)

A. Passive Infrared Sensors:
   1. Sensor Function: Detects human presence in floor area being controlled by detecting changes in Infrared energy. Sensor detects small movements, i.e., when people are writing while seated at a desk.
   2. Provide temperature compensated dual element pyro-electric sensor and with multi element Fresnel lens.
   3. Sensor utilizes DIP switches for adjustment to time delay and override. Field adjustable settings for sensitivity.

4. Provide daylight filter to ensure that sensor is insensitive to short-wavelength infrared waves, i.e., those emitted by sun.
5. Adjustments and mounting hardware under removable cover to prevent tampering with adjustments and hardware.
6. Sensor utilizes advanced digital signal processing technology to reduce false offs without reducing sensitivity.
7. Ceiling-Mounted Sensor:
    a. Programmable to operate as an occupancy sensor (automatic-on and automatic-off) or a vacancy sensor (manual-on and automatic-off).
    b. 360 degree sensor range; coverage: 1200 SF, unless otherwise noted on drawings.
    c. Low Voltage Sensor: 24VDC power. Sensor operates remote power switch packs. Multiple sensors can be wired in parallel allow coverage of large areas.
    d. Provide internal form C dry contacts for HVAC control.
    e. Basis of Design: Wattstopper CI-300 Series.
8. Building Exterior Sensor:
    a. Capable of mounting on walls, eaves or ceilings.
    b. On/off control based on daylight levels via adjustable light level setting.
    c. Line Voltage: provide sensor to match voltage of lighting controlled; capable of switching up to 1000 watts ballast and incandescent load.
    d. Adjustable time delay from 15 seconds to 15 minutes.
    e. Silicon gasketed to prevent water and dust intrusion. UL listed raintight.
    f. Rated to operate in temperatures from -40 degrees F to 130 degrees F.
    g. Provide each sensor with manufacturer supplied wire-guard.
    h. Provide isolated relay for monitoring by security system
    i. Coverage:
        1) Narrow beam up to 100 foot distance.
        2) 90 degree beam up to 50 foot distance.
    j. Finish: White.
    k. Basis of Design: Wattstopper EN Series.
    l. Parking Lot Lighting Control:
        1) On/off control based on daylight levels via adjustable light level setting.
        2) Low Voltage Sensor: 24VDC power. Sensor operates luminaire high/low control.
        3) Adjustable time delay from 15 seconds to 15 minutes.
        4) Silicon gasketed to prevent water and dust intrusion. UL listed raintight.
        5) Rated to operate in temperatures from -40 degrees F to 130 degrees F.
        6) Sensor front rotates and pivots for coverage adjustment after installation.
        7) Basis of Design: Wattstopper EW Series

B. Ultrasonic Occupancy/Vacancy Sensors:
1. Sensor Function: Detects human presence in controlled floor area by detecting Doppler shifts in 40kHz ultrasound created by sensor.
2. Sensors are precision crystal controlled and do not interfere with each other when two or more are placed in same area. Sensor includes advanced digital signal processing to reduce false on signals without decreasing sensitivity, as well as immunity to RFI/EMI sources.
3. Sensor utilizes DIP switches for adjustment to time delay and override. Field adjustable settings for sensitivity.
4. Low Voltage Sensor: 24VDC power. Sensor operates remote power switch packs. Multiple sensors can be wired in parallel allow coverage of large areas.
5. Provide adjustments and mounting hardware under removable cover to prevent tampering.
6. Ceiling-Mounted Sensor:

a. Programmable to operate as an occupancy sensor (automatic-on and automatic-off) or a vacancy sensor (manual-on and automatic-off).
b. Maximum protrusion of 1.1-inches and blend in aesthetically with ceiling.
c. Coverage: 360 degree sensor range; coverage: 2,000 SF, unless otherwise noted on Drawings.
d. Provide internal form C dry contacts for HVAC control.
e. Basis of Design: Wattstopper WT Series.

7. Ceiling Mounted Sensor - Hallway Sensor Coverage:
a. Programmable to operate as an occupancy sensor (automatic-on and automatic-off) or a vacancy sensor (manual-on and automatic-off).
b. Maximum protrusion of 1.5-inches and blend in aesthetically with ceiling.
c. Coverage: 90 linear feet.
d. Provide internal form C dry contacts for HVAC control.
e. Basis of Design: Wattstopper UT-300-3 Series.

C. Dual Technology Sensors:
1. Sensor Function: Combined capability of passive infrared with ultrasonic or microphonic technology as described above.
2. Function: Upon a person entering a space, motion must be sensed by both technologies before lighting will be turned on. After this has occurred, detection by either technology will hold lighting on. Sensors retrigger time delay where only one motion is necessary to turn on lights within 5 seconds after turning off.
3. Ceiling-Mounted Sensor:
a. Programmable to operate as an occupancy sensor (automatic-on and automatic-off) or a vacancy sensor (manual-on and automatic-off).
b. 360 degree sensor range; coverage: 1000 SF for half-step motion, unless otherwise noted on Drawings.
c. Low Voltage Sensor: 24VDC power. Sensor operates remote power switch packs. Multiple sensors can be wired in parallel allow coverage of large areas.
d. Provide internal form C dry contacts for HVAC control.
e. Basis of Design: Wattstopper DT-300 Series.

2.04 COMBINED OCCUPANCY/VACANCY SENSOR/WALL SWITCHES ("SENSOR/SWITCHES")

A. Completely self-contained sensor system that fits into standard single gang box. Internal transformer power supply, latching dry contact relay switching mechanism compatible with electronic ballasts, compact fluorescent, and inductive loads. Triac and other harmonic generating devices are not allowed.

B. Passive infrared sensor technology includes advanced signal processing to reduce false triggers without increasing sensitivity. LED indicator blinks when occupant sensed.

C. Rated to switch loads: 800 watts incandescent or 120-volt ballast; 1000 watts 277 volt ballast. Zero-crossing technology switches lighting off when AC voltage is at zero, minimizes contact wear.

D. Provide adjustable daylight feature that holds lighting "off" when desired footcandle level is present.

E. Provide integral off override switch with no leakage current to load or ground.

F. Vandal-resistant lens.

G. Includes neutral wire to meet NEC 2014 Code.

H. Finish: White.

I. Alerts for impending shut-off: light flash, audible, both or none.

J. Standard Sensor/Switch:
1. Programmable to operate as an occupancy sensor (automatic-on and automatic-off) or a vacancy sensor (manual-on and automatic-off). Factory set to manual on/auto off.
2. 180 degree sensor range; coverage: 150 SF for desktop activity.
3. Basis of Design: Wattstopper PW-101 Series.

K. Dual Relay Sensor/Switch:
1. Programmable to operate as an occupancy sensor (automatic-on and automatic-off) or a vacancy sensor (manual-on and automatic-off).
2. Dual auto-off buttons on face of switch allow end-user to turn off two switch legs in room space. Built-in light adjustable level sensor only turns off second of two relays when desired footcandle level is present. Otherwise similar to specifications above for single-zone sensor/switch.
3. Defaults to Manual-ON to 50% operation for maximum energy savings.
4. 180 degree sensor range; coverage: 150 SF for desktop activity.
5. Finish: White.
6. Basis of Design: Wattstopper PW-302.

L. Sensor/Slide Dimmer:
1. Line voltage slider dimmer allows for manual adjustment of lighting levels from 100 percent to 10 percent; compatible with two-wire line voltage 100 percent to 10 percent electronic dimming ballasts. Separate manual button for override 'off' control.
2. 180 degree sensor range; coverage: 300 SF for desktop activity.
3. Basis of Design: Wattstopper PW-100D/101D Series.

M. Passive Infrared Wall Switch Vacancy-Only Sensors:
1. Operates only as a vacancy sensor (manual-on and automatic-off) in accordance with California Title 24 requirements.
2. Adjustable sensitivity (high, low presets).
3. Basis of Design: Lutron Maestro MS Series.

N. Dual Technology Wall Switch Vacancy-Only Sensors:
1. Operates only as a vacancy sensor (manual-on and automatic-off) in accordance with California Title 24 requirements.
2. Adjustable sensitivity (high, medium, low, and off presets) individually for passive infrared and ultrasonic sensing.
3. Basis of Design: Lutron Maestro MS Series.

O. Passive Infrared Wall Dimmer Vacancy-Only Sensors:
1. Operates only as a vacancy sensor (manual-on and automatic-off) in accordance with California Title 24 requirements.
2. Basis of Design: Lutron Maestro MSCL Series.

P. Passive Infrared 0-10 V Wall Dimmer Vacancy-Only Sensors:
1. Operates only as a vacancy sensor (manual-on and automatic-off) in accordance with California Title 24 requirements.
2. Basis of Design: Lutron Maestro 0-10V Dimmer Sensor MS Series.

2.05 AUTOMATIC SWITCHES

A. Automatic ("Sentry") Switch:

1. Programmable to operate as an occupancy sensor (automatic-on and automatic-off) or a vacancy sensor (manual-on and automatic-off).
2. Controls up to 1800 watts at 120-volt, 4100-watts at 277-volt, suitable for ballast and motor loads.
3. Compatible with Decora style faceplate.
4. Zero crossing circuitry.
5. Finish: Match wiring devices unless selected otherwise by Architect.
6. Capable of being connected with other sentry switches to produce 3 and 4 way switching.
7. Based on power interruptions of following durations from an upstream control panel, produces following effects:
   a. 5 Seconds: Turns lighting off with no delay.
   b. 3 Seconds: Turns lighting on with no delay.
   c. 1 to 2 Seconds: Delayed off. Blinks lights and provides audible signal to room occupant. If switch push button is not pressed within 5 minutes, lights are turned off.
8. Basis of Design: Wattstopper AS-100 Series.

B. Digital Timer Switch:
1. Controls up to 1800 watts at 120 volt, 4100 watts at 277 volt, suitable for ballast and motor loads.
2. Compatible with Decora style faceplate.
3. Provide low voltage (24VAC/VDC) version where used as input to lighting relay panel; includes single-pole, double-throw isolated relay rated for 1A at 30VDC.
4. Electroluminescent LCD display shows timer countdown.
5. Time out setting range from 5 minutes to 12 hours. Lights can be turned off before time-out setting by holding down on/off button.
6. Timer countdown can be reset to beginning by holding down push button for 2 seconds.
7. Zero crossing circuitry.
8. Finish: White.
9. Room lighting flashed and switch beeps 5 minutes and 1 minute prior to switching room lighting off. Either visible or audible features can be disabled.
10. Basis of Design: Wattstopper TS-400 Series.

END OF SECTION

SECTION 26 09 24

DAYLIGHTING CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Continuous Dimming Daylighting Controller
   2. Switched Daylighting Controller
   3. Local Continuous Dimming Photosensor
   4. Local Switched Photosensor

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Continuous Dimming Daylighting Controller:
   1. WattStopper
   2. Greengate
   3. Sensor Switch
   4. Or approved equivalent.
   5. Basis of Design: Daylighting sensor layout on Drawings are designed based on WattStopper product line. Approved manufacturers listed below are allowed on condition of meeting specified conditions including complete sensor coverage of area controlled and switching of luminaires in area controlled. Provide additional sensors and power switch packs as needed to provide same level of functionality as shown on Drawings. Remove and replace electrical equipment installed not meeting these conditions at no cost to Owner.

B. Switched Daylighting Controller:
   1. WattStopper
   2. Greengate
   3. Sensor Switch
   4. Or approved equivalent.
   5. Basis of Design: Daylighting sensor layout on Drawings are designed based on WattStopper product line. Approved manufacturers listed below are allowed on condition of meeting specified conditions including complete sensor coverage of area controlled and switching of luminaires in area controlled. Provide additional sensors and power switch packs as needed to provide same level of functionality as shown on Drawings. Remove and replace electrical equipment installed not meeting these conditions at no cost to Owner.

C. Local Continuous Dimming Photosensor:
   1. WattStopper
   2. Greengate
   3. Sensor Switch
   4. Or approved equivalent.

5. Basis of Design: Daylighting sensor layout on Drawings are designed based on WattStopper product line. Approved manufacturers listed below are allowed on condition of meeting specified conditions including complete sensor coverage of area controlled and switching of luminaires in area controlled. Provide additional sensors and power switch packs as needed to provide same level of functionality as shown on Drawings. Remove and replace electrical equipment installed not meeting these conditions at no cost to Owner.

D. Local Switched Photosensor:
1. WattStopper
2. Greengate
3. Sensor Switch
4. Or approved equivalent.
5. Basis of Design: Daylighting sensor layout on Drawings are designed based on WattStopper product line. Approved manufacturers listed below are allowed on condition of meeting specified conditions including complete sensor coverage of area controlled and switching of luminaires in area controlled. Provide additional sensors and power switch packs as needed to provide same level of functionality as shown on Drawings. Remove and replace electrical equipment installed not meeting these conditions at no cost to Owner.

2.02 CONTINUOUS DIMMING DAYLIGHT CONTROLLER

A. Control dimming of interior lights in response to light level data, compatible with 0 to 10VDC dimming ballasts. Control system to be open loop, to provide three output control zones consisting of a 0 to 10VDC signals compatible with fluorescent dimmable ballasts. Control system to include three relay outputs capable of switching each of three output zones off after an adjustable time delay when a given channel is fully dimmed.

B. Control module to include following characteristics:
1. Seven individually adjustable parameters for each channel:
a. Setpoint: 5 to 60 footcandles;
b. Minimum Output: 0 to 4 volts DC;
c. Maximum Output: 6 to 10 volts DC;
d. Ramp Rate: 5 to 60 seconds;
e. Fade Rate: 5 to 60 seconds;
f. Cutoff Time Delay: 0 to 20 minutes or disabled;
g. Load Shed Limit: 0 to 10 volts DC.
2. Compatible with 0 to 10VDC dimming ballasts.
3. Suitable for panel mounting on DIN rail.
4. When daylighting is adequate for a channel to fully dim; lights switch off after an adjustable time delay via relay pack connected to controller. This feature can also be disabled if lights must remain when fully dimmed.
5. LCD display with menu-driven, pushbutton programming without special tools or accessories; automatic internal calculation for dimming requirements of individual channels for simplified setup.
6. Operates from either 120VAC or 277VAC power source.
7. Automatic Off Control.

C. Utilize low voltage photosensor to continuously measure light levels. Photosensor range is 30 to 6000 footcandles. Adjustments and calibrations capable of being made at control module, not at remote photosensor.

D. Basis of Design: WattStopper LCD-203 series control module with LS-290C photosensor and WattStopper BT-203 power pack. Control module mounted in factory-approved enclosure with

factory-installed DIN rails (WattStopper LS-E8, LS-E12, or approved equivalent) and DC power supplies as needed.

2.03 SWITCHED DAYLIGHTING CONTROLLER

A. Switched control of interior lights in response to photocell input. Control system to be open loop, and will provide three output control zones as shown on Drawings.

B. Control module will include following characteristics:
1. Five individually adjustable parameters for each channel:
a. Setpoint: 5 to 60 footcandles;
b. Programmable Deadband: 10 to 80 percent;
c. On Delay: 5 to 60 seconds;
d. Off Delay: 3 to 60 minutes;
e. Load Shed Limit: 5 to 60 footcandles.
2. Compatible with 0 to 10VDC dimming ballasts.
3. Suitable for panel mounting on DIN rail.
4. Lights switched via relay pack connected to controller.
5. LCD display with menu-driven, pushbutton programming without special tools or accessories; automatic internal calculation for dimming requirements ofindividual channels for simplified setup.
6. Operates from either 120VAC or 277VAC power source.

C. Utilize low voltage photosensor to continuously measure light levels. Photosensor range is 30 to 6000 footcandles. Adjustments and calibrations will be capable of being made at control module, not at remote photosensor.

D. Basis of Design: WattStopper LCO-203 series control module with LS-290C photosensor and WattStopper BT-203 power pack. Mount control module in factory-approved enclosure with factory-installed DIN rails (WattStopper LS-E8, LS-E12, or approved equivalent) and DC power supplies as needed.

2.04 LOCAL CONTINUOUS DIMMING PHOTOSENSOR

A. Provide low voltage, indoor photocell to interface with electronic dimming ballasts using low voltage (0 to 10VDC) control signal.

B. Spectral filtering system to measure relative levels of daylighting and indoor lighting within control space. Measures light as human eye perceives; linear photocell response with greater than 1 percent accuracy.

C. Ceiling-mounted 2.4-inch diameter, 0.875-inch depth white housing.

D. 10VDC input voltage, 0.2 to 10VDC output voltage. 20 to 60 footcandle adjustable range with plus or minus 3 percent accuracy. One photocell controls up to 50 ballasts. 5 year warranty. White finish.

E. Automatic Off Control.

F. Provide with separate handheld remote controller to field program target lighting levels for daytime and nighttime (i.e. when plenty of daylighting is available and when no daylighting is available).

G. Basis of Design: WattStopper LS-301 Series.

2.05 LOCAL SWITCHED PHOTOSENSOR

A. Low voltage, indoor photosensor to switch lighting using power pack; integrate with room occupancy sensors.
   1. LCD display under removable cover to display four user-adjustable parameters:
      a. ON Setpoint.
      b. 1-850 footcandles.
      c. OFF Setpoint (25 percent to 100 percent above ON Setpoint).
      d. OFF Setpoint time delay (3 to 30 minutes).
   2. Dimensions: 2.4-inches diameter by 0.7-inches deep.
   3. White finish; surface mounted. Mountable in top-lit or side-lit position.
   4. Voltage: 12/24VDC. LED status indicator.

B. Basis of Design: WattStopper LS-101 Series.

END OF SECTION

SECTION 26 09 25

DIGITAL LIGHTING CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:
1. General Performance
2. Digital Wall or Ceiling Mounted Occupancy Sensor System
3. Digital Wall Switches
4. Handheld Remote Controls
5. Room Controllers
6. Digital Photosensors
7. Room Network (DLM Local Network)
8. Configuration Tools
9. Network Bridge
10. Segment Manager
11. Emergency Lighting
12. Source Quality Control

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards per Division 01, General Requirements and Section 26 00 00, Electrical Basic Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Wattstopper DLM Series

B. Lutron Quantum Series

C. Douglas Lighting Controls Dialog Series

D. Or approved equivalent.

2.02 GENERAL PERFORMANCE

A. Daylight Harvesting and Occupant Detection to Control Lighting with the Following Hierarchy:
1. Emergency (Highest Priority): Ignores all other inputs.
2. Programming: During system programming, sensor inputs are ignored.
3. Occupant Sensor: Allows lights to be on/off.
4. Daylight Sensor: Imposes a high end limit for light output.

5. Personal Control: Fine tune light levels up to the daylight sensor limit.

B. Response to a single sensor can be unique on luminaire by luminaire basis.

C. Power failure recovery - All devices return to their previous light level prior to power loss.

D. All programmable devices with integral power failure memory to maintain settings for a minimum of 10 hours during power loss.

E. Wall station and sensor replacement accomplished without programming.

2.03 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM

A. Wall or Ceiling mounted (to suit installation) dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the system accommodating the square-foot coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, and accessories which suit the lighting and electrical system parameters.

B. Digital Occupancy Sensors will provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
   1. Digital calibration and pushbutton programming for the following variables:
      a. Sensitivity: 0-100 percent in 10 percent increments.
      b. Time delay: 1-30 minutes in 1 minute increments.
      c. Test mode: Five second time delay.
      d. Detection technology: PIR, Ultrasonic or Dual Technology activation and/or re-activation.
      e. Walk-through mode.
      f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
   2. Two RJ-45 port(s) for connection to DLM local network.
   3. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
   4. Device Status LEDs including:
      a. PIR Detection.
      b. Ultrasonic detection.
      c. Configuration mode.
      d. Load binding.
   5. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
   6. Manual override of controlled loads.

C. Units will not have any dip switches or potentiometers for field settings.

D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

E. Wattstopper product number: LMDC-100 or LMDX-100.

2.04 DIGITAL WALL SWITCHES

A. Low voltage momentary pushbutton switches in 1, 2, 3, and 4 button configuration; available in white, light almond, ivory, grey, and black; compatible with wall plates with decorator opening. Wall switches will include the following:
   1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
3. Red configuration LED on each switch that blinks to indicate data transmission.
4. Blue Load/Scene Status LED on each switch button with the following characteristics:
   a. Bi-level LED.
   b. Dim locator level indicates power to switch.
   c. Bright status level indicates that load or scene is active.
5. Dimming switches will include seven bi-level LEDs to indicate load levels using 14 steps.

B. Two RJ-45 ports for connection to DLM local network.

C. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

D. The following switch attributes may be changed or selected using a wireless configuration tool:
1. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
2. Individual button function may be configured to Toggle, On only, or Off only.
3. Individual scenes may be locked to prevent unauthorized change.
4. Fade Up and Face Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
5. Ramp rate may be adjusted for each dimmer switch.
6. Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

E. Wattstopper product number: LMSW-101, LMSW-102, LMSW-103, or LMSW-104.

2.05 HANDHELD REMOTE CONTROLS

A. Battery-operated handheld switches in 1, 2, and 5 button configuration for remote switching or dimming control. Remote controls will include the following features:
1. Two-way infrared (IR) transceiver for line of sight communication with DLM local network within up to 30 feet.
2. Blue LED on each button confirms button press.
3. Load buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.
4. Inactivity timeout to save battery life.

B. A wall mount holster and mounting hardware will be included with each remote control.

C. Wattstopper product number: LMRH-101, LMRH-102, or LMRH-105.

2.06 ROOM CONTROLLERS

A. Room controllers automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will not have, dip switches, potentiometers or require special configuration. The control units will include the following features:
1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.

2. Simple replacement - Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.
3. Device Status LEDs to indicate:
   a. Data transmission.
   b. Device has power.
   c. Status for each load.
   d. Configuration status.
4. Quick installation features including:
   a. Standard junction box mounting.
   b. Quick low voltage connections using standard RJ-45 patch cable.
5. Plenum rated.
6. Manual override and LED indication for each load.
7. Dual voltage (120/277 VAC, 60 Hz).
8. Zero cross circuitry for each load.

B. On/Off/Dimming Enhanced Room Controllers shall include:
1. Real time current monitoring.
2. Three relay configuration.
3. Efficient 250 mA switching power supply.
4. Four RJ-45 DLM local network ports.
5. One 0-10 volt analog output per relay for control of compatible LED drivers.
6. Network Bridge for BACnet MS/TP communications (LMRC-3xx).
7. The following dimming attributes may be changed or selected using a wireless configuration tool:
   a. Establish preset level for each load from 0-100 percent.
   b. Set high and low trim for each load.
8. Discrete model listed for connection to receptacles, for occupancy-based control of plug loads within the space.
   a. One relay configuration only.
   b. Automatic ON/OFF configuration.
9. Wattstopper product number: LMRC-213.

2.07 DIGITAL PHOTOSENSORS

A. Digital photosensors work with room controllers to provide automatic switching or dimming daylight harvesting capabilities for any load type connected to a room controller. Closed loop photosensors measure the ambient light in the space and control a single lighting zone. Open loop photosensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones. Photosensors shall be interchangeable without the need for rewiring.

B. Digital photosensors include the following features:
1. An internal photodiode that measures only within the visible spectrum, and has a response curve that closely matches the photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5 percent for any wavelengths less than 400 nanometers or greater than 700 nanometers.
2. Sensor light level range shall be from 1-10,000 footcandles (fc).
3. The capability of switching one-third, one-half or all lighting ON and OFF, or raising or lowering lighting levels, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).
4. For switching daylight harvesting, the photosensor shall provide a deadband or a separation between the “ON Setpoint” and the “OFF Setpoint” that will prevent the lights from cycling after they turn off.

5. For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a user-selectable minimum level.
6. Programmable wall switch override to allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise and lower lighting levels for a selected period of time or cycle of occupancy.
7. Infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.
8. Red configuration LED that blinks to indicate data transmission.
9. Blue status LED indicates test mode, override mode and load binding.
10. Recessed switch to turn controlled load(s) ON and OFF.
11. One RJ-45 port for connection to DLM local network.
12. An adjustable head and a mounting bracket to accommodate multiple mounting methods and building materials. The photosensor may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox.

C. Open loop digital photosensors include the following additional features:
1. An internal photodiode that measures light in a 60 degree angle cutting off the unwanted light from the interior of the room.
2. Automatically establishes setpoints following calibration using a wireless configuration tool or a PC with appropriate software.
3. A proportional control algorithm for dimming daylight harvesting with a “Setpoint” to be maintained during operation.
4. Wattstopper product number: LMLS-500.

2.08 ROOM NETWORK (DLM LOCAL NETWORK)

A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building. Digital room devices connect to the network using CAT 5e cables with RJ-45 connectors which provide both data and power to room devices. Features of the DLM local network include:
1. Plug n’ Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.
3. Push n’ Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

2.09 CONFIGURATIONS TOOLS

A. A configuration tool facilitates optional customization of DLM local networks, and is used to set up open loop daylighting sensors. A wireless configuration tool features infrared communications, while PC software connects to each local network via a USB interface.

B. Features and functionality of the wireless configuration tool shall include:
1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.

3. Read, modify and send parameters for occupancy sensors, daylighting sensors, room controllers, and buttons on digital wall switches.
4. Save up to nine occupancy sensor setting profiles, and apply profiles to selected sensors.
5. Temporarily adjust light level of any load(s)on the local network, and incorporate those levels in scene setting.
6. Adjust or fine-tune daylighting settings established during auto-commissioning, and input light level data to complete commissioning of open loop daylighting controls.

C. Wattstopper product number: LMCT-100.

2.010 NETWORK BRIDGE

A. The network bridge connects a DLM local network to a BACnet-compliant network for communication between rooms, panels and a segment manager or BAS. Each local network shall include a network bridge component to provide a connection to the local network room devices. The network bridge shall use industry standard BACnet MS/TP network communication.
1. The network bridge may be incorporated directly into the room controller hardware (LMRC-3xx Room Controllers) or be provided as a separate module connected on the local network through an available RJ-45 port.
2. Provide Plug n' Go operation to automatically discover all room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network.
3. The network bridge shall automatically create standard BACnet objects for selected room device parameters to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. Standard BACnet objects shall be provided as follows:
   a. Read/write the normal or after hours schedule state for the room.
   b. Read the detection state of the occupancy sensor.
   c. Read/write the On/Off state of loads.
   d. Read/write the dimmed light level of loads.
   e. Read the button states of switches.
   f. Read total current in amps, and total power in watts through the room controller.
   g. Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings.
   h. Activate a preset scene for the room.
   i. Read/write daylight sensor fade time and say and night setpoints.
   j. Read the current light level, in footcandles, from interior and exterior photosensors and photocells.
   k. Set daylight sensor operating mode.
   l. Read/write wall switch lock status.
4. Wattstopper product number: LMBC-300.

2.011 SEGMENT MANAGER

A. The Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser. Each segment manager shall have support for one segment networks as required and allow for control of a maximum of 120 local networks (rooms) and/or lighting control panels per segment network.

B. Operational features of the segment manager shall include the following:
1. Connection to PC or LAN via standard Ethernet TCP/IP.

2. Easy to learn and use graphical user interface, compatible with Internet Explorer 11, or equal browser.
3. Log in security capable of restricting some users to view-only or other limited operations.
4. Automatic discovery of all DLM devices on the segment network(s). Commissioning beyond activation of the discovery function shall not be required.
5. After discovery, all rooms and panels shall be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.
6. Ability to view and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation.
7. Ability to set up schedules for rooms and panels. Schedules shall automatically set controlled zones or areas to either a normal hours or after hours mode of operation.
8. Ability to group rooms and loads for common control by schedules, switches or network commands.
9. Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature.
10. Provide seamless integration with the BAS via BACnet IP.

C. Wattstopper product number: LMSM-3E.

2.012 EMERGENCY LIGHTING

A. Emergency Lighting Control Unit - A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:
1. 120/277 volts, 50/60 Hz, 20 amp ballast rating.
2. Push to test button.
3. Auxiliary contact for remote test or fire alarm system interface.
4. UL2043 plenum rated.

B. Wattstopper product number: ELCU-100, with EMTS-100 remote test switch.

2.013 SOURCE QUALITY CONTROL

A. Perform full-function testing on all completed assemblies at end of line.

B. Diagnostics and Service - Tiered control scheme for dealing with component failure that minimizes loss of control for occupant.
1. Bus Failure: Lights go to emergency level for safety.
2. Failure of One Sensor Type: Ballast still controllable via other sensors.
3. Ballast Failure: Only impacts one fixture - remainder of system operates as programmed.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Power Distribution Panelboards
   2. Panelboards

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Power Distribution Panelboards:
   1. Eaton
   2. General Electric
   3. Siemens
   4. Basis of Design: Schneider Electric/Square D
   5. Or approved equivalent.

B. Panelboards:
   1. Eaton
   2. General Electric
   3. Siemens
   4. Basis of Design: Schneider Electric/Square D
   5. Or approved equivalent.

C. Manufacturers listed above are allowed on condition of meeting specified conditions including available space for equipment, Code required working clearances, and both amps interrupting capacity (AIC). Prior to submitting bid, manufacturer to provide documentation to Engineer verifying specific conditions, including those mentioned above, can be met. Remove and replace electrical equipment installed, at no cost to the Owner, that does not meet these conditions.

2.02 POWER DISTRIBUTION PANELBOARDS

A. Description: NEMA PB 1 Type 1 or as indicated on drawings, circuit breaker type.

B. Circuit breakers in distribution panels to be rated for minimum 42,000A RMS symmetrical interrupting capacity or as indicated on drawings. Where the required interrupting capacities, according to the Overcurrent Protection Devices Coordination Study, are higher than those indicated in items above, the equipment selected must provide these higher interrupting capacities. As per Section 26 00 00, Electrical Basic Requirements, submit the Protection Coordination Study with the first set of shop drawings on switchgear and panelboards.

C. Panelboard Bus: Non-reduced copper, ratings as indicated on drawings. Bus bar with suitable electroplating (tin) for corrosion control at connection. Provide copper ground bus in each panelboard.

D. Lugs: Mechanical type for both aluminum and copper conductors. All device terminals/lugs shall be rated for a minimum of 75 degrees C to facilitate the use of 75 degrees C conductor ampacity rating.

E. Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole; UL listed. For air conditioning equipment branch circuits provide circuit breakers UL listed as Type HACR.

F. Molded Case Circuit Breakers with Current Limiters: With replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole; UL listed.

G. Current Limiting Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole: UL listed. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

H. Solid-State Molded Case Circuit Breakers: With electronic sensing, timing and tripping circuits for adjustable current settings; UL listed.
   1. Ground fault trip, ground fault sensing integral with circuit breaker.
   2. Instantaneous trip.
   3. Adjustable short time trip.
   4. Adjustable long time delay.
   5. Adjustable long time pickup.
   6. Adjustable short time delay.
   7. Adjustable short time pickup.
   8. Stationary mounting.
   9. Include shunt trip where indicated.

I. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

J. Circuit Breakers 1200 Amp and Greater: Provide breaker with energy-reducing maintenance switching with local status indicator per CEC Article 240.87(B).

K. Fully equip unused spaces for future devices, including manufacturer required connections and mounting hardware.

L. Cabinet Front: Surface type hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

M. Surge Protective Device: Provide for emergency distribution systems equipment as required per NEC Article 700.8.

2.03 PANELBOARDS

A. Description: Panelboards 400 amps or less. NEMA PB1, Type 1 or as indicated on drawings, circuit breaker type. Maximum enclosure depth: 6-inches for surface mounted, 5-3/4-inches for flush mounted.

B. Maximum Width: 20-inches.

C. Circuit breakers in branch circuit panels to be rated for minimum 22,000A RMS symmetrical interrupting capacity or as indicated on drawings. Where the required interrupting capacities, according to the Overcurrent Protection Devices Coordination Study, are higher than those indicated in items above, the equipment selected must provide these higher interrupting capacities. As per Section 26 00 00, Electrical Basic Requirements, submit the Protection Coordination Study with the first set of shop drawings on switchgear and panelboards.

D. Panelboard Bus Non-Reduced: Copper, ratings as indicated on drawings. Bus bar with suitable electroplating (tin) for corrosion control at connection. Provide copper ground bus in each panelboard.

E. Lugs: Mechanical type for both aluminum and copper conductors. All device terminals/lugs shall be rated for a minimum of 75 degrees C to facilitate the use of 75 degrees C conductor ampacity rating.

F. Provide double lugs and/or feed-through lugs for feed through feeders.

G. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for poles; UL listed. Predrill bus for bolt-on breakers.
   1. Type SWD for lighting circuits.
   2. Type HACR for air conditioning equipment circuits.
   3. Class A ground fault interrupter circuit breakers where scheduled.
   4. Class B ground fault equipment protection circuit breakers for heat trace and other circuits as required by Code. Provide shunt trip circuit breakers where scheduled; provide wiring to remote trip switch/contacts as indicated on Drawings.
   5. Do not use tandem circuit breakers.
   6. AFCI Circuit Breaker: UL 489 and 1699 compliant. Manual test button for AFCI mechanism. Self-testing, tripping if AFCI module fails. Cause of trip indication to the AFCI requirements.
   7. Dual Function (AFCI/GFCI) Circuit Breaker: UL 489, 493 and 1699 compliant. Integral Class A 5mA GFCI trip. Manual test button for AFCI mechanism. Self testing, tripping if AFCI module fails.

H. Current Limiting Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole; UL listed. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

I. Solid-State Molded Case Circuit Breakers: With electronic sensing, timing and tripping circuits for adjustable current settings; UL listed.
   1. Ground fault trip, ground fault sensing integral with circuit breaker.
   2. Instantaneous trip.
   3. Adjustable short time trip.
   4. Adjustable long time delay.
   5. Adjustable long time pickup.
   6. Adjustable short time delay.
   7. Adjustable short time pickup.
   8. Stationary mounting.
   9. Include shunt trip where indicated.

J. Accessories: Provide where indicated: shunt trip, arc-fault circuit interrupter (AFCI), Class A ground fault circuit interrupter (GFCI), auxiliary switch, and alarm switch.

K. Cabinet Front: Provide flush or surface mounting as shown on the schedules, drawings, or otherwise noted. Cabinet front with concealed hinged front cover construction, metal directory

frame with heavy clear plastic protector, flush lift latch and lock, two keys per panel all keyed alike.

L. Provide boxes with removable blank end walls and interior mounting studs. Provide interior support bracket for ease of interior installation.

M. Furnish surface mounted cabinet boxes without knockouts.

N. Surge Protective Device: Provide for emergency distribution systems equipment as required per NEC Article 700.8.

END OF SECTION

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SECTION 26 2511
BUSWAY SYSTEM

1 Summary

1.1 This specification covers the electrical characteristics and general requirements for a track busway system, hereafter referred to as Track Busway. The system shall be designed primarily for overhead power distribution of electrical power. Once installed, the Track Busway will provide simple, versatile, fast and economic means of distributing power. Loads fed from Track Busway plug-in units can be added or removed without shutting down the busway.

1.2 Specification includes:

1.2.1 Three-phase Track Busway system with the following features:

1.2.1.1 Extruded aluminum busway housing with conductors
1.2.1.2 Power Feed
1.2.1.3 Plug-in units for power distribution
1.2.1.4 Monitoring
1.2.1.5 Installation tool and joint kits
1.2.1.6 Optional accessories

2 Standards and Certification

2.1 The Track Busway shall be designed and manufactured to the following standards:

2.1.1 Electrical Testing Laboratories (ETL) (US/Canada) Certified to UL 857.

2.1.2 CCC (China) Certified to GB 7251.1-2013.

2.1.3 CE (Europe) Certified to IEC 61439-1 and IEC 61439-6.

2.1.4 VDE (Germany) Certified to IEC 61439-1 and IEC 61439-6. *(pending)*

2.1.5 NOM (Mexico) Certified to NOM-003-SCFI-2000

2.1.6 National Electric Code (NEC) – Article 368 – Busways

2.1.7 National Fire Protection Agency (NFPA) – 70, National Electric Code (NEC)

2.1.8 National Electrical Manufacturers Association (NEMA) - AB1, Molded Case Circuit Breakers and Molded Case Switches *(if applicable)*

2.1.9 National Electrical Manufacturers Association (NEMA) – KS-1, Enclosed and Miscellaneous Distribution Equipment Switches (600 VAC) *(if applicable)*

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3 System Description

3.1 Electrical Requirements

3.1.1 System voltage: up to 600V

3.1.2 Frequency: 50/60 Hz.

3.1.3 Ampacity: 100, 225

3.1.4 Neutral Ampacity: Minimum of 100% of rating (optional 200% for 100T3)

3.1.5 Short circuit rating must be: 22 kAIC up to 600V; 50 kAIC up to 240V, 65kAIC up to 480V

3.1.6 Conductors: 3 phase conductors, 1 neutral conductor solid copper, tin plated

3.1.7 Grounding: Aluminum casing or 1 dedicated conductor solid copper, tin plated

3.2 Operational Requirements

3.2.1 Environmental Conditions: The Track Busway shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage, degradation or derating of operating capability.

3.2.1.1 UL Operating temperature: busway shall operate with continuous load with no derating up to 40 degrees Celsius, 0.90 multiplier at 50 degrees Celsius, 0.85 at 55 degrees Celsius and 0.825 at 60 degrees Celsius

3.2.1.2 IEC Operating Temperature: busway shall operate with continuous load with no derating up to 55 degrees Celsius, 0.95 at 60 degrees Celsius, 0.925 at 65 degrees Celsius and 0.9 at 70 degrees Celsius

3.2.1.3 Relative humidity: 0 to 95 percent, noncondensing

3.2.1.4 Altitude: Sea level to 6,600 feet (2000m)

3.3 Manufacturers Qualification

3.3.1 A minimum of 10 years' experience in the manufacturing of the busway products.

3.4 Manufacturing Requirements

3.4.1 All Track Busway components and accessories shall be manufactured by Universal Electric Corporation.

Universal Electric Corporation
168 Georgetown Rd.
Canonsburg, PA 15317
(724) 597-7800

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4 Submittals

4.1 Submittals shall be in accordance with specified procedures. Submit shop drawing and product data for record purposes prior to shipment. Shop drawings for Track Busway must include:

4.1.1 Detailed equipment assemblies and dimensions, weights, location and identification of each field connection

4.1.2 Wiring Connection: For power and monitoring wiring

4.1.3 Orientation of plug-in units face in final installation

4.1.4 Include plug-in schedule with detailed description

4.2 Provide electrical characteristics and connection requirements for the system and accessories.

4.3 Indicate special receiving and handling procedures.

5 Warranty

5.1 The Track Busway manufacturer shall guarantee the entire system against defective material and workmanship for a period of one (1) year from date of shipment.

5.2 Additional years of warranty and ability for start-up services must be an option if required per drawings.

5.3 Warranty shall only cover Track Busway product components manufactured by Universal Electric Corporation; use of any aftermarket components with Track Busway shall void warranty and any certifying listings completely

6 Product Components

6.1 Track Busway Housing

6.1.1 Extruded aluminum housing certified to serve as a 100% ground. Standard housing lengths are 5, 10 and 20 feet (1.5, 3 and 6 meters). 20 ft. (6 meter) maximum lengths can be cut in customizable lengths down to the inch or 3 centimeters. The housing should be properly extruded with a slot to receive rod mount hangers to hang from a ceiling. This housing should be open on the bottom to accept plug-in units anywhere along its length. This opening shall pass UL’s hypothetical finger probe test.

6.1.2 All conductors shall be made of copper, or of copper/aluminum for 800T5 and 1200T5 systems, and sized to handle 100% of its rating continuously up to the maximum ambient temperature. The conductors shall be electrically isolated from the housing. All insulators must be UL and IEC compliant.

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6.1.2.1 Ground conductor: An internal, 100% ground conductor is to be supplied if shown on the drawings

6.1.2.2 Oversized neutral: An oversized, 200% neutral conductor shall be supplied if shown on the drawings

6.1.3 Track Busway housing sections shall be joined together by a ‘press fit’ that requires no bolted connection and no future maintenance

6.1.4 Track Busway T5 series shall have an included data channel built into the housing to accommodate optional, color-coded data cabling accessories

6.1.5 Track Busway housing shall be available in standard silver, red, blue, black, white or custom RAL colors

6.2 Power Feed

6.2.1 The power feed shall provide the connections from the incoming cables to the Track Busway system. The power feed shall have internal connection to a section of busway conductors. End feeds, top feeds, center feeds and bottom feeds shall be available depending upon what Track Busway system is required. Feeds shall have the option to be designed with mechanical or compression type lugs.

6.3 Plug-In Units

6.3.1 Plug-in units shall be polarized to avoid incorrect installation

6.3.2 Plug-in units can be added, removed or repositioned without de-energizing the busway

6.3.3 Plug-in units shall use either a circuit breaker or a fuse for branch circuit protection as shown in the schedule on the project drawings

6.3.4 Plug-in units shall be capable of being built with customer-specified circuit protection, outlets and accessories

6.3.5 Plug-in units shall not require any tools to mount to the busway

6.3.6 Plug-in units shall not have a mechanism in order to engage the electrical connection to the busway conductors

6.3.7 Plug-in units shall have locking clips or bolt-on tabs to secure units to the busway

6.3.8 Plug-in units that include drop cords shall be manufactured with cord grips and receptacles as specified in the drawings

6.3.9 Plug-in units shall be configured by the manufacturer to balance the load based on quantity of plug-in unit types provided

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6.3.10 Plug-in units shall have the ability to provide up to a 400 amp load in certain plug-in unit configurations

6.3.11 Plug-in units shall have a minimum of 10kAIC and the ability to obtain a maximum of 200kAIC

6.3.12 Plug-in units shall be interchangeable within each Track Busway series (T1, T2, T3, T5)

6.3.13 Plug-in units shall be available with optional, revenue grade metering devices

6.3.14 Plug-in units authenticity shall be proven by the presence of a Starline ratings label

6.4 Accessories *(OPTIONAL)*

6.4.1 Closure strip and access panels shall be available for conductor access points to minimize accidental contact or build-up of debris

6.4.2 Integrated cable management solutions as part of the aluminum housing (T5 series), capable of handling accessories such as the data channel cover, hinged wire way, data cable strap, and multi-use mounting bracket

6.4.2.1 Data channel covers are color-coded for integrated cable management solutions

6.4.3 Universal Server Cabinet Mounting Brackets shall be available as an alternative hanging solution; meant for mission critical applications

6.5 Monitoring *(OPTIONAL)*

6.5.1 Power Feed Monitoring: The power feed is to be provided with the following power measurements and remote monitoring interface:

6.5.1.1 Input Voltage (L/L and L/N)
6.5.1.2 Current per Phase (Min/Max)
6.5.1.3 Voltage per Phase (Min/Max)
6.5.1.4 Neutral Current
6.5.1.5 Power Factor
6.5.1.6 Frequency
6.5.1.7 Power (Active, Reactive, Apparent)
6.5.1.8 Demand (kWH)
6.5.1.9 Current Peak Demand
6.5.1.10 Lug Temperature
6.5.1.11 Communications is Modbus RTU, Modbus TCP, Ethernet SNMP, BACnet and optional wireless
6.5.1.12 LED colored, 4.9 inch (125mm) display

6.5.2 Plug-In Unit Monitoring: The plug-in units as indicated on the schedule on the project drawings shall have the following power measurements and remote monitoring interface.

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6.5.2.1	Input Voltage (L/L and L/N)
6.5.2.2	Current per Phase (Min/Max)
6.5.2.3	Voltage per Phase (Min/Max)
6.5.2.4	Power Factor
6.5.2.5	Frequency
6.5.2.6	Power (Active, Reactive, Apparent)
6.5.2.7	Demand (kWH)
6.5.2.8	Current Peak Demand
6.5.2.9	Accuracy is better than 0.5%
6.5.2.10	Communications is Modbus RTU, Modbus TCP, Ethernet SNMP, BACnet and optional wireless plus available daisy chain Ethernet topology
6.5.2.11	Optional display

7 Installation

7.1 The contractor shall install Track Busway in accordance with the manufacturer's instructions.

7.1.1 Track Busway runs shall consist of lengths as shown on the drawings.

7.1.2 The plug-in unit orientation shall be indicated on the drawings.

7.1.3 Hanging of the Busway: The Track Busway shall be hung from a structure above the busway, using the supplied busway hangers. The hangers shall connect to the busway, and to an all thread rod provided by the installing contractor. The spacing of the hangers along the busway is 10 feet (3 meters).

7.1.4 The busway shall be installed with the open access channel facing downward, or to the side for special applications. Special installation shall be agreed upon by the manufacturer.

7.1.5 Connecting Sections of Track Busway: At a junction of Track Busway sections, the installer will use a Joint Kit (includes Housing Couplers and Bus Connector) and an Installation Tool supplied by the manufacturer. Two sections are joined together by a 'press fit' that requires no bolted connection and no future maintenance.

7.1.6 End of Runs: End caps will be provided to install at the end of each run.

7.1.7 Closure Strip: The closure strip is an optional accessory that can be cut and fitted to cover the bottom opening of the Track Busway housing to prevent dust and debris. Closure Strip can be field modified for fit.

7.2 All Track Busway joints are non-bolted, compression fit and shall require no maintenance after installation

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8 Field Quality Control

8.1 Manufacturers Field Services: Track Busway shall be accompanied by optional services, such as on-site support and system startup, ongoing support, metering services and extended warranty programs. These services include:

8.1.1 On-site Training

8.1.2 Installation Inspection, Commissioning and Certification

8.1.2.1 Includes comprehensive visual inspection and certified report once results are satisfactory, which extends standard factory warranty from one to two years

8.1.3 Load Bank Testing

8.1.4 IR Scanning and other Ongoing Support

8.1.5 Extended Warranty Programs (Meter programming, commissioning and support)

8.1.6 24/7 Emergency Service and Phone Support

9 Documentation

9.1 The following documentation shall be available to assist in product selection and installation, and is available for download at http://downloads.uecorp.com/:

9.1.1 Track Busway Product Selection Guide

9.1.2 Operation, Installation and Maintenance Manuals

9.1.3 Installation Instructions

9.2 Product drawings shall be rendered and provided at the time of ordering

END OF SECTION

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SECTION 26 27 16

ELECTRICAL CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Hinged Cover Enclosures
   2. Cabinets
   3. Terminal Blocks
   4. Accessories

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Hinged Cover Enclosures:
   1. Cooper B-Line
   2. Qube Corporation
   3. Robroy Industries
   4. Circle AW
   5. Hoffman
   6. Wiegmann
   7. Or approved equivalent.

B. Cabinets:
   1. Hoffman
   2. Circle AW
   3. Cooper B-Line
   4. Or approved equivalent.

C. Terminal Blocks:
   1. Allen-Bradley/Rockwell Automation
   2. Cooper Bussmann
   3. WECO Electrical Connectors Inc.
   4. Or approved equivalent.

D. Accessories:
   1. Cooper B-Line
   2. Rob Roy
   3. Qube Corporation
   4. Or approved equivalent.

2.02 HINGED COVER ENCLOSURES

A. Construction: NEMA 250, Type 1 steel enclosure.

B. Covers: Continuous hinge, held closed by flush latch operable by screwdriver, key, or thumb latch.

C. Provide interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.

D. Enclosure Finish: Manufacturer's standard enamel.

E. Keys: Provide two of each different key.

2.03 CABINETS

A. Boxes: Galvanized Steel, Plastic, Fiberglass, or Stainless Steel.

B. Box Size: As noted on drawings.

C. Backboard: Provide 3/4-inch thick plywood backboard for mounting terminal blocks. Paint matte white.

D. Fronts: Steel, flush type with concealed trim clamps, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.

E. Provide metal barriers to form separate compartments for wiring of different systems and voltages.

F. Provide accessory feet for free-standing equipment.

G. Keys: Provide two of each different key.

2.04 TERMINAL BLOCKS

A. Terminal Blocks: NEMA ICS 4.

B. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.

C. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.

D. Provide ground bus terminal block, with each connector bonded to enclosure.

2.05 ACCESSORIES

A. Plastic Raceway: Plastic channel with hinged or snap-on cover.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: Provision of materials, installation and testing of:
   1. Wall Switches
   2. Receptacles
   3. Finish Plates
   4. Wall Dimmers
   5. Surface Covers

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Wall Switches:
   1. Decorative AC Rocker Switch Characteristics:
      a. Cooper
      b. Hubbell
      c. Leviton
      d. Legrand P&S
      e. Or approved equivalent.

B. Receptacles:
   1. Industrial Grade:
      a. Cooper 5362
      b. Hubbell HBL5362
      c. Bryant BRY5362
      d. Leviton 5362
      e. Legrand P&S 5362A
      f. Or approved equivalent.
   2. Commercial Grade:
      a. 20 Amp:
         1) Cooper 5362
         2) Hubbell 5362
         3) Bryant CBRS20
         4) Leviton 5362S
         5) Legrand P&S 5362
         6) Or approved equivalent.
   3. Ground Fault Circuit Interrupter (GFCI) Receptacle - 20 Amp:
      a. Cooper WRSGF20W
      b. Hubbell GFR5362SGW
      c. Legrand P&S 2097TRWR
      d. Or approved equivalent.

C. Finish Plates:
   1. Bryant
   2. Cooper
   3. Hubbell
   4. Leviton
   5. Legrand P&S
   6. Or approved equivalent.

D. Wall Dimmers:
   1. Lutron Maestro Series
   2. Or approved equivalent.

E. Surface Covers:
   1. Aluminum with Gasket, Blanks, Single Gang:
      a. Bell 240-ALF
      b. Carlon
      c. Or approved equivalent.
   2. 2-Gang:
      a. Bell 236-ALF
      b. Carlon
      c. Or approved equivalent.
   3. While-in-Use Weatherproof Cover:
      a. Die Cast Cover:
         1) Intermatic
         2) Hubbell
         3) Cooper
         4) Or approved equivalent.

F. Provide lighting switches and receptacles of common manufacturer and appearance.

2.02 WALL SWITCHES

A. Characteristics: Decorative AC Rocker Switch Characteristics: Quiet acting, 20 amp, 120/277 volt, UL Listed for motor loads up to 80 percent of rated amperage.

B. Timer Switches: Digital time switch to automatically turn light off after set time. Adjustable time setting from five minutes to 12 hours. LCD to show time remaining. 20-amp/120 to 277 volt.

C. Momentary Center Off: Toggle type, quiet acting, 20-amp/120/277 volt, double throw momentary contact, center off position.

D. Pilot Light Switches: Lighted handle, toggle type, red unless noted otherwise, neon pilot lamp. Pilot lamp energized when load is energized. 20 amp/120, 208 and 277 volt.

E. Lighted Handle Switches: Lighted handle, quiet acting, 20 amp, 120/277 volt, toggle type, red unless noted otherwise neon lamp. Lamp energized when load is not energized.

F. Key Switches: 20 amp/120-277 volt, black key guide.

G. Finish: White.

H. Plug-Tails: Switches that use a plug-tail or snap-on connector are allowed; switches installed that do not meet these specifications (example: switch with plug-tails installed that is not fully rated for 20 amps load) are subject to removal and replacement at no cost to the Owner.

2.03 RECEPTACLES

A. Duplex Receptacles Characteristics: Straight parallel blade, 125 volt, 2 pole, 3 wire grounding.
   1. Commercial Grade: Riveted. Back and side wired. Brass ground contact on steel strap. Nylon face and nylon base. 20 amp.

B. Isolated Ground Receptacle: Isolated ground "delta" on receptacle face, same finish as standard duplex receptacles, 20 amp.

C. Ground Fault Circuit Interrupter (GFCI) Receptacle: Feed through type, back-and-side wired, tamper-resistant, weather resistant self-testing, 20 amp, 125VAC.

D. Surge Protector Receptacle: Feed-through type, back and side wired, 20 amp, 125VAC, LED monitor light, MOV protection in L-N, L-L, and N-G modes for up to 9000 amp surges. Minimum 170 joule rating.

E. Specification Grade Tamper-Resistant Receptacle: 20 amp, 125VAC, complies with CEC requirements.

F. Specification Grade Plug Load Duplex Receptacle: 20A, 125V, Decora style duplex receptacle, straight blade, hot terminal split with 1 plug controlled, self grounding. Back and side wired.

G. Special Purpose Receptacles: Reference Drawings for NEMA Standard Specification.

H. Finish:
   1. Same exposed finish as switches.
   2. Receptacles connected to emergency circuits life safety and critical to have red finish.
   3. Receptacles installed in surface raceway to match raceway finish. See Section 26 05 33, Raceways.
   4. All automatically controlled, nonlocking type, 125 volt, 15 amp and 20 amp rated receptacles to be permanently marked by the manufacturer with the "universal power" symbol and the word "controlled."
   5. Receptacles connected to isolated ground to have orange finish.

I. Plug-Tails: Receptacles that use a plug-tail or snap-on connector are allowed; receptacles installed that do not meet these specifications (example: GFCI outlet with plug-tails installed that does not have UL self-test ability or is not weather or tamper resistant) are subject to removal and replacement at no cost to the Owner.

2.04 FINISH PLATES

A. Finish Plates: Type 302 stainless steel with smooth satin finish.

B. Provide telephone/signal device plates; activated outlets to have coverplates to match modular jack.

C. Provide emergency devices with factory engraved "Emergency."

2.05 WALL DIMMERS

A. Provide wall dimmers compatible with type of load controlled (i.e. line voltage, low voltage, 2-wire, 3-wire, 0-10v). Finish to match wall switches. Size dimmers to accept connected load. Do not cut fins. Where dimmers are ganged together, provide a single multi gang coverplate.

B. LED indicator dots show by what percentage controlled lighting is dimmed. Programmable settings for maximum and minimum trim settings, and rate of change in lighting levels.

2.06 SURFACE COVERS

A. Material: Galvanized steel, 1/2-inch raised industrial type with openings appropriate for devices installed on surface receptacles.

B. Cast Box and Extension Adaptors: Aluminum with gasket, blanks single gang or 2-gang.

C. While-in-Use Weatherproof Cover: NEMA 3R when closed over energized plug. Vertical mount for duplex receptacle. Provide continuous use cover with cover capable of closing over energized cord cap with bottom aperture for cord exit.
   1. UV stabilized polycarbonate cover with closed cell neoprene foam gasket.
   2. Thermoplastic cover with closed cell neoprene gasket.
   3. Die cast cover with closed cell neoprene foam gasket: Capable of being locked closed to prevent tampering or unauthorized use.

END OF SECTION

SECTION 26 3353

STATIC UNINTERRUPTIBLE POWER
SUPPLY GUIDE SPECIFICATION

1.01 SUMMARY

A. This specification describes a three-phase continuous duty, on-line, double conversion, solid-state uninterruptible power system, hereafter referred to as the UPS. The UPS shall operate in conjunction with the existing building electrical system to provide power conditioning, back-up and distribution for critical electrical loads. The UPS shall consist of, as required by the project, the UPS module, batteries, or other DC storage systems, and accessory cabinet(s) for transformers, maintenance bypass, and distribution applications, and other features as described in this specification.

1.02 UPS SYSTEM DESCRIPTION

A. UPS System Components: The UPS system shall consist of the following main components:

1. UPS module containing Rectifier(s), Inverter(s), Battery Charger(s), Static Bypass, and associated Control and Monitor Panel.
2. Battery string(s) in Line-and-Match Battery Cabinets.
3. Line-and-Match and/or sidecar-type accessory cabinets for transformer, maintenance bypass, parallel tie and distribution applications. Specific accessory availability depends on UPS model.
4. Non-matching wall mounted or floor standing maintenance bypass cabinets or multi-module parallel tie cabinets.

B. UPS Module Modes of Operation: The UPS Module shall operate as an on-line, fully automatic system in the following modes:

1. Normal: Utilizing commercial AC power, the critical load shall be continuously supplied by the Inverter. The Inverter shall power the load while regulating both voltage and frequency. The Rectifier shall derive power from the commercial AC source and shall supply DC power to the Inverter. Simultaneously, the Battery Charger shall charge the battery.
2. Battery: Upon failure of the commercial AC power, the critical load shall continue to be supplied by the Inverter, which shall obtain power from the batteries without any operator intervention. There shall be no interruption to the critical load upon failure or restoration of the commercial AC source. The 93PM UPS shall be capable of operating with 432V or 480VDC battery systems.
3. Recharge: Upon restoration of the AC source, the Charger shall recharge the batteries and simultaneously the Rectifier shall provide power to the Inverter. This shall be an automatic function and shall cause no interruption to the critical load.

4. Bypass: If the UPS module must be taken out of the Normal mode for overload, load fault, or internal failures, the static bypass switch shall automatically transfer the critical load to the commercial AC power. Return from Bypass mode to Normal mode of operation shall be automatic. No-break transfer to and from Bypass mode shall be capable of being initiated manually from the front panel .

5. Energy Saver: The UPS shall continuously monitor the voltage and frequency of the bypass source. When the source parameters are within acceptable limits, the UPS will utilize a minimal/optimal combination of its internal subsystems to ensure acceptable power is always delivered to the critical load, at a system efficiency of up to 99.1%. The Energy Saver System shall be enabled by the user, and shall be adjustable. It shall incorporate a "High Alert Mode" to automatically (without user intervention) provide maximum power conditioning any time bypass source variation levels exceed preset, adjustable limits. When Energy Saver System is utilized, the UPS shall attenuate ANSI C62.41-type line transients to within IEC and ITIC limits. The Energy Saver System shall be able to distinguish between upstream (utility) faults and downstream (load) faults, and react appropriately to protect and support the critical load, without interruption.

1.03 REFERENCES

A. UL 1778 (Underwriters Laboratories) – Standard for Uninterruptible Power Supply Equipment. Product safety requirements for the United States, 4th Edition.

B. CSA C22.2 No 107.1(Canadian Standards Association) – Commercial and Industrial Power Supplies. Product safety requirements for Canada.

C. NEMA PE-1 – (National Electrical Manufacturers Association) – Uninterruptible Power Systems standard.

D. IEC 62040-2 C3

E. IEC 62040-3 (International Electrotechnical Commission) – Uninterruptible power systems (UPS) – Part 3: Method of specifying the performance and test requirements.

F. IEEE 587 (ANSI C62.41) Category A & B (International Electrical and Electronics Engineers)
– Recommended practices on surge voltages in low voltage power circuits.

G. CISPR 22 and 24, FCC Rules and Regulations 47, Part 15, Class A (Federal Communications Commission) – Radio Frequency Devices.

1.04 SUBMITTALS

A. The UPS shall be supplied with sufficient documentation, including the following manuals:

1. Installation and Operation Manual: One copy of the installation and operation manual shall be furnished. It shall possess sufficient detail and clarity to enable the owner's technicians or representatives to install and operate the UPS equipment and accessories. The manual shall include the following major items:

a) UPS description

b) UPS site planning and unpacking

c) UPS installation

d) Optional accessory installation

e) UPS theory of operation

f) Operating procedures

g) System events

h) UPS maintenance

i) Performance and technical specifications

j) Wiring requirements and recommendations

k) Physical features and requirements

l) Cabinet dimensions

1.05 QUALIFICATIONS

A. The UPS manufacturer shall have a minimum of fifty years' experience in the design, manufacture and testing of solid-state UPS systems. A list of installed UPS systems of the same type as the manufacturer proposes to furnish for this application shall be supplied upon request.

B. The UPS manufacturer shall have ISO 9001 certification for engineering/R&D, manufacturing facilities and service organization.

C. The UPS manufacturer shall maintain a staffed 7x24x365 call center for technical and emergency support.

D. Field Engineering Support: The UPS manufacturer shall directly employ a nationwide field service department staffed by factory-trained field service engineers dedicated to startup, maintenance, and repair of UPS equipment. The organization shall consist of local offices managed from a central location. Field engineers shall be deployed in key population areas to provide on-site emergency response within 24 hours. A map of the United States showing the location of all field service offices shall be submitted with the proposal. Third-party service or maintenance will not be accepted.

E. Spare Parts Support: Parts supplies shall be located in the field to provide 80% of all emergency needs. The factory shall serve as the central stocking facility where a dedicated supply of all parts shall be available within 24 hours.

F. Product Enhancement Program: The UPS manufacturer shall make available feature upgrade service offerings to all users as they are developed. These upgrades shall be available as optional field-installable kits.

G. Maintenance Contracts: A complete range of preventative and corrective maintenance contracts shall be provided and offered with the proposal. Under these contracts, the manufacturer shall maintain the user's equipment to the latest factory revisions.

1.06 ENVIRONMENTAL REQUIREMENTS

A. The UPS shall withstand any combination of the following external environmental conditions without operational degradation.

1. Operating Temperature: 5 degrees C to + 40 degrees C (41 degrees F to 104 degrees F) without de-rating (excluding batteries).
2. Storage Temperature: - 25 degrees C to + 55 degrees C (-13 degrees F to 131 degrees F). Prolonged storage above + 40 degrees C (104 degrees F) will cause rapid self-discharge and permanent damage to the battery.
3. Relative Humidity (operating and storage): 5-95% non-condensing.
4. There shall be at least a 1.8ºF (1.0ºC) difference between the dry bulb temperature and the wet bulb temperature, at all times, to maintain a non- condensing environment
5. The maximum rate of temperature change shall be limited to 3ºF over 5 minutes (36ºF/hour), based on the ASHRAE Standard 90.1-2013
6. Elevation:
    a) Operational: 5000 ft. (1500 m) maximum without de-rating. Above this rating, altitude de-rating as per IEC 62040-3
    b) Transportation: Capable of air transport, up to 15,000m

1.07 SAFETY

A. The UPS shall be certified by Underwriters Laboratories in accordance with UL 1778, 4th Edition.

B. The UPS shall be certified by the Canadian Standards Association in accordance with CSA C22.2 NO.107.1-M91.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers: Eaton.

2.02 UPS MODULE STANDARD FEATURES

The UPS module shall consist of the following standard components, housed in a 50 kW, 100kW, 150kW, 200kW, or 400kW frame:

A. Quantity 1, 2, 3, 4, 5, 6, 7, or 8 identical 50kW UPM Universal Power Modules, each containing:

1. Rectifier/Charger: The rectifier/charger shall convert incoming AC power to regulated DC output for supplying the inverter and for charging the battery. The rectifier/charger shall be a high-frequency PWM design, using Insulated Gate Bi- polar Transistors (IGBTs). The modular design of the UPS shall permit safe and fast removal and replacement of the rectifier/charger module. Mean time to repair (MTTR) for the module shall be no more than 30 minutes in order to return UPS to normal mode. The rectifier/charger module shall also provide the following:
2. The rectifier shall be capable of drawing power from the utility with a power factor of 0.99 under nominal conditions.
3. The rectifier shall feature protection circuitry that prevents the IGBTs from sourcing current in excess of their published ratings.

4. Inverter: The inverter shall feature an IGBT pulse-width-modulation (PWM) design with high speed switching. The inverter shall also have the following features:

5. The inverter shall be capable of providing the specified quality output power while operating from any DC source voltage (rectifier or battery) within the specified DC operating range.

6. The modular design of the UPS shall permit safe and fast removal and replacement of the power module, while in maintenance bypass. Mean time to repair (MTTR) for the module shall be no more than 30 minutes in order to return UPS to normal mode.

7. The inverter shall feature protection circuitry that prevents the IGBTs from sourcing current in excess of their published ratings.

B. Static Bypass: The bypass shall serve as an alternative source of power for the critical load when an abnormal condition prevents operation in normal mode. The bypass for 50- 200kW frames shall consist of a fully rated, continuous duty, naturally commutated static switch for high-speed transfers. The 400kW bypass system will consist of two 200Kw static switches. The bypass shall feature the following transfer and operational characteristics.

1. Transfers to bypass (for stand alone, and parallel capacity systems) shall be automatically initiated for the following conditions:

   a) Output overload period expired.

   b) Critical bus voltage out of limits.

   c) Internal over temperature period expired.

   d) Total battery discharge.

   e) UPS failure.

2. Parallel Redundant UPS systems shall transfer to bypass on conditions (a), (b), and (d) above. Conditions (c) and (e) will result in the affected UPS isolating itself from the parallel bus, allowing the remaining UPS(s) to support the critical load.

3. Uninterrupted automatic re-transfer shall take place whenever the inverter(s) is capable of assuming the critical load.

4. Uninterrupted automatic re-transfers shall be inhibited for the following conditions:

   a) When transfer to bypass is activated manually or remotely.

   b) In the event of multiple transfers/re-transfer operations the control circuitry shall limit “cycling” to three (3) operations in any ten-minute period. The third transfer shall lock the critical load on the bypass source, for 60 minutes.

   c) UPS failure.

5. Uninterrupted manual transfers shall be initiated from the control panel. Uninterrupted manual transfers to bypass and from bypass shall be possible with the inverter logic. During manual transfers to bypass mode, the inverter must verify proper bypass operations before transferring the critical load to the bypass.

6. All transfers to bypass shall be inhibited for the following conditions:

a) Bypass voltage out of limits (+10%, to -10% of nominal)

b) Bypass frequency out of limits (+/- 4 Hz, adjustable, factory set)

c) Bypass out of synchronization

d) Bypass phase rotation / installation error

7. Static transfer time: No break, complete in less than 4ms.

8. The bypass shall be manually energized using the control panel or remotely through a building alarm input.

C. Monitoring and control components: The following components shall provide monitor and control capability:

1. Control panel: color LCD, touch sensitive, with LED status indicators.

2. Alarm and metering display.

3. Building alarm monitoring.

4. Communication ports: RS-232 and USB.

D. Battery management system: The UPS shall contain a battery management system which has the following features:

1. The battery management system shall provide battery time remaining while operating in normal mode and battery mode. Battery time available information shall be displayed real-time, even under changing load conditions. Upon commissioning, battery runtime information shall be available.

2. The battery management system shall automatically test the battery system to ensure that the battery is capable of providing greater that 80% of its rated capacity. Testing the batteries shall not jeopardize the operation of the critical load. Upon detection of the battery string(s) not capable of providing 80%, the UPS system will alarm that the battery needs attention/replacement. The battery test shall be able to detect the following:

a) Open battery string

b) Shorted battery string (current limit)

c) Battery capacity (runtime) less than 80% of “new” battery capacity

E. Wiring Terminals: The UPS 50 kW, 100kW, and 150kW frame modules shall contain mechanical compression terminals (adequately sized to accommodate 75 degree C wiring). The 200kW and 400kW frames shall utilize threaded busbar landings sized for 2- hole lugs, for securing user wiring to the following locations:

1. Rectifier/charger input connections (3-wire plus ground, or 4-wire plus ground for 4-wire models)

2. Bypass input connections, (for dual source configurations): 3-wire plus ground for 3-wire plus ground output configuration (480Vac), or 4-wire plus ground for 4- wire plus ground output configuration (480/277Vac)

3. DC link connections for battery cabinets (positive and negative plus ground).

4. AC output connections (3 wires plus ground, or 4-wire plus ground for 4-wire models), 4 wire plus ground if distribution accessory cabinet with

transformer is utilized.

2.03 UPS MODULE OPTIONS AND ACCESSORIES

The UPS system may include the following options and accessories as required:

A. Integrated Maintenance Bypass, Distribution, Parallel Tie and Accessory Cabinet(s): Integrated Line-and-Match cabinet(s) shall be provided that include(s):

1. All hardware and interconnecting cable for connection to UPS module.

2. IAC-B (Bypass) Sidecar: Two, three, or four-breaker manual maintenance bypass switch in a sidecar configuration, to isolate UPS module from commercial AC input and critical load. The sidecar may be mounted on either side of the UPS module. Switch shall provide complete isolation of UPS for servicing. Switch shall be make-before-break, interlocked between UPS and bypass to prohibit improper operation. The bypass sidecar for the 400kW model provides 2 or 3- breaker maintenance bypass, and may optionally include 480V distribution breakers, for supplying downstream distribution.

3. IAC-D (Distribution) cabinet (20-200kW models): This may be positioned on either side of the UPS module, and may include a K-1, or K-13 rated output isolation and step down transformer. Optionally, the transformer shall meet TP-1 specifications. An optional input step up transformer may be included as well.

a) The 50kW, 100kW, 150kW, and 200kW versions house up to qty two (2), 42 pole distribution panels with main disconnects for a total of 84 poles of distribution. Up to five (5) distribution circuit breakers may be substituted in lieu of distribution panels. The 200kW version may haveone of its 42-pole panels provided with a 400A main breaker Additionally, a separate 225A sub feed breaker may be provisioned, regardless of the configuration of distribution panels.

4. Parallel Tie Sidecar (20-200kW models): This will include 2x Module Output Breakers (MOB) intended to allow a maximum of 2 UPS modules to be paralleled for capacity or redundancy. Optionally, a maintenance bypass circuit, including a Maintenance Isolation Switch (MIS) and a Maintenance Bypass Switch (MBS) can be included in this sidecar. The Parallel Tie sidecar may be provisioned with a single UPS for the intention of adding the second UPS at a later time.

5. IAC-T (Tie) cabinet (20-200kW models): This can include up to 4x Module Output Breakers (MOB) intended to allow a maximum of 4 UPS modules to be paralleled for capacity or redundancy. Optionally, a maintenance bypass circuit, including a Maintenance Isolation Switch (MIS) and a Maintenance Bypass Switch (MBS) can be included in this cabinet.

B. Network Adapter and UPS Power Monitoring Software: Optional PX Gateway card adapter shall provide a communications interface between the UPS module and the following network management systems.

1. SNMP v.1, v.3

2. Modbus TCP

3. BACnet/WS or /IP

4. IPv6

This capability shall allow the unit to be monitored remotely over an Ethernet network using a standard web browser.

C. UPS Power Monitoring Software: This system shall continuously monitor critical power elements associated with the UPS, using the communications port on each module and a customer furnished PC. The system shall automatically alarm if any problems arise and notify local or remote personnel of the alarm condition via email, page, or text message.

D. Relay Card: Serial dry contact card providing 4 isolated dry output contacts, 1 isolated input. The relays are programmable.

E. External Battery Cabinet: The battery cabinet shall feature valve regulated, high-rate discharge, lead-acid batteries which provide energy to the support the critical load during a momentary loss of input power to the rectifier. The batteries shall be flame retardant in accordance with UL 94V2 requirements. The battery cabinet shall have the following features:

1. The battery cabinet shall be the same depth and height as the UPS module. A “Slim” (20” width) battery cabinet is optional for 20 to 200kW models, and may contain 1, 2 or 3 strings of batteries.
2. The battery cabinet shall feature a mechanical enclosure of like appearance to the UPS module and shall feature casters for easy installation. Each battery cabinet shall require front access only for installation, service and maintenance. The battery cabinet shall provide bottom cable entry standard and top entry capability via sidecar.
3. Power wiring internal to each battery cabinet shall be factory provided. Each battery cabinet shall feature up to 10 battery trays which can be individually disconnected from the battery cabinet power wiring with quick disconnect devices. Each battery tray shall be firmly secured to the battery cabinet frame with fasteners. Each battery tray shall be removable from the front of the battery cabinet.
4. Up to 4 line and match battery cabinets may be connected to a single UPS, containing 2 or more 50 kW UPMs. Up to 2 battery cabinets may be connected to a single UPS containing only one UPM.
5. For parallel systems, each UPS frame shall have a discrete battery system. A single battery system may not be shared across multiple UPS frames.
6. Each battery cabinet shall feature a DC rated circuit breaker. The circuit breaker within the battery cabinet shall only provide protection to the battery string(s) within that battery cabinet. For battery configurations involving multiple battery cabinets, the batteries in one battery cabinet may be isolated from the DC link via its circuit breaker without disconnecting other battery cabinets from the DC link and the UPS module.
7. The circuit breaker in each battery cabinet shall feature an A/B auxiliary switch. The UPS module shall be capable of monitoring and alarming an open battery cabinet circuit breaker condition.
8. The circuit breaker in each battery cabinet shall feature a 48VDC shunt trip device. The shunt trip shall operate to trip the battery breaker(s) for an emergency power off command or battery disable command.
9. Power and Control wiring between the co-located battery cabinet and the UPS shall be factory provided.
10. The batteries shall be optionally configured with a ¼” spade type

connector for attaching sense leads to each jar to facilitate the future addition of a battery monitoring system.

11. Expected battery life: 200 complete full load discharge cycles when operated and maintained within specifications.

F. Internal Batteries: The 50kW UPS frame shall feature internal, valve regulated, high-rate discharge, lead-acid batteries which provide energy to the support the critical load during a momentary loss of input power to the rectifier. The batteries shall be flame retardant in accordance with UL 94V2 requirements.

1. The 50kW frame with internal batteries shall be configurable with either 3, 4, or 5 strings of batteries (12, 16, or 20 battery trays, respectively). Each battery tray shall be removable from the front of the UPS cabinet.

2. The circuit breaker in the 50kW UPS cabinet shall feature an A/B auxiliary switch. The UPS module shall be capable of monitoring and alarming an open battery cabinet circuit breaker condition.

3. The circuit breaker in the 50KW UPS cabinet shall feature a 48VDC shunt trip device. The shunt trip shall operate to trip the battery breaker(s) for an emergency power off command or battery disable command.

4. Expected battery life: 200 complete full load discharge cycles when operated and maintained within specifications.

G. Parallel Systems (20 to 200kW models): Up to 8 UPS modules (UPS “frames”) may be paralleled for N+X redundancy, and/or for increased capacity. Maximum capacity in a parallel-for-capacity system is 1600kW. Maximum capacity for a parallel redundant system is 1550kW, N+1.

1. UPS frames are not required to be identical in terms of quantity of internal UPMs. For example, a 50kW UPS may be paralleled with a 100kW UPS.

2. Additional 50kW UPMs may be field-added to any UPS frame in a parallel system.

3. Each UPS frame must have a dedicated battery system, or DC storage system.

4. Each UPS will contain a built-in circuit (Control Area Network, or CAN) for communication of metering and status information between UPS frames. This will not require the use of a separate communication card. Interruption of the CAN bus will not cause the parallel system to fail to support the critical load.

5. Load share balance will be within +/-5% of full load rating.

6. For 2-UPS parallel systems ONLY, an optional sidecar cabinet shall be available to provide 2x module output breakers. A further option provides maintenance bypass (MBS) and maintenance isolation (MIS) switches. This cabinet will be wired and tested with one UPS at the factory, and shall ship attached to that UPS.

2.05 UNINTERRUPTIBLE POWER SUPPLY RATINGS AND OPERATING CHARACTERISTICS*

A. UPS Continuous Ratings. The UPS shall be rated:

UPS Rating (max)	Opt. Rating (1)	Opt. Rating (2)	Opt. Rating (3)	Opt. Rating (4)	Opt. Rating (5)	Opt. Rating (6)	Opt. Rating (7)	Opt. Rating (8)

50 kW	40kW	30kW	20kW	--	--	--	--	--
50 kW+1	40kW	30kW	20kW	--	--	--	--	--
100 kW	90kW	80kW	70kW	60kW	50kW	40kW	30kW	20kW
100 kW+1	90kW	80kW	70kW	60kW	50kW	40kW	30kW	20kW
150 kW	140kW	130kW	120kW	110kW	100kW	90kW	80kW	70kW
	60kW	50kW	40kW	30kW	20kW			
150 kW+1	140kW	130kW	120kW	110kW	100kW	90kW	80kW	70kW
	60kW	50kW	40kW	30kW	20kW			
200kW	190kW	180kW	170kW	160kW	150kW	140kW	130kW	120kW
	100kW	90kW	80kW	70kW	60kW	50kW	40kW	30kW
	20kW							
400kW	350kW	300kW	250kW	200kW	150kW	100kW		

Units may be upgraded to their maximum UPS frame rating when sufficient UPMs are installed and appropriate firmware settings are implemented.

UPS Rating (max) is the maximum output possible from the UPS (for a load power factor range of 0.8 lagging to 0.8 leading). The UPS shall not require de-rating when supporting a leading or lagging power factor load of 0.8 or greater.

The UPS may be ordered with any of the optional ratings, and later upgraded to its corresponding maximum frame rating (50kW, 100kW, 150kW, 200kW, or 400kW). It is recommended that premises wiring should be sized for the maximum possible rating of the UPS (i.e. to match the UPS frame rating).

B. Acceptable UPS input sources:

1. 3-wire model UPS shall support 3-wire grounded Wye sources. A neutral conductor is not used from the source, and is not supplied to the load

   a) Single source, single or dual feed: 3-wire grounded neutral wye OR 3- wire high resistance ground

   b) Dual source, dual feed: 3-wire grounded neutral wye

   *TT sources for the UPS must all share the same ground plane. 4-wire model UPS shall support 4-wire grounded Wye sources. A neutral conductor is used from the source and is supplied to the load. Rectifier/charger input:

2. Nominal three phase input voltage: 480 Vac or 480/277Vac for 4-wire models

   3-wire plus ground for 3-wire plus ground output configuration or 4-wire plus ground for 4-wire plus ground output configuration

3. Operating input voltage range: +10%, -15% of average nominal input voltage without battery discharge. Note the UPS shall “power share” with the battery to - 30% of nominal voltage, at full rated load.

4. Operating input frequency range shall be 40 to 72Hz.

5. Input power factor 0.99 lagging at rated load.

6. Normal input current limit: The UPS shall have the following programmable input current limit settings while operating in normal mode:

   a) Rectifier/charger input current limit shall be adjustable from 100 to 115% of UPS kW rating.

   b) Battery input current limit shall be adjustable from 0 to 16.5A per 50 kW UPM module. This limit may be extended to 29.3A for loads less than 80%.

7. On generator input current limit: The UPS shall have the following programmable input current limit settings while operating in normal mode on generator:

   a) Rectifier/charger input current limit shall be adjustable from 100% to 115% of UPS full load kW rating.

   b) Battery recharge input current limit shall be adjustable from 0 to 16.5A per 50kW UPM module. This limit may be extended to 29.3A for loads less than 80%..

8. Input current total harmonic distortion (THD) shall be less than 3% at nominal line voltage and 5% nominal source impedance.

9. Power walk-in: Ramp-up to full utility load adjustable from 10 amps per second to 1 amp per second.

C. Bypass input:

1. Synchronizing bypass voltage range shall be +10, -15% of average nominal input voltage.

2. Synchronizing bypass frequency range is +/- 0.5 Hz to +/-4 Hz, user adjustable, and is centered on the nominal frequency. Default setting is +/- 4 Hz.

3. Slew rate: 0.5 Hz per second, maximum.

4. Bypass and rectifier inputs can be supplied from out of phase sources if required.

5. Input surge withstand capability: The UPS shall be in compliance with IEEE 587 (ANSI C62.41), category A & B (6kV).

D. Rectifier/charger output:

1. Nominal DC voltage shall be 432 or 480 VDC (open circuit battery voltage). For 4-wire models, nominal DC voltage shall be 480 VDC (open circuit battery voltage).

2. Capacity: The rectifier/charger shall support a fully loaded inverter and recharge the battery to 90% of its full capacity within 10 times the discharge when input current limit is set at maximum.

3. Low line operation: The rectifier/charger shall be capable of sharing the DC load with the battery when the input voltage falls below the specified operation input voltage range, the “on battery” indicator shall annunciate operation in this mode.

4. DC sensing: DC voltage sensing methods shall be incorporated for providing battery over-voltage protection.

5. Battery charger characteristics: The UPS battery charging system shall have the following characteristics:

   a) The charger shall be capable of being configured for several charge modes including:

      (1) A charging mode that increases battery life by allowing the battery to rest, reducing positive plate corrosion

      (2) A charging mode floating the battery at a set level, which can be adjusted via software.

   b) UPS module will automatically adjust battery shutdown based upon loading and battery capacity.

      (1) The UPS module shall automatically adjust the final discharge voltage between 1.67 and 1.75 Volts per cell based on the existing load and the rate and length of discharge.

      (2) The absolute minimum operational voltage is 1.67 V per cell (adjustable upward).

E. UPS output in normal mode

1. For 3-wire models, nominal output voltage 480V, 3-phase, 3-wire plus ground at the UPS output terminals, or 4 wire plus ground at the output of the IAC-D cabinet with 208V output transformer. Output wiring configuration is based upon input wiring configuration for systems without transformers. For 4-wire models, nominal output voltage 480/277V, 3-phase, 4-wire plus ground at the UPS output terminals.
2. Steady-state voltage regulation (in inverter) shall be within +/- <1% average from nominal output voltage.
3. Transient voltage response shall be per EN62040-3, Class 1, VFI-SS-111.
4. Transient voltage recovery shall be compliant to EN62040-3, Class 1, VFI-SS- 111.
5. Linear load harmonic distortion capability: Output voltage THD of less than 1% for 100% linear load.
6. Non-linear load harmonic distortion capability: Output voltage THD of less than 5% for 100% non-linear load when tested using the non-linear load described in IEC 62040-3.
7. Line synchronization range shall be +/- 4Hz, adjustable to+/-0.5 Hz.
8. Frequency regulation shall be +/- 0.1Hz free running.
9. Frequency slew rate shall be 0.5 Hz/second maximum.
   a) Phase angle control: Balanced linear load shall be <1 degree from nominal 120 degrees
10. Phase voltage control:
    a) Balanced linear loads shall be +/- 1% from average phase voltage
    b) Unbalanced linear loads shall be less than <2% from average phase voltage for 100% load unbalanced

11. Overload current capability (with nominal line and fully charged battery, non- paralleled systems):
    a) Double Conversion mode: The unit shall maintain voltage regulation for 102% to <110% of resistive/inductive load for 10 minutes, 111% to <125% for 60 seconds, and 126% to 150% for 10 seconds, >151% for 300ms.
    b) Stored energy mode (typically on battery): The unit shall maintain voltage regulation for 102% to <110% of resistive/inductive load for 10 minutes, 111% to <125% for 60 seconds, and >126% for 300ms
    c) Energy Saver System operation: Continuous = 110%. Transient = 1000% peak current for 10ms.
    d) On bypass (single UPS systems): Continuous = 125%. Transient = 1000% peak current for 10ms.

12. Fault clearing current capability: See section 12 above.

13. Static transfer time, inverter to bypass: No break, completed in less than 4ms.

14. Static transfer time, Energy Saver to inverter: No break, completed in less than 4ms maximum, typically <2ms.

15. Common mode noise attenuation:

    a) -65dB up to 20kHz, -40db up to 100kHz

    b) > 100dB with isolation transformer

16. Acoustical noise: Noise generated by the UPS under normal operation shall not exceed 65dbA at one meter from any operator surface, measured at 25 degrees C (77 degrees F) and full load, per ISO 7779 standard.

17. EMI Suppression: The UPS shall meet FCC rules and regulation 47, part 15, for Class A devices, CISPR22, and IEC62040-2 C2 and C3.

18. Electrostatic discharge (ESD): The UPS shall meet IEC61000-4-2 level 3; 4kV contact/8kV air discharge.

F. Efficiency: The UPS incorporate 3-level power converter design for highest possible efficiency. Full load efficiency for non-derated hardware shall be up to 97%, 50% load efficiency shall be 96.5%, and the UPS shall achieve >95.0% efficiency at 25% load (94% at 25% load, for 4-wire version). These numbers are for N+0 configurations only. UPS Output with Energy Saver System option

1. The Energy Saver System acts to optimize the internal components of the UPS power train to maximize system efficiency when the bypass source is within the following (adjustable) limits: Voltage: +/-10%, and Frequency: +/-3Hz.

2. For 3-wire models, nominal output voltage 480V, 3-phase, 3-wire plus ground at UPS output terminals (or 4 wire plus ground at the output of the IAC-D cabinet with transformer). Output wiring configuration is based upon input wiring configuration for systems without internal transformers. For 4-wire models, nominal output voltage 480/277V, 3-phase, 4-wire plus ground at UPS output terminals.

3. Steady-state voltage regulation shall be within +/- 10% from nominal output voltage.

4. Line synchronization range shall be +/- 4 Hz, adjustable.

5. Frequency regulation shall be +/-4 Hz when bypass source is within the limits in
(1) above, and +/- 0.1Hz free running,

6. Overload current capability (with bypass source within the limits of (1) above) Continuous: 110%, Transient: 1000% for 10msec.

7. Static transfer time: No break, typically completed in less than 2ms, including detection time.

8. Acoustical noise: Noise generated by the UPS under normal operation shall not exceed 65dbA at one meter from any operator surface, measured at 25 degrees C (77 degrees F) and full load.

9. EMI Suppression: The UPS shall meet FCC rules and regulation 47, part 15, for Class A devices, CISPR22, and IEC62040-2 C2 and C3.

10. Electrostatic discharge (ESD): The UPS shall meet IEC61000-4-2 level 3; 4kV contact/8kV air discharge.

11. Efficiency: The UPS efficiency shall greater than 99%, over the range of 25% to 100% load; for N+0 configurations only.

*Unless otherwise specified, performance data in Sec 2.05 above is measured under conditions of 100% resistive load for fully rated UPS sizes, 25 degrees C ambient temperature, nominal rectifier and bypass input voltages, and battery system floating.

2.06 MECHANICAL DESIGN

A. Enclosures: The UPS shall be housed in free-standing double front enclosures (safety shields behind doors) equipped with casters and leveling feet. The enclosures shall be designed for computer room applications. Front doors shall have locks to prevent unauthorized entry.

B. Modular construction: The UPS shall be comprised of Universal Power Modules (UPMs), each hardware-rated for 50kW, and each including the rectifier, inverter, and battery converter power and control circuitry. These UPMs shall be draw-out assemblies that can be quickly exchanged or replaced as necessary.

C. Ventilation: The UPS and shall be designed for forced-air cooling. Air inlets shall be on the front of the unit. Air outlet configuration for the UPS, and its accessory cabinet(s) shall be user selectable at time of order to exhaust warm air at the top of the cabinet (row or wall installations), or exhaust at the rear of the cabinet for “hot aisle” configurations. Eighteen inches of clearance over the UPS outlets shall be required for proper air circulation (top exhaust), or working space (rear exhaust). An air filter shall be mounted in the front door of the UPS module.

D. No back or side clearance or access shall be required for the system. The back and side enclosure covers shall be capable of being located directly adjacent to a wall.

E. Cable entry: Standard cable entry for the 50/100/150kW frame UPS cabinet shall be through the enclosure bottom. Top cable entry shall be facilitated by a sidecar which can be mounted on either side of the 50/100/150kW frame UPS. Standard cable entry for the 200kW and 400kW frame UPSs shall be through the enclosure top or bottom.

F. Front access: All serviceable subassemblies shall be modular and capable of being replaced from the front of the UPS (front access only required). Side or rear access for installation, service, repair or maintenance of the UPS system

shall not be required.

G. Service area requirements: The system shall require no more than thirty six (36) inches of front service access room and shall not require side or rear access for service or installation.

2.07 CONTROLS AND INDICATORS

A. Microprocessor controlled circuitry: The UPS controls shall have the following design and operating characteristics:

1. Fully automatic operation of the UPS shall be provided through the use of microprocessor controlled Digital Signal Processing. Start-up and transfers shall be automatic functions, and will not require operator intervention.

B. Digital Front Panel Display: The UPS control panel shall be a 7" touch sensitive, backlit LCD front panel display that includes LED indicators for basic UPS status. Large, luminous, color coded LED pillars (vertical bars) shall show the UPS status (green, amber, red), and be visible up to 30m from the UPS. The LCD shall display:

1. UPS status (home screen): the LCD screen shall have a color coded border (header) that turns red on alarm, and shows basic UPS status in the header of the display, visible at all times. The header shall alternately show UPS status output voltage and battery time remaining, and be visible constantly in all display screens. The home screen shall show load level, average efficiency, and power consumption in kWh. The home screen shall show a system mimic diagram with a color-highlighted power path, operating mode, and active events.

2. Controls tab: Shall provide touch sensitive button controls, with a confirm prompt, for turning the UPS on and off, transfer to/from bypass, and enabling or disabling the battery charger, initiating a battery test, and enabling or disabling Energy Saver System (ESS).

3. Metering tab: The metering screen shall show voltages currents, temperatures, kW, kVA, and power factor (as applicable) for the UPS input, output, bypass source, and battery. Color coded (green, amber, red) bar graph indicators will accompany power and temperature measurements

4. Logs tab: alarm/event queue, active alarms and alarm history, events, status changes and commands, all timed to the 1/1000th second for tracking and analysis.

5. Statistics tab: Numerically and graphically displays the estimated savings afforded by ESS operation over time.

C. Settings tab: shall provide button access to user adjustable settings such as, but not limited to: date/time, building alarm designations, communications parameter setup, UPS name, user passwords, and display language.

D. Control Panel Lamp Indicators: The UPS control panel shall provide the following monitoring functions with indicator (icon) LED's:

1. NORMAL: This green LED shall indicate that the commercial AC utility or generator source is supplying power to the rectifier and the inverter is

supporting the critical load.

2. BYPASS: This amber LED shall indicate that the UPS has transferred the load to the bypass circuit.

3. BATTERY: This amber LED shall indicate that the commercial AC utility or generator source has failed and the battery is supplying power to the inverter, which is supporting the load.

4. ALARM: This red LED and the accompanying audible alarm horn, shall indicate that the UPS detects an alarm condition, outlined in detail in the Logs tab from the home screen and in the operator's manual.

E. Interface panel: The UPS shall be equipped with an interface panel, located behind a protective cover, which provides the following signals and communication features in a Class 2 environment:

1. Alarm contact: A dry contact for annunciating a summary alarm shall be provided for customer use. This contact shall be Form "C" capable of supplying both N/O and N/C contacts. Contact ratings shall be 5A max at a voltage not to exceed 28VDC or 277VAC.

2. RS232 (EIA / TIA-232) and USB communications interfaces: Circuitry shall be provided for one "host", and one "device" USB connector, and one RS232 (EIA / TIA-232) communication port for connection to automated service department diagnostic tools. This port may be used with simple ("dumb") terminals to gain remote access to all unit operation information.

3. Building alarms: Five inputs shall be provided for monitoring the status of external dry contacts. Building alarms shall be set up through the UPS configuration mode function on the UPS front panel display or via the RS232 (EIA / TIA-232) port.

4. External REPO contacts: Shall be provided to connect an external remote emergency power off switch to shut down the UPS and de-energize the critical load. Normally open or normally closed contacts shall be acceptable.

5. Battery control contacts: Contacts shall be provided to connect the battery shunt trip and auxiliary contact signals from a battery breaker or battery disconnect switch.

6. External bypass indicator connection: A connection point shall be provided to acknowledge that an external maintenance bypass has been closed around the UPS, placing the critical load on utility power.

2.08 COMMUNICATIONS

A. Communications Bay: The UPS shall be equipped with field configurable communications bays that will accommodate four (4) plug-in communication devices

B. Remote Monitoring:

1. Optional WEB/SNMP communication capabilities will be available for all systems.

2. The UPS shall be able to be monitored remotely via communications devices. UPS manufacturer shall provide optional communications devices capable of communicating via various industry standard protocols such

as RS232, SNMP, BACnet and ModBus. Monitoring of UPS status may also be performed through isolated dry contact Form C relays.

The UPS communication capability should be able to integrate into any industry standard Building Management System (BMS) and/or Network Management System (NMS). The UPS must also be able to be monitored via any standard Internet browser.

All optional hardware interfaces shall be "Hot-swappable" (UPS maintains power to critical applications while changing interfaces).

C. Shutdown:

1. There shall be a mechanism that provides graceful, orderly, unattended, sequential shutdown of one or multiple computers powered by one UPS. This shutdown shall be performed via in-network or out-of-network means. The order of shutdown shall be user-defined, allowing the maximization of runtime on battery for more critical systems.

2. The UPS shall also be capable of interfacing with an operating system's built-in shutdown routine. This shall be done through a cable connection to the communication interface card.

D. Notification:

1. There shall be a mechanism to send alerts to key personnel via email or SNMP traps. An alarm notification may also be sent by a network message.

2.08 UPS MODULE PROTECTION

A. Rectifier/Charger and Bypass protection shall be provided through individual fusing of each phase.

B. kAIC rating: 65kAIC for the 50kW frame, and 100kAIC for all of the 100-400kW frames.

C. Battery protection shall be provided by thermal-magnetic molded-case circuit breakers in each battery cabinet (if standard battery pack is provided) or external protective device for an external battery.

D. Electronic current limiting circuitry and fuses in the Inverter circuit shall provide output protection.

E. To comply with agency safety requirements, the UPS module shall not rely upon any disconnect devices outside of the UPS module to isolate the battery cabinet from the UPS module.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.02 COMMISSIONING

A. Factory start-up shall be provided on a 5x8 basis (7 x 24 optional). Start-up service shall be provided at no extra charge and shall include one visit to perform all procedures and tests specified within UPS Installation and Operation

manual. UPS manufacturer shall also offer the following optional services:

1. Pre-energize visit to inspect installation and provide guidance to installers as required. Post-start-up visit for alarm notification configuration, operator training, generator testing, etc.

B. The following procedures and tests shall be performed by Field Service personnel during the UPS startup:

1. Visual Inspection:

   a) Visually inspect all equipment for signs of damage or foreign materials.

   b) Observe the type of ventilation, the cleanliness of the room, the use of proper signs, and any other safety related factors.

2. Mechanical Inspection:

   a) Check all the power connections for tightness.

   b) Check all the control wiring terminations and plugs for tightness or proper seating.

3. Electrical Pre-check:

   a) Check the DC bus for a possible short circuit.

   b) Check input and Bypass power for proper voltages and phase rotation.

   c) Check all lamp test functions.

4. Initial UPS Startup:

   a) Verify that all the alarms are in a “go” condition.

   b) Energize the UPS module and verify the proper DC, walkup, and AC phase on.

   c) Check the DC link holding voltage, AC output voltages, and output waveforms.

   d) Check the final DC link voltage and Inverter AC output. Adjust if required.

   e) Check for the proper synchronization.

   f) Check for the voltage difference between the Inverter output and the Bypass source.

   g) Optional on site full-load, step-load, and battery discharge tests using supplier furnished load bank, shall also be offered.

5. Operational Training: Before leaving the site, the field service engineer shall familiarize responsible personnel with the operation of the UPS. The UPS equipment shall be available for demonstration of the modes of operation.

3.03 WARRANTY

All components of the UPS system shall be covered by a standard one-year limited factory warranty and service protection package.

One-year limited factory warranty shall include replacement coverage for the UPS parts for a period of 18 months from shipment or 12 months from start-up, whichever occurs

sooner. Labor coverage is for 90 days after product startup.

One-year service protection package shall include 7x24 on-site repair/replacement labor for UPS parts and batteries; 7x24 technical support coverage; and 7x24 remote monitoring service (with monthly reports for UPS and battery performance). Standard response time shall be 8 hours from receipt of call. Manufacturer shall also offer, as an option, 7x24 on-site service support with guaranteed response times of 4, or 2 hours in certain major metropolitan areas. Additional preventive maintenance visits shall be available as an option for both UPS and battery components.

Manufacturer shall also include Start-up services consisting of: 7x 24 Start-up service of UPS and batteries. On-site user training, Site Audit, installation and commissioning of monitoring service, and validation of one-year limited factory warranty will be performed during the start-up.

Manufacturer shall also offer an optional service plan to provide 7x24 on-site coverage (preventive and corrective) for UPS and batteries, guaranteed response time, remote monitoring, Web access to service site history, annual Site Audit, UPS and battery preventive maintenance visit, and discounts on upgrade and modification kits. Manufacturer shall also provide an optional battery service plan to provide parts-and-labor coverage for partial and full battery strings, either with preventive maintenance or replacement coverage.

END OF SECTION

SECTION 26 5100

LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Luminaires
   2. LED Drivers
   3. Lamps
   4. Lighting Poles

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Luminaires:
   1. Reference description and manufacturers in Luminaire Schedule on Drawings.
   2. Or approved equivalent.

B. LED Drivers:
   1. Indoor Drivers:
      a. eldoLED Series
      b. Advance/Philips
      c. Osram Sylvania
      d. Or approved equivalent.
   2. Outdoor Drivers:
      a. Advance/Philips
      b. Osram Sylvania
      c. LG
      d. Or approved equivalent.

C. Lamps:
   1. LED (Light Emitting Diode) Lamps:
      a. Nichia
      b. Cree
      c. Osram Sylvania
      d. GE Lumination
      e. Or approved equivalent.
   2. Unless specific manufacturer not shown on this list is indicated in the Luminaire Schedule.
   3. Special types as indicated in Luminaire Schedule.
   4. Or approved equivalent.

D. Lighting Poles:
   1. Reference description and manufacturers in Luminaire Schedule on Drawings.
   2. Or approved equivalent.

2.02 LUMINAIRES

A. Luminaires: Reference description and manufacturers in Luminaire Schedule on drawings.

B. Where recessed luminaires are installed in cavities intended to be insulated, provide IC rated luminaires or other code approved installation.

C. UL label luminaires installed under canopies, roof or open porches, and similar damp or wet locations, as suitable for damp or wet location.

D. Suspended luminaires: Provide minimum 24-inch adjustability in aircraft cable length where used.

E. Recessed Luminaires: Frame compatible with ceiling material installed at particular luminaire location. Provide proper factory trim and frame for luminaire to fit location and ceiling material. Verify with Architectural Reflected Ceiling Plan prior to submittals.

F. Finishes:
   1. Manufacturer's standard finish (unless otherwise indicated) over corrosion resistant primer.
   2. Interior Light Reflecting Finishes: White or specular finish with not less than 85 percent reflectance.
   3. Exterior Finishes: As detailed in Luminaire Schedule or on drawings. Refer cases of uncertain applicability to Architect for resolution prior to release for fabrication.

G. Light Transmitting Components:
   1. Plastic diffusers, molded or extruded of 100 percent virgin acrylic.
   2. Prismatic acrylic, extruded, flat diffusers, 0.125-inch overall thickness, unless otherwise noted.

H. LED Luminaires:
   1. UL listing of luminaire includes drivers, transformers, enclosures, rated wire, communications devices and accessories needed for a complete and functional system.
   2. LM-79: Testing and measurement of absolute photometry, chromaticity (CCT) and luminaire power. Report provided by DOE certified independent testing laboratory. CCT as specified in Luminaire Schedule.
   3. Standards: ANSI C78.377, LM-79 and LM-82 compliant for performance characteristics, photometry, colorimetry, efficacy and thermal characteristics.
   4. LM-80 + TM-21: Testing and measurement, and statistical prediction of LED lamp life. Report provided by DOE certified independent testing laboratory.
   5. LEDs in one module/luminaire: Supplied from same batch/bin and fall within 3-step MacAdam Ellipse, or as described in Luminaire Schedule, whichever is the more stringent requirement.
   6. Provide luminaires with integral LED thermal management system (heat sinking).
   7. Luminaires to be equipped with an LED driver that accepts 120V through 277V, 50Hz to 60Hz (universal). Component-to-component wiring within the luminaire will carry no more than 80 percent of rated current and be listed by UL for use at 600VAC at 302 degrees F/150 degrees C or higher. Plug disconnects to be listed by UL for use at 600VAC, 15A or higher.
   8. Provide luminaires with individual LED arrays/modules and drivers that are accessible and replaceable from exposed side of the luminaire.

2.03 LED DRIVERS

A. General:

1. Performance: Meet dimming range called out in Luminaire Schedule, free from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experienced in a commercial environment. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
2. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
3. Minimum efficiency of 85 percent, power factor greater than or equal to 0.90, compliance with reduction of hazardous substances (RoHS). Rated for operating temperature range of area in which driver is installed.
4. Limit inrush current to minimize breaker tripping.
    a. Base specification: NEMA 410 standard for inrush current for electronic drivers.
    b. Preferred Specification: Meet or exceed 30 milliamp-squared-seconds at 277VAC for up to 50 watts of load and 75 amps at 240 microseconds at 277VAC for 100 watts of load.
5. Withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.
6. No visible change in light output with a variation of plus/minus 10 percent line voltage input.
7. Total Harmonic Distortion less than 10 percent and meet ANSI C82.11 maximum allowable THD requirements at full output. THD at no point in the dimming curve allows imbalance current to exceed full output THD.
8. Support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
    a. Adjustment of forward LED voltage, supporting 3V through 55V.
    b. Adjustment of LED current from 150mA to 1.4A at the 100 percent control input point in increments of 1mA.
    c. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.
9. Operate for a (+/- 10 percent) supply voltage of 120V through 277VAC at 60Hz.
10. UL Recognized under the component program and modular for simple field replacement. Drivers that are not UL Recognized or not suited for field replacement will not be considered.
11. Ability to provide no light output when the analog control signal drops below 0.3 V, or the DALI/DMX digital signal calls for light to be extinguished and consume 0.5 watts or less in this standby. Control dead band between 0.3V and 0.65V included to allow for voltage variation of incoming signal without causing noticeable variation in luminaire to luminaire output.

B. Light Quality:
1. Over the entire range of available drive currents, driver to provide step-free, continuous dimming to black from 100 percent to 0.1 percent and 0 percent relative light output, or 100 percent to 1 percent light output and step to 0 percent where indicated. Driver to respond similarly when raising from 0 percent to 100 percent.
    a. Driver must be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.
2. Driver must be capable of configuring a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels.
3. Drivers to track evenly across multiple luminaires at all light levels, and must have an input signal to output light level that allows smooth adjustment over the entire dimming range.

4. Driver and luminaire electronics to deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within the dimming range from 100 percent to 0.1 percent luminaire will have:
    a. LED dimming driver to provide continuous step-free, flicker free dimming similar to incandescent source.
    b. Base specification: Based on IEEE PAR1789, minimum output frequency should be greater than 1250 Hz.
    c. Preferred specification: Flicker index to be equal to incandescent, less than 1 percent at all frequencies below 1000 Hz.

C. Control Input:
1. Provide control protocol to match lighting control system specified for use with luminaire.
2. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers:
    a. Meet IEC 60929 Annex E for General White Lighting LED drivers.
    b. Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
    c. Meet ESTA E1.3 for RGBW LED drivers.

2.04 LAMPS

A. Provide lamps for luminaires.

B. Provide lamp catalogued for specified luminaire type.

C. Incandescent Lamps: Not allowed unless noted in Luminaire Schedule.

D. LED (Light Emitting Diode):
1. LED manufacturer will include, but not be limited to, light source, luminaire, power supply and control interface with added components as needed for complete and functioning system.
    a. Comply with ANSI chromaticity standard for classifications of color temperature. See Luminaire Schedule for specified LED lamp color and color temperature. UL or ETL listed and labeled.
    b. Luminaire testing per IESNA LM-79 and LM-80 procedures.
    c. Lamp life for white LEDs: 50,000 plus hours with lamp failure occurring when LED produces 70 percent of initial rated lumens.
    d. Lamp life for color LEDs: 30,000 plus hours with lamp failure occurring when LED produces 50 percent of its initial rated lumens.
    e. LED Drivers: Reverse polarity protection, open circuit protection, require no minimum load. Minimum 80 percent efficiency. Class A noise rating.
    f. Dimming: LED system capable of full and continuous dimming.
    g. Correlated Color Temperature (CCT): See Luminaire Schedule for selection of color temperature for each luminaire. Ranges given below reflect maximum allowable tolerances for color temperature range for each nominal CCT.
        1) Nominal CCT:
            (a) 2700 K (2725 ± 145)
            (b) 3000 K (3045 ± 175)
            (c) 3500 K (3465 ± 245)
            (d) 4000 K (3985 ± 275)
    h. Color Rendering Index (CRI) to be greater than or equal to 80.
2. Special types as indicated in Luminaire Schedule.

2.05 LIGHTING POLES

A. Provide exterior light poles, with concrete bases or direct buried, which are structurally supportive of pole under design loading.

B. Provide exterior poles clean and scratch free with base bolt covers to match pole and luminaire finish.

C. Provide poles and pole bases rated for a minimum of 100 MPH, unless otherwise noted. Wind EPA loading for quantity and type of luminaire it supports with a 1.3 gust factor.

D. Provide poles with gasketed handholes, stainless steel tamper resistant hardware, anchor bolts and ground lugs.

E. Description:
   1. Material: Steel, Aluminum, Treated wood, or Concrete.
   2. Shape: Tapered round, Round, or Square.
   3. Finish: Galvanized, Primed for field painting, or Anodized.
   4. Base: Embedded, Anchor, or Transformer.
   5. Accessories: Slipfitter and Mast Arms.

END OF SECTION

SECTION 27 0000

BASIC COMMUNICATIONS REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes general administrative and procedural requirements for Division 27, and is intended to supplement, not supersede, the general requirements specified in Division 00.

B. The requirements described herein include the following:

1. References
2. Definitions
3. System Description and Project Conditions
4. Submittals
5. Quality Assurance
6. Delivery, Storage, and Handling
7. Scheduling
8. Warranty
9. Product Substitutions
10. Project Management and Coordination Services
11. Permits and Inspections
12. Field Quality Control
13. Project Closeout and Record Documents

C. Related Items

1. General and Supplementary Conditions: General provisions of the Prime Contract and Divisions 00 and 01 apply to Division 27.
2. Consult other Divisions and Sections, determine the extent and character of related work, and coordinate Work of Division 27 with that specified elsewhere to produce a complete and operable installation.
3. Section 270527, “Communications Bonding”
4. Section 270528, “Communications Building Pathways”
5. Section 270811, “Communications Twisted Pair Testing”
6. Section 270821, “Communications Optical Fiber Testing”
7. Section 271100, “Communications Equipment Rooms”
8. Section 271313, “Communications Backbone ISP Twisted Pair Cabling”
9. Section 271314, “Communications Backbone OSP Twisted Pair Cabling”
10. Section 271323, “Communications Backbone ISP Fiber Optic Cabling”
11. Section 271513, “Communications Horizontal Twisted Pair Cabling”

1.02 REFERENCES

A. General

1. Codes, standards, and industry manuals/guidelines listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Consider such codes and/or standards a part of this specification as though fully repeated herein.
2. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
3. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest

edition of such publications adopted and published prior to submittal of the bid unless otherwise specifically stated.

B. Codes: Perform work and furnish materials and equipment under Division 27 in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:
   1. California Code of Regulations (CCR):
      a. Title 8, “Industrial Relations”
         1) Chapter 3.22, “California Occupational Safety and Health Regulations (CAL/OSHA)”
      b. Title 24, “California Building Standards Code”
         1) Part 1, “California Building Standards Administrative Code”
         2) Part 2, “California Building Code” (CBC)
         3) Part 3, “California Electrical Code” (CEC)
         4) Part 11, “California Green Building Standards Code” (CALGeen)”
   2. National Fire Protection Agency (NFPA)
      a. NFPA 75, “Protection of Information Technology Equipment”
   3. Code of Federal Regulations (CFR) Title 47 “Telecommunication”, Chapter I “Federal Communications Commission (FCC)”:
      a. Part 15, “Radio Frequency Devices and Radiation Limits”
      b. Part 68, “Connection of Terminal Equipment to the Telephone Network”
   4. International Code Council (ICC):
      a. “International Building Code” (IBC)
      b. “International Fire Code” (IFC)
      c. “ICC Performance Code”
   5. Other applicable national, state, and local binding building and fire codes

C. Standards: Perform work and furnish materials and equipment under Division 27 in accordance with the latest editions of the following standards as applicable:
   1. Building Industry Consulting Services International (BICSI):
      a. “Telecommunications Distribution Methods Manual” (TDMM)
      b. “Customer-Owned Outside Plant Design Manual”
   2. EIA testing standards
   3. National Electrical Contractors Association (NECA):
      a. ANSI/NECA 1-2015, “Standard Practices for Good Workmanship in Electrical Construction”
   4. Telecommunications Industry Association (TIA):
      a. ANSI/TIA-568.0-D, “Generic Telecommunications Cabling for Customer Premises”
      b. ANSI/TIA-568.1-D, “Commercial Building Telecommunications Cabling Standards”
      c. ANSI/TIA-568.2-C, “Balanced Twisted Pair Telecommunications Cabling and Components”
      d. ANSI/TIA-568.3-D, “Optical Fiber Cabling Components”
      e. ANSI/TIA-569-D, “Telecommunications Pathways and Spaces”
      f. ANSI/TIA/EIA-598-D, “Optical Fiber Cable Color Coding”
      g. ANSI/TIA-606-C, “Administration Standard for Telecommunications Infrastructure”
      h. ANSI-TIA-607-C, “Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises”
      i. ANSI/TIA-758-B, “Customer-Owned Outside Plant Telecommunications Infrastructure Standard”

j. ANSI/TIA-1005-A, “Telecommunications Infrastructure Standard for Industrial Premises”

1.03 DEFINITIONS

A. The definitions of Divisions 00 and 01 shall apply to Division 27 sections.

B. In addition to those definitions of Divisions 00 and 01, the following list of terms as used in this specification defined as follows:

1. “AFF”: Above Finished Floor
2. “As directed”: As directed or instructed by the Owner, or their authorized representative
3. “AHJ”: Authority Having Jurisdiction
4. “Cabling”: installed media ready for electronic or optical signal circuit use; a complete media connection comprised of cables, termination apparatus (patch panels, blocks, connectors), outlets, connecting media (path cord, crossconnects), labeling
5. “CBC”: California Building Code (CCR Title 24 Part 2)
6. “CCR”: California Code of Regulations
7. “CEC”: California Electrical Code (CCR Title 24 Part 3)
8. “Connect”: To install patch cords, equipment cords, crossconnect wire, etc. to complete an electronic or optical signal circuit
9. “Cord”: a length of cordage having connectors at each end. The term “Cord” is synonymous with the term “Jumper” and “Lead”
10. “Engineer”: TEECOM
11. “First-In-Place”: a single unit of work for the Owner’s and Engineer’s review and written approval prior to proceeding with the work of the entire project
12. “Furnish”: To purchase, procure, acquire, and deliver complete with related accessories
13. “General Contractor”: successful bidder
14. “Identifier”: A unique code assigned to an element of the Telecommunications infrastructure that links it to its corresponding record
15. “Install”: To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to the Owner, parts, items, or equipment supplied by contractor or others. Make installation complete and ready for regular operation
16. “IOR”: Inspector Of Record
17. “ISP”: Inside Plant
18. “LED”: Light Emitting Diode
19. “MSDS”: Material Safety Data Sheets
20. “NEC”: National Electrical Code (NFPA 70)
21. “NEMA”: National Electrical Manufacturers Association
22. “NFPA”: National Fire Protection Agency
23. “NIC”: Not In Contract (work or equipment)
24. “OFCI”: Owner-furnished contractor-installed; coordinate the integration of components furnished by the Owner; provide mounting hardware, cable, connectors, etc. to ensure proper integration of OFCI equipment
25. “OFE”: Owner Furnished Equipment
26. “OSP”: Outside Plant
27. “Owner”: CLPCCD
28. “Owner’s Representative”: ITS
29. “PDF”: portable document format (electronic file format / *.pdf)
30. “Pigtail”: a length of cordage having connectors at one end
31. “Provide”: To furnish, transport, install, erect, connect, test and turn over to the

Owner, complete and ready for regular operation

32. “UL”: Underwriters Laboratories

1.04 SYSTEM DESCRIPTION AND PROJECT CONDITIONS

A. In circumstances where the Specifications and Drawings conflict, the Drawings shall govern quantity and the Specifications shall govern quality.

1.05 SUBMITTALS

A. Submit required submittals to the General Contractor in the quantities and formats as required under the general contract. In the absence of requirements, provide as described in the following with reference to quantity and format.

B. Failure to comply with requirements in part or whole shall constitute grounds for non-review and/or rejection of resubmittal packages.

C. Resubmittals: For resubmittals, include a cover letter that lists actions taken and revisions made to each product in response to the Engineer’s submittal review comments. Lack of this actions-taken cover letter shall constitute grounds for non-review and/or rejection of resubmittal packages.

D. Obtain written approval from the Engineer for the product data submittal, the shop drawing submittal, and other required pre-construction submittals prior to materials and equipment purchase order and prior to installation.

E. Submittal Description: Product Data

1. Electronically submit the product data submittal via cloud-based project management application (such as Proliance) or as a file transfer (such as Dropbox).
2. File Format:
   a. File format shall be PDF, either as a single compiled PDF file or as a PDF portfolio.
   b. PDF files should be produced from original electronic media, not scans of printed media. If scans from prints are the only option, annotate electronically, not on the prints prior to scanning.
   c. Page size should be letter (8.5"x11").
3. Organization:
   a. Organize the Content in the following order:
      1) Cover
      2) Table of Contents (TOC)
      3) Statement of compliance
      4) Product information
      5) Seismic calculations (as required)
   b. Clearly and precisely indicate the submitted product and accessories by part number using an electronic annotation (arrow, rectangle, oval, etc.). Where the product data presents “part number builds”, list the exact part number of the submitted products and accessories.
   c. Add page numbers in numerical order with no gaps to each page that correctly correspond to the TOC.
   d. Add bookmarks to the file to improve navigation.
4. Content:
   a. Cover: Include a cover that clearly displays the following information:
      1) Owner name
      2) Project name and address
      3) Submittal name (e.g., “Product Data Submittal for Telecommunications Equipment Rooms”)
      4) Project submittal number
      5) Contractor’s submittal number (discretionary)

6) Submittal date; format: Month Day, Year (e.g., “January 1, 2020”)
7) Specification section numbers included in the submittal (e.g., “Section 271100”)
8) Contractor name and contact information

b. Table of Contents (TOC): Include a TOC that lists materials by section number, article and paragraph number. Add a brief product description (what it is, size or color or other optional features), manufacturer and part number. List the submittal page number per product. Example heading for TOC:

Section	Article	Paragraph	Description	Manufacturer	Part #	Page #

c. Statement of Compliance: Include a “Statement of Compliance” letter or memorandum on the submitter’s company letterhead from the highest ranking employee assigned to this project stating the submittal has been reviewed (quality control check) and is in full compliance with the requirements of the contract documents, and listing the submittal’s contents. Wet sign (and stamped, if applicable) the letter.

d. Product Information: Include manufacturer's technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary) that clearly describe the product’s characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color and finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements. Include products listed in the specifications, at a minimum. Include relevant products that will be installed, which are not listed in the specifications.

e. Seismic Calculations: Include structural calculations for anchorage and seismic restraint of floor-mounted equipment (such as racks, frames, cabinets), wall-mounted equipment (such as video display equipment, etc.), and overhead-mounted equipment (such as cable tray, overhead cable support, etc.) in conformance with CBC, Chapter 16. Calculations shall be based on fully loaded equipment and support systems. Calculations shall demonstrate that the equipment and support systems will remain attached to the mounting surface during and after experiencing seismic forces in conformance with the CBC. A Structural Engineer registered in the State of California shall prepare Structural Calculations and shall wet stamp and sign them. Obtain approval from DSA for the calculations.

F. Submittal Description: Shop Drawings

1. Electronically submit the shop drawings submittal via cloud-based project management application (such as Proliance) or as a file transfer (such as Dropbox).
2. Format:
   a. Use the same sheet size as the contract drawings.
   b. Use the same title block as the contract drawings, modified to include contractor information.
   c. Text: 3/32" - 1/8" high when plotted at full size.
   d. Symbols should match those in the contract documents.
   e. Screen background information.
   f. Plot system components (symbols, outlet, devices, pathways, cable

routes, etc.) and text using a heavier line weight sufficient enough to stand out against background information.

g. Scaling:
   1) Scale floor plans and reflected ceiling plans at 1/8"=1'-0"
   2) Scale enlarged room plans at 1/4"=1'-0"
   3) Scale wall elevations at 1"=1'-0"
   4) Scale rack elevations at 1"=1'-0"

3. Content:
   a. Cover Letter: Accompany each shop drawing submittal with a cover letter stating that the shop drawings have been thoroughly reviewed by the Contractor and are in full compliance with the requirements of the contract documents. Have the person who prepared the submittal sign (and stamped, if applicable) the cover letter and include a drawing index.
   b. Drawings: Shop drawing submittals shall consist of symbols list, point-to-point diagrams, block diagrams, riser diagrams, line diagrams, floor plans, reflected ceiling plans, enlarged room plans, wall and rack elevations, installation details, and other aspects of the system. Include detailed labeling examples for cables, outlets, termination apparatus, devices, equipment, etc.
   c. Seismic Calculations: Include structural calculations for anchorage and seismic restraint of floor-mounted equipment (such as racks, frames, cabinets), wall-mounted equipment (such as video display equipment, etc.), and overhead-mounted equipment (such as cable tray, overhead cable support, etc.) in conformance with CBC, Chapter 16. Calculations shall be based on fully loaded equipment and support systems. Calculations shall demonstrate that the equipment and support systems will remain attached to the mounting surface during and after experiencing seismic forces in conformance with the CBC. A Structural Engineer registered in the State of California shall prepare Structural Calculations and shall wet stamp and sign them. Obtain approval from DSA for the calculations.

G. Submittal Description: As-Built Drawings
1. As-built drawings shall accurately represent actual installed conditions and shall incorporate modifications made during construction.
2. Electronically submit the as-built drawings submittal via cloud-based project management application (such as Proliance) or as a file transfer (such as Dropbox).
3. Format:
   a. Electronic files shall include native format and plotted PDF files. The file names shall include the sheet number.
   b. Use the same sheet size as the approved shop drawings.
   c. Use the same title block as the approved shop drawings.
   d. Text: 3/32" - 1/8" high when plotted at full size.
   e. Use symbols identical to the symbols shown on the approved shop drawings.
   f. Screen background information.
   g. Plot system components (symbols, outlet, devices, pathways, cable routes, etc.) and text using a heavier line weight sufficient enough to stand out against background information.
4. Content:
   a. Title Sheet, including symbols list and sheet index

b. Diagrams, such as (but not limited to) point-to-point diagrams, block diagrams, riser diagrams, line diagrams, and other diagrams that conceptually describe the system

c. Floor Plans and Reflected Ceiling Plans: Scale plans at 1/8”=1’-0”. Plans shall show:
   1) Locations and identifiers of telecommunications outlets
   2) Routes, types, sizes, and quantities of pathways (such as cable trays, conduits, hangers, and other pathways)

d. Enlarged Rooms Layouts: Applicable rooms: Entrance facilities (MPOE), DAS. Room drawings shall show:
   1) Floor layouts – scaled at either 1/4"=1’-0" or 1/2"=1'-0", showing dimensioned placement of equipment cabinets/frames, rack bays, etc.
   2) Overhead layouts – scaled at either 1/4"=1'-0" or 1/2"=1'-0", showing dimensioned placement of overhead cable support (e.g., cable tray, cable runway, conduit sleeves, etc.)
   3) Rack elevations – scaled at 1"=1'-0", showing placement of termination apparatus and other equipment installed onto rack bays
   4) Wall Elevations – scaled at 1"=1'-0", showing dimensioned placement of termination apparatus (e.g., termination/crossconnect blocks

H. Submittal Description: Operation and Maintenance (O&M) Manual

1. Quantity and Media: Submit O&M Manual as described in Division 01. In the absence of requirements given, submit one packaged O&M Manual set and one electronic copy.
2. Electronic Submission: Submit the product data submittal via a file transfer (such as Dropbox).
3. Electronic Format:
   a. File format shall be PDF, either as a single compiled PDF file or as a PDF portfolio.
   b. PDF files should be produced from original electronic media, not scans of printed media. If scans from prints are the only option, annotate electronically, not on the prints prior to scanning.
   c. Page size should be letter (8.5"x11") or full size for drawings.
   d. Insert bookmarks to improve navigation through the file.
4. Printed Format:
   a. Package contents in a 3-ring binder with front cover and spine clear pockets for insertion of the submittal information.
   b. Page size should be letter (8.5"x11") or tabloid (17"x11") for drawings.
   c. Include tabbed separators to improve navigation through the manual.
5. Content and Organization:
   a. Cover, showing the following information
      1) Owner name
      2) Project name and address
      3) Manual name (e.g., “Operation and Maintenance Manual for Telecommunications Cabling System”)
      4) Date; format: Month Day, Year (e.g., “January 1, 2020”)
      5) Contractor name and contact information
   b. Table of Contents (TOC)
   c. Product information (the final approved product submittal and updates

through construction)

d. As-built drawings (the final approved as-built submittal)
e. Seismic calculations (the final approved product submittal)
f. Warranty Information
    1) Warranty certificate from the manufacturer and the contractor
    2) Instructions on making a warranty claim during the warranty period
    3) Contact information during the warranty period
    4) Contact information beyond the warranty period for maintenance and related service
g. Manufacturer's instructions for system or component use
h. Instructions and requirements for proper maintenance (according to the manufacturer) and as to maintain warranty

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications
    1. Five continuous years, minimum, design and manufacture of the materials and equipment specified herein.
    2. Manufacturer(s) of products and equipment specified herein shall demonstrate that they have a quality assurance program in place to assure that the specifications are met. Include in the program, at a minimum, provisions for:
        a. Incoming inspection of raw materials
        b. In-process inspection and final inspection of the cable product
        c. Calibration procedures of test equipment to be used in the qualifications of the product
        d. Recall procedures in the event that out of calibration equipment is identified.
    3. Conform to government standards on quality assurance for applications within these specifications.

B. Contractor Qualifications
    1. A current, active, and valid and C7 or C10 California State Contractors License
    2. Five, minimum, continuous years of experience
    3. Five, minimum, completed projects of similar scope and cost
    4. Evidence of technicians qualified for the work (such as successfully completed training by the cabling vendor or BICSI, etc.)
    5. The Contractor shall be a SYSTIMAX certified installer (authorized SYSTIMAX reseller) and capable of providing a "SYSTIMAX" warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid submission.

C. Materials
    1. Materials, support hardware, equipment, parts comprising units, etc., shall be new, unused, without defects and of current manufacturer, materials
    2. Use specified products and applications, unless otherwise submitted and approved in writing.

D. Regulatory Requirements
    1. Work and materials shall conform to the latest rules of National Board of Fire Underwriters wherever such standards have been established and shall conform to the regulations of the State Fire Marshal, OSHA and the codes of the governing local municipalities. Work under Division 27 shall confirm to the most stringent of the applicable codes.
    2. Provide the quality identified within these specifications and drawings when codes, standards, regulations, etc. allow Work of lesser quality or extent. The

contract documents address the minimum requirements for construction.

E. Drawings
   1. Follow the general layout shown on the contract drawings except where other work may conflict with the drawings.
   2. Contract drawings for the work within this division are essentially diagrammatic within the constraints of the symbology applied.
   3. Contract drawings do not fully represent the entire installation. Rather, they indicate the general route for pathways and cables and show general locations of outlets. Contract drawings might not expressly show every conduit, sleeve, hanger, etc.; regardless, a complete system is required.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery
   1. Do not deliver products to the site until protected storage space is available.
   2. Coordinate materials delivery with installation schedule to minimize storage time at jobsite.
   3. Deliver materials in manufacturer's original, unopened, undamaged packaging and containers with identification labels (name of the manufacturer, product name and number, type, grade, UL classification, etc.) intact.
   4. Immediately replace equipment damaged during shipping at no cost to the Owner, so as not to impact the construction schedule.

B. Storage and Protection
   1. Store materials in clean, dry, ventilated space free from temperature and humidity conditions (as recommended by manufacturer) and protected from exposure to harmful weather conditions.
   2. Comply with manufacturer's storage requirements for each product. Comply with recommended procedures, precautions or remedies as described in the MSDS as applicable.
   3. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.
   4. Storage outdoors covered by rainproof material is not acceptable.
   5. Provide heat where required to prevent condensation or temperature related damage.

C. Handling
   1. Handle materials and equipment in accordance with manufacturer's written instructions. Handle with care to prevent damage, breakage, denting, and scoring.
   2. Do not install damaged materials and equipment. Replace damaged equipment at no cost to the Owner.

1.08 SCHEDULING

A. Unless otherwise specified, the construction schedules of the Sections within Division 27 may be combined into a single, overall schedule.

B. Do not proceed without written approval from the Owner or Owner’s Representative for schedule of this Work.

1.09 PROJECT MANAGEMENT AND COORDINATION

A. Concurrent Installation
   1. The network will be installed concurrent with the work of Division 27. Coordinate your work with the Owner’s/network integrator’s work. For example, coordinate scope and dates for rack and cabling (terminations) readiness to allow the network integrator to plan and schedule installation of the network equipment (for example, access switches).

B. Role of the Engineer
   1. The network will be installed concurrent with the work of Division 27. Coordinate your work with the Owner's/network integrator's work. For example, coordinate scope and dates for rack and cabling (terminations) readiness to allow the network integrator to plan and schedule installation of the network equipment (for example, access switches).

C. Use of Electronic Drawing Files
   1. Should the Contractor require the Engineer's electronic files to produce shop drawings and/or as-built drawings, the Engineer will require the Contractor sign a file release agreement.

1.10 WARRANTY

A. The horizontal cabling system, as specified in this section, shall carry a "25-Year SYSTIMAX Structured Connectivity Solutions Extended Product Warranty and Application Assurance" supporting applicable cabling systems.

B. Render service within 24 hours of system failure notification. Note deviations or improvements to this service at the time of bid and obtain written acceptance from the Owner, or Owner's Representative.

C. Manufacturers of the major system components shall maintain a replacement parts department and provide testing equipment when needed. Provide complete replacement parts within 24 hours during the warranty period.

D. Conformance to certain government standards on quality assurance may be required for some applications outlined in these specifications.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials used shall present no environmental or toxicological hazards as defined by current industry standards and shall comply with OSHA and EPA standards, other applicable federal, state, and local laws.

B. Product numbers are subject to change by the manufacturer without notification. In the event a product number is invalid or conflicts with the written description, notify the Engineer in writing prior to ordering the material and performing installation work.

2.02 PRODUCT SUBMITTAL AT TIME OF BID

A. At the time of bid, include a list of major products in the Contract documenting the intended cabling system solution.

2.03 SUBSTITUTIONS

A. Conform to the substitutions requirements and procedures outlined in Division 01.

B. Only one substitution for each product specified will be considered.

C. Where products are noted as "or equal", a product of equivalent design, manufacture, and performance will be considered. Submit product data (product information, catalog cuts, pertinent test data, etc.) to substantiate that the product is in fact equivalent to that specified. The burden of proof that the substituted product is equivalent to the specified product rests with the Contractor. Whenever material, process or equipment is specified in accordance with an industry specification (ANSI, TIA, etc.), UL rating, or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, submit supporting test data to substantiate compliance.

D. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the contract documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment that, in the opinion of the Engineer, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when "or equal" follows the manufacturers' names or model

number(s).

E. When the Engineer accepts a substitution in writing, it is with the understanding that the Contractor guarantees the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction according to contract documents. Do not provide substituted material, processes, or equipment without written authorization from the Engineer. Assumptions on the acceptability of a proposed substitution, prior to acceptance by the Engineer, are at the sole risk of the Contractor.

F. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from provisions of the specifications.

G. Pay expenses, without additional charge to the Owner, in connection with substitution materials, processes and equipment, including the effect of substitution on self, subcontractor's or another Contractor's work.

PART 3 - EXECUTION

3.01 PERMITS AND INSPECTIONS

A. Obtain and pay for permits and inspections required for the work.

B. Furnish materials and execute workmanship for this work in conformance with applicable legal and code requirements.

C. Perform tests required herein, or as may be reasonably required to demonstrate conformance with the Specifications or with the requirements of legal authority having jurisdiction.

D. Arrange and pay for review/inspection from compliance officials responsible for enforcement of applicable codes and regulations to establish that the work is in compliance with requirements of reference codes indicated herein.

3.02 EXAMINATION

A. Verify existing conditions, stated under other sections, are acceptable for installation in accordance with manufacturer's instructions.

B. Verify cable routes and lengths prior to pulling cables. Immediately notify the Engineer if actual lengths are expected to exceed project’s maximum length requirement(s).

3.03 FIELD QUALITY CONTROL

A. Staffing: Provide a qualified foreman to supervise the crew performing the work and who is present at the job site at times work is being performed.

B. Construction Meetings: Participate in construction coordination meetings throughout the course of construction to review the progress and to resolve issues and conflicts. Prepare and distribute meeting agenda for telecommunication issues prior to, and meeting notes after meetings, in a format acceptable to the Owner. Publish meeting notes within 3 business days following the meeting.

C. Scheduling: Perform the work within the approved construction schedule. Keep the construction schedule current, based on the results of the construction meetings. At minimum, schedule shall document critical due dates, tasks, and milestones. Submit revised schedules for approval within 3 business days whenever there are modifications.

D. Inspection: Inspect the work after installation. Keep areas of work accessible and notify code authorities, or designated inspectors, of work completion ready for inspection. Document completion and inspection as required.

3.04 INSTALLATION

A. Complete work in conformance to applicable federal, state and local codes, and telephone standards.

B. Complete work in a neat, high-quality manner, relative to common industry practices, and in accordance to NECA “Standard of Installation”.

C. Coordinate the entire installation throughout the construction team (general contractor

and subcontractors).

D. Manufacturer's Instructions: Comply with manufacturer's published installation instructions, product data, product technical bulletins, product catalog, and other instructions for installation. Maintain a file on the jobsite of MSDSs for each product delivered to jobsite packaged with an MSDS.

E. Adjusting: Make changes and revisions to systems to optimize operation for final use. Make changes to systems such that defects in workmanship are corrected and completed systems pass the minimum test requirements.

F. Protection: Protect installed products and finish surfaces from damage during construction.

G. Repair/Restoration: Replace or repair work completed by others that you deface or destroy. Pay the full cost of this repair/replacement. Repair defects prior to system acceptance.

3.05 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Remove unused, excess, and left over products, debris, spills, or other excess materials. Remove installation equipment.

B. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.

C. Repair or replace damaged installed products.

D. Legally dispose of debris.

E. Clean installed products in accordance with manufacturer's instructions prior to Owner's, or Owner’s Representative’s, punch walk.

3.06 PUNCH WALKS AND PUNCH LISTS

A. Punching the work of individual sections of Division 27 may be combined when noted so.

B. Execute a punch walk with the Engineer and the Owner or Owner’s Representative to observe Work.

C. Develop a punch list for items needing correction. Issue this punch list to Engineer.

D. Correct the Work as noted on punch list.

E. Execute follow up punch walk with the Engineer and the Owner or Owner’s Representative to verify punch list items have been corrected.

3.07 SYSTEM ACCEPTANCE

A. Complete corrections (punch list items) prior to submitting acceptance certificate.

B. On completion of the acceptance test, submit system acceptance certificate to the Owner or Owner’s Representative requesting their signature and return of the certificate. Issue copies of the signed certificate back to the Owner or Owner’s Representative with copy to the Engineer.

3.08 TRAINING

A. After acceptance, schedule a time convenient with the Owner, or Owner's Representative, for instruction in the configuration, operation, and maintenance of the system.

B. Refer to individual sections within Division 27 for additional training requirements.

END OF SECTION

SECTION 27 0527

COMMUNICATIONS BONDING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Bonding of telecommunication support infrastructure and equipment to approved grounding points (such as the common bonding network) for telecommunications.

B. Base Bid Work

1. The work under this section includes materials, accessories, etc., includes labor and associated services required to bond telecommunications support infrastructure and ITE to approved grounding points, and includes coordination with other trades through (as needed) the General Contractor. This specification lists major equipment but not every wire support, fastener, hardware, etc., required for a complete and professional installation.
2. Provide bonding within telecommunications rooms between the approved grounding points for telecommunications and the components shown on the drawings, such as the following:
   a. Rack bays: equipment racks, vertical management sections, frames, frame bays, cabinets, and other similar support infrastructure
   b. IT/Server cabinets
   c. Overhead cable support (e.g., cable tray, runway) and vertical cable support (e.g., cable runway)
   d. Termination apparatus (e.g., shielded panels, wall-mounted 110 blocks)
   e. Conduit longer than 1 meter, including ground bushings
   f. Exit pathways
3. Provide labeling consisting of, in general, 1 label at each end of each bonding conductor (e.g., TEBCs and RBBs).
4. Testing, to ensure connection integrity and minimum resistance performance has been attained.

C. Work provided under another Section

1. Common Bonding Network (CBN): The CBN (or grounding backbone) includes busbars, backbone conductors, and connecting components (lugs, clamps, exothermic welds, etc.) to form a low impedance path to the building's grounding electrode system for stray voltages or spurious signals that may be induced onto telecommunications support infrastructure (e.g., racks, cable tray, etc.), telecommunications media (e.g., cabling), and ITE. Refer to section 260526 for detailed information regarding the CBN.
2. Grounding Electrode System: The grounding electrode system includes grounding (earthing) electrodes and grounding electrode conductors to establish a 0 volt reference for electrical power systems and to provide a path for the dissipation of currents due to lightning, accidental contact with high voltage systems, and/or electrostatic discharge. Refer to section 260526 for detailed information regarding the grounding electrode system.

D. Related Sections

1. Comply with the Related Sections requirements of section 270000.
2. Section 260526, "Grounding"

1.02 REFERENCES

A. Comply with the References requirements of section 270000.

B. In addition to the codes and standards listed in section 270000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
   1. California Administrative Code, Title 24, Part 3, “California Electrical Code” (CEC)
   2. Underwriters Laboratories, Inc. (UL) 467, “Grounding and Bonding Equipment”
   3. Telecommunication Industry Association (TIA) ANSI/TIA-607-C, “Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises”
   4. Building Industry Consulting Services International (BICSI) “Telecommunications Distribution Methods Manual” (TDMM), particularly “Bonding and Grounding (Earthing)” chapter
   5. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
      a. IEEE 467, “IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems”
      b. IEEE P1100, “IEEE Recommended Practice for Powering and Grounding Electronic Equipment in Industrial and Commercial Power Systems”

1.03 DEFINITIONS

A. Definitions as described in section 270000 shall apply to this section.

B. Definitions as described in TIA-607 shall apply to this section.

C. In addition to those Definitions of section 270000, the following list of terms (definitions, acronyms, and abbreviations) as used in this specification are defined as follows:
   1. “ACEG”: alternating current equipment ground (such as a ground bus in an electrical panel)
   2. “AWG”: American wire gauge
   3. “Bond”: (*n*): a set of components consisting of a wire, connectors/terminals, and associated hardware (screws, bolts, washers, nuts, etc.) for joining metallic parts to intentionally create an electrically conductive path; (*v*): to provide a TEBC between support infrastructure (such as racks) or ITE and an approved grounding point
   4. “CBC”: coupled bonding conductor (such as a cable shield)
   5. “CBN”: Common Bonding Network
   6. “CM” and “cmil” (*unit of area*): a millionth of a circular inch
   7. “ITE”: information technology equipment
   8. “PBB”: primary bonding busbar
   9. “SBB”: secondary bonding busbar
   10. “RBB”: rack bonding busbar
   11. “RBC”: rack bonding conductor
   12. “TBB”: telecommunications bonding backbone (conductor)
   13. “TBC”: telecommunications bonding conductor (a conductor that connects the telecommunications bonding infrastructure to the MBGRB)
   14. “TEBC”: telecommunications equipment bonding conductor
   15. “THHN”: thermoplastic high heat-resistant nylon-coated (*insulation/jacket*)
   16. “TR”: telecommunications room
   17. “UBC”: unit bonding conductor (e.g., a sing unit of equipment)

1.04 SYSTEM DESCRIPTION

A. Bonding shall comply with applicable codes and with TIA’s 607 standard and BISCI’s TDMM.

B. Approved Grounding Point: An approved grounding point is component of the CBN (thus providing a low impedance path to earth) that satisfies the applicable electrical code and is designed to receive bonding conductor connections. An example of an approved grounding point for telecommunications bonding is a busbar (PBB or SBBs) present

within each telecommunications room.

C. Approved Conductors for Bonding:
   1. Conductors approved for telecommunications bonding include an insulated copper wire (THHN or other approved wire) used in conjunction with approved connection/termination components.
   2. Bare copper may be considered for certain applications (such as the bonding conductor for cable tray or runway or for a MBN) but remain subject to approval by the Engineer.
   3. Conductor Sizing: Refer to drawings for conductor sizing.

D. Approved Connections / Termination Components: The following connection types are approved for the associated applications, subject to submittals:
   1. Approved connection types, though final approved connection products/components are subject to submittals.

Conductor-To-	Preferred Connection	Alternate Connection
Conductor	C-tap or H-tap compression connectors	Exothermic weld
Busbar	2-hole compression lug	
Equipment Rack	2-hole compression lug	screw terminal block (only if 2-hole can't work)
Server/IT Cabinet	2-hole compression lug	As needed for cabinet's bonding stud
Cable Tray, Ladder	2-hole compression lug	Lay-in terminal block
Cable Tray, Wire Mesh	Split-Bolt	
Cable Runway	2-hole compression lug	

E. Approved Rack Bay Bonding: Refer to the drawings for approved rack bay bonding. If not explicitly shown, string is the approved configuration for rack bay bonding as follows:
   1. Provide a TEBC from the SBB along the length of each rack bay routed as shown on the drawings or adjacent to the overhead cable support. The TEBC shall be continuous and not interrupted at connection points. Connect the TEBC to the SBB using an approved connection.
   2. Provide a pigtail from the TEBC to each rack. Connect pigtails to the TEBC and to racks using approved connections.

F. Approved Server Cabinet Bonding: Refer to the drawings for diagrammatic requirements for approved server cabinet bonding. If not explicitly shown, the following is an approved configuration for server cabinet bonding.
   1. Provide a TEBC from the SBB along the length of each server cabinet row routed as shown on the drawings or adjacent to the overhead cable support. The TEBC shall be continuous and not interrupted at connection points. Connect the TEBC to the SBB using an approved connection.
   2. Provide a pigtail from the TEBC to each cabinet. Connect pigtails to the TEBC and to cabinets using approved connections. Connect pigtails to cabinets either at the frame or at the cabinet's bonding stud.

G. Overhead and Vertical Cable Support Bonding: Bond overhead and vertical cable support (e.g., cable tray, runway) using the following acceptable configurations:
   1. If the installed cable support system is UL List as a bonding conductor:
      a. Provide a TEBC from the busbar to the overhead cable support. Provide UL Listed splice and junction kits.
      b. Provide a TEBC to each section of vertical cable support. If multiple sections of vertical cable support are installed, then the sections can be bonded in series using a common lug or connection point per section.

2. If the installed cable support system is not UL Listed as a bonding conductor
   a. Provide a TEBC to and route along the entire length of the overhead cable support, bonding the TEBC to each section, fitting, etc.>

H. Termination Apparatus Bonding: Bond the back panels of wall-mounted 110 blocks to the busbar within the same room or space. Termination apparatus may be bonded in a string configuration or in a series configuration with a single connection point per object.>

1.05 SUBMITTALS

A. Comply with Submittal requirements of section 270000 for procedure, quantity, and format.

B. Submittal Requirements at Start of Construction:
   1. Product Data submittal: Submit cutsheets of the products used for communications bonding, clearly indicating product numbers, size, color, option, etc.
   2. Bonding Configurations submittal: Submit a narrative supplemented with (as appropriate) sketches and/or diagrams to clearly describe the intended configurations of bonding throughout the project. Given that bonding configuration can depend upon product certifications and use listings, submit both the product data and bonding configurations submittals together.

C. Substitutions
   1. Requests for substitutions shall conform to the general requirements and procedure outlined in section 270000.

D. Submittal Requirements at Closeout:
   1. As-Built drawings: Include bonding in the telecommunications rooms as-built drawings submittal (refer to section 271100).
   2. Test Report submittal, consisting of the recorded resistance measurements.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of section 270000.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of section 270000.

1.08 WARRANTY

A. Warrant the work to perform as described within this Section for a period of 1 year. Correct deficiencies within 24 hours of notification.

PART 2 - PRODUCTS

2.01 GENERAL

A. Conductors, connectors, busbars, and other products shall be UL Listed for the purpose used.

2.02 CONDUCTOR / WIRE

A. Type THHN, or equal

B. Conductor: soft annealed bare copper (per ASTM B-3) solid or standard (per UL 83), 6 AWG or larger (sized as required per Part 1)

C. Insulation: low smoke (VW-1 or CT rated) thermoplastic compound (such as polyvinyl chloride/PVC). Outside jacket: clear, heat stabilized, abrasion resistant nylon

D. Color (insulation): green, or green with a yellow stripe

E. Manufacturer, or equal:
   1. General Cable (Prysmian Group)
   2. Southwire

2.03 CONNECTORS

A. Lug, 2-hole, Compression Type
   1. Application: conductor-to-surface (e.g., TEBC-to-busbar or RBC-to-rack/cabinet)
   2. Standard (or long) compression-type barrel lug, 2-hole (1/4” dia. x 5/8” on center)

3. Manufacturer, or equal:
   a. Chatsworth Products Inc #40162-901; compression lug for 6 AWG conductor
   b. Panduit #LCC6-14AW-L; compression lug for 6 AWG conductor

B. "C" Tap, compression type
1. Application: conductor–to–conductor connection (e.g., run-to-tap off) and conductor–to–wire mesh cable tray connection
2. Material: copper thick wall for compression, tinned or not tinned
3. Manufacturer, or equal:
   a. Chatsworth Products Inc
      1) #40163-001; C-tap for 6-4 AWG run –to– 6 AWG tap
      2) #40163-004; C-tap for 2 AWG run –to– 2 AWG tap
   b. Panduit
      1) #CTAPF4-12TP-C; C-tap for 6 AWG run –to– 6 AWG tap
      2) #CTAPF1/0-12TP-L; C-tap for 1/0 AWG run –to– 6 AWG tap
      3) #CTAPF2/0-12TP-Q; C-tap for 2/0 AWG run –to– 6 AWG tap

C. Split-Bolt
1. Application: conductor–to–wire mesh cable tray connection
2. Material: high-strength copper alloy
3. Manufacturer, or equal:
   a. [Eaton] Cooper B-Line #GROUND BOLT; split bolt bonding clamp
   b. Panduit #SBC3-C; split-bolt connector for #6 AWG (#8 to #4) conductor

2.04 BONDING JUMPER
A. Bonding jumper shall be UL Listed, at least fabricated of UL Listed components.
B. Bonding jumper shall consist of a 6 AWG conductor, insulated or non-insulated, terminated at both ends via 2-hole compression lugs.
C. Length: 6 to 12 inches (150 to 300 mm), or as needed.
D. Manufacturer, or equal:
1. CPI #40164-001; bonding jumper (strap), #6, 8 inches

2.05 ANTIOXIDANT JOINT COMPOUND
A. Application: Compound to inhibit oxide forming at copper-to-copper, aluminum-to-aluminum or aluminum-to-copper connections.
B. Manufacturer, or equal:
1. Chatsworth Products Inc
   a. #40168-801; antioxidant joint compound for copper-to-copper connections
   b. #40166-801; antioxidant joint compound for aluminum-to-aluminum or aluminum-to-copper connections
2. [Eaton] Cooper B-Line
   a. #SBJCC; antioxidant joint compound for copper-to-copper connections
   b. #SBJCA; antioxidant joint compound for aluminum-to-aluminum or aluminum-to-copper connections

2.06 LABELS
A. Labels shall be machine-printable (such as by a laser printer or hand-held printer).
B. Conductor/Wire Labels
1. Labels for wires shall be either of the following types:
   a. Tape – adhesive-backed, wrap-around, self-laminating
   b. Strip – adhesive backed, under shrink-wrap
2. Face stock (print area) shall be white.
3. Size: as needed fit around the insulated wire and to fit the full identifier (at least 1" wide).

4. Manufacturer, or equal:
    a. Brady
    b. Brother
    c. DYMO XTL or Rhino
    d. Panduit
        1) #S100X125YAJ; self-laminating cable label, for cable diameters 0.12"-0.28", white face stock 1"W x 0.38"H
        2) #S100X150YAJ; self-laminating cable label, for cable diameters 0.16"-0.32", white face stock 1"W x 0.5"H
        3) #S100X225YAJ; self-laminating cable label, for cable diameters 0.24"-0.48", white face stock 1"W x 0.75"H

PART 3 - EXECUTION

3.01 GENERAL
- A. Comply with the Execution requirements of section 270000.
- B. Install products according to the manufacturer's installation instructions.
- C. The completed binding shall conform to applicable codes.

3.02 EXAMINATION AND PREPARATION
- A. Prior to the start of work of this section, examine communications rooms and CBN and MBN for completeness, compatibility, and readiness for connections with the work of this section.

3.03 INSTALLATION
- A. TEBCs:
    1. Install TEBCs in a manner that will protect them from damage.
    2. Route TEBCs in the shortest practical path between connection points and with as few bends as possible – no bend shall be sharper than an 8-inch radius.
    3. Route TEBCs near other wall-mounted equipment or at the outside edges of backboards. Do not cut across the middle/usable area of the backboard (thus, taking space away from wall mounted equipment/apparatus). Secure TEBCs in place using approved support means
    4. Install TEBCs exterior of cable trays and cable runways (e.g., on the side wall / stringer). Support TEBCs along the sidewalls and/or stringers by approved support means. Do not route TEBCs through fully encircled metallic apparatus, such as through wire mesh cable tray or through the rungs of cable runway.
    5. When passing TEBCs through floors or walls, first install a sleeve long enough to extend between 1/2" to 2" from the floor/wall (both sides). Then pull the conductor through the sleeve. Sleeves should be 1.5" PVC or other approved non-metallic sleeves. If metallic sleeve, then bond the TEBC to the sleeve if longer than 1 m (~3').
    6. When pulling TEBCs through metallic conduit, bond the TEBC to each end of the conduit using grounding bushings or conduit clamp (pipe clamp), a 6 AWG pigtail, and an irreversible conductor-to-conductor connector.
    7. Approved Support Means: non-metallic clamps, clips, or similar management/attachment components; devices that do not form a closed metallic ring around the conductor.
    8. Install heat shrink end caps onto the free ends of insulated conductors (ends otherwise not captured within a connector).
- B. RBCs:
    1. Install RBCs in a manner that will protect them from damage.
    2. Route RBCs outside of the top angles, not through the enclosed top angles.

C. At connection points:
1. Thoroughly clean connection surfaces prior to attaching connection/termination components.
2. At painted surfaces (such as racks, cabinets, cable tray, runway, etc.), remove paint to completely expose metal – enough for the connector to make 100% contact by area with the surface.
3. Apply antioxidant joint compound to the surface prior to receiving connection/termination components.
4. Attach connection/termination components using hardware sets appropriate for the connector and receiving surface. Tighten hardware sets.
a. For lugs at holes, use appropriately sized bolt, flat washer, Belleville or split washer, and nut.
b. For lugs at studs, use appropriately sized flat washer, Belleville or split washer, and nut.
5. Connections shall be visible, accessible and verifiable.

D. Rack Bay, Server Cabinet, and Overhead and Vertical Cable Support Bonding
1. Refer to the drawings for diagrammatic requirements for bonding rack bays, server racks, and overhead and vertical cable support.
2. Bond equipment racks, frames, frame bays, cabinets, server racks, and other similar support systems located within the same room or space as the TMGB/TGB to the busbar.
3. If the point of connection is painted, remove the paint to attain a metal-to-metal connection.
4. Where equipped on racks and/or cabinets, utilize the intended connection point, such as threaded studs for receiving lugs. Install the connector using properly sized hardware sets (nuts, washers).
5. Apply antioxidant compound at the point of connection.

3.04 TESTING

A. Test the bonding between the busbar and each the following objects:
1. Equipment racks
2. IT/Server cabinets
3. Overhead cable support
4. Termination apparatus
5. Conduit longer than 1 meter, including ground bushings
6. Exit pathways

B. Testing shall consist of a 2-point resistance measurement using a grounding resistance test set configured for a continuity test.

C. Testing Procedure:
1. Connect meter leads to the busbar (to include the TEBC terminal's connection to the busbar) and directly to the object being bonded (to include the TEBC/RBC terminal's connection to the object) such as an equipment rack.
2. For bonding configurations with multiple objects (such as rack bays in a string configuration), test each object to ensure connection integrity per object.
3. Record each measurement.

D. The maximum resistance value shall not exceed 0.1 Ohms. If a test result exceeds the maximum resistance, then trouble shoot and repair the bonding to attain this requirement.

3.05 LABELING

A. General Requirements
1. Labeling, identifier assignment, and label colors shall conform to the TIA-606 standard and/or as approved by the Engineer before installation.
2. Label text shall be machine-generated; hand written labels will not be accepted.

B. Text Attributes
   1. Color: black
   2. Size: approx. 1/8" high (#12 font size).

C. Identifier System
   1. TEBCs: Identifier format for TEBCs attached to a PBB/SBB busbar: *fs*-TEBC/*object*, where:
      a. "*fs*" = space identifier (refer to 271100 for space identifier)
      b. "*object*" = object being bonded, such as "Rack Bay"
      c. Example: "2A–TEGB/RackBay"

D. Label Installation
   1. Install labels such that they are visible during normal maintenance.
   2. Conductor / Wire Labels: Install labels onto wires as shown on the drawings. Install labels on both ends of wires no more than 2" from the edge of the termination.
   3. Rack Busbars: Install labels onto rack busbars as shown on the drawings. If not shown, install labels at the top. Do not block lug attachment positions.

3.06 FINAL INSPECTION AND CERTIFICATION

A. Punch the work of this section compliant to the requirements of section 270000. Punching the work of this section may be combined with punching the telecommunications rooms.

B. Comply with system acceptance and certification requirements of section 270000.

END OF SECTION

SECTION 27 0528

COMMUNICATIONS BUILDING PATHWAYS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Pathway systems within buildings to support telecommunications, and other signal systems - namely cable hangers and rated sleeves.

B. Related Sections

1. Comply with the Related Sections paragraph of Section 270000.
2. Section 260533, “Raceways and Boxes for Electrical Systems”
3. Section 270527, “Communications Bonding”
4. Section 271100, “Communications Equipment Rooms”

1.02 REFERENCES

A. Comply with the References requirements of Section 270000.

B. In additional to those codes, standards, etc., listed in 270000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. Underwriters Laboratories (UL)
   a. UL 5, “Standard for Surface Metal Raceways and Fittings”
   b. UL 5A, “Nonmetallic Surface Raceways and Fittings”
   c. UL 5C, “Standard for Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits”
2. Underwriters Laboratories (UL)
   a. UL 467, “Grounding and Bonding Equipment”

1.03 DEFINITIONS

A. Definitions of Section 270000 apply to this Section.

B. In addition to those Definitions of Section 270000, the following list of terms as used in this Section defined as follows:

1. “Cable Hanger”: A cable support component often shaped (section view) similar to the letter J (thus gaining the nickname “J hanger”), metallic (most often steel) or non-metallic (most often thermoplastic); available in different sizes (to support different quantities of cables) and with different attachment hardware suiting multiple installation methods (e.g., wire support, beam flange clip, etc.).
2. “Cable Strap”: A flexible cable support that generally ‘wraps’ around cables and ‘latches’ into a fixed position, most often textile, available in different sizes (to support different quantities of cables) and with different attachment hardware suiting multiple installation methods (e.g., wire support, beam flange clip, etc.).
3. “Enclosure”: The case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage.
4. “J Hanger” and “J Hook”: nickname for cable hanger
5. “NEC”: National Electrical Code (NFPA 70)
6. “NFPA”: National Fire Protection Agency
7. “UL”: Underwriters Laboratories

1.04 SYSTEM DESCRIPTION

A. Existing Conditions:

1. Wire mesh basket tray.

B. Base Bid Work:

1. The Work of this section includes planning and coordination with General

Contractor (and other trades) of inside plant pathway systems and components, furnishing necessary materials, and labor and associated services required to install pathways.

C. Cable Hanger Systems

1. Provide a complete cable hanger system compliant with requirements of the CEC (in particular, compliant with the requirements of Article 300.11), in accordance with NECA's "Standards of Installation" (pertaining to general electrical installation practices), compliant with applicable portions of NFPA 70B, in accordance with manufacturer's instructions, and in accordance with recognized industry practices. A "complete system" shall include cable hangers, supports, anchors, fasteners, and other required accessories.
2. Provide cable hangers between primary pathways (or telecommunications rooms) and work area pathways and/or outlet locations at intervals up to 48 inches on center per a given route, at transitions downward/upward, and within 24 inches of an outlet stub/outlet location.
3. Supports:
   a. Provide dedicated supports for cable hangers. Do not support cable hangers on ceiling grid support wires. Do not share supports with other trades. Do not support hangers from ductwork, piping, or other equipment hangers.
   b. Support Wires:
      1) Support wires shall consist of #12 drop wire (or as approved) with integral clip and fastener (such as power-actuated deck pin, beam flange, or other fastener appropriate for the use).
      2) Secure support wires at both ends in accordance with CEC.
   c. Support Rods:
      1) Support rods shall consist of 1/4 inch (6.3mm) or 3/8 inch (9.5mm) threaded or smooth rod and concrete anchor or beam flange clip or angled flange clip (as required for attachment to the building structure).
4. Clearances (minimum):
   a. From fluorescent light fixtures, or other EMI sources = 6 inches (150 mm)
   b. From any motor = 48 inches (1,220mm)
   c. From flue, hot water, steam line or other non-insulated heat sources = 12 inches (300 mm)

D. Fire Rated Sleeves

1. Provide complete fire rated sleeve systems where shown on the drawings and where cables penetrate rated walls, in accordance with ASTM E814 (UL1479). Complete shall include sleeves, brackets, frames, plates, etc, and other required accessories necessary for a complete installation according to UL System drawings.
2. Provide complete fire rated sleeve systems equal to (or greater than) the F rating of the barrier in which the device is installed.
3. Provide a system label at each penetration instance.

E. Spiral Wrap

1. Provide spiral wrap to support and dress cables from feed pathways to the point where the cables enter the furniture system.

1.05 SUBMITTALS

A. General: Conform to Submittal requirements as described in Section 270000.

B. Quantity: Furnish quantities of each submittal as noted in Section 270000.

C. Submittal Requirements Prior to the Start of Construction:
1. Product Data Submittal, showing product dimensions, fabrications materials, fabrication details, knockout sizes and locations, capacities, finishes, and accessories
2. Seismic Calculations for Anchoring and Bracing: Submit seismic calculations for support systems in conformance Section 270000. Calculations shall be prepared and signed by a Structural Engineer registered in the state of California. If used, specify proof loads for drilled-in anchors.

D. Submittal Requirements at Close Out:
1. As-Built Drawings, showing the routes/locations, dimensions, types, sizes, quantities, etc., of pathways/pathway devices.
2. O&M Manual, including as-builts, a parts list, repair information, and detailing ongoing maintenance requirements

E. Substitutions
1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 270000.

1.06 QUALITY ASSURANCE
A. Comply with Quality Assurance requirements of section 270000.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Comply with Delivery, Storage and Handling requirements of section 270000.

1.08 WARRANTY
A. Comply with Warranty requirements of section 270000.

PART 2 - PRODUCTS

2.01 HANGERS AND STRAPS
A. Application: Suitable for indoor installation within ceiling space for the support of communications cables.
B. Hanger shall be rated for use in air handling space.
C. Hangers shall contain a closing loop, retainer, or latch to prevent cables from falling off the hanger.
D. Manufacturer:
1. CEAS “Stiffy” low voltage supports (such as Figure 200 series)
2. Eaton B-Line
a. #BCH21-W2; for drop wire installation
b. #BCH32-W2; for drop wire installation
c. #BCH21; for wall installation
d. #BCH32; for wall installation
3. Erico
a. #CAT12 (or variation per installation method); cable hanger
b. #CAT21 (or variation per installation method); cable hanger
c. #CAT32 (or variation per installation method); cable hanger
d. #CAT425 (or variation per installation method); cable strap
4. Panduit
a. #JMJH2-X20
5. Or equal

2.02 DROP WIRE
A. Application: Suitable for indoor installation within ceiling space into structure above (e.g., deck or slab) for the support of cable supports such as cable hangers.
B. Listings: UL 2043, for use in air handling spaces
C. Drop wire shall be equipped with pre-mounted ceiling clip, fastening pin, and pre-tied wire. Pin shall be 7/8”. Wire shall be 12 gauge.

D. Manufacturers:
1. Hilti #CC27 X-AL-H22P8T x ft. PT (100); drop wire assembly, “x” for length
2. Armstrong #7891
3. Dottie #CWC
4. Garvin Industries
5. Oregon Wire Products
6. Or Equal

2.03 DROP ROD
A. Application: Suitable for indoor installation within ceiling space into building structure above (e.g., deck or slab) for the support of cable supports such as cable hangers.
B. Listings: UL 2043, for use in air handling spaces
C. Zinc plated for corrosion resistance
D. Manufacturers:
1. CEAS #01014801; “Stiffy” straight rod, 1-1/4” power-actuated pin, 48 inches (or configured as required per instance)
2. Or equal

2.04 FIRE RATED SLEEVE
A. Application: Suitable as a sleeve for cables to pass through a full-height partition or floor, and as a through-penetration fire stop system maintaining the fire rating of the penetrated partition.
B. Sleeve system shall be tested in accordance with ASTM E 814 (ANSI/UL1479).
C. Sleeve system shall be UL Listed and shall bear a UL Classification marking.
D. Sleeve system shall match (or exceed) the partition’s/floor’s F and T rating.
E. Manufacturers:
1. Hilti
a. #236324; “CP 653 Speed Sleeve”, 4-inch round sleeve kit
2. Specified Technologies Inc (STI)#EZDP44; “EZ Path Series 44” 4-inch square sleeve kit

2.05 SPIRAL WRAP
A. Application: Suitable for an indoor installation for the support of telecommunications cables from a feed pathway to furniture systems, or similar.
B. Material shall be flame retardant polyethylene (UL94V-0), or equivalent.
C. Color: Black.
D. Size: As required to support the given cable bundle size (e.g., 3/4" minimum).
E. Manufacturers:
1. Panduit
2. Or equal

PART 3 - EXECUTION

3.01 GENERAL
A. Comply with the Execution requirements of Section 270000.

3.02 EXAMINATION AND PREPARATION
A. Prior to starting the work of this section, examine areas to receive pathways systems to verify conditions are ready for work and to verify conformance with manufacturer and specification tolerances. Notify the Owner’s Representative in writing of conditions that would adversely affect the installation, or subsequent utilization, of the system. Do not proceed with installation until unsatisfactory conditions are corrected.
B. Prior to installation, plan routes and locations of pathway systems and coordinate with other trades (ductwork, plumbing, electrical raceways, wall construction, ceilings, etc.). Pathway systems shall not unnecessarily cross other trade’s work, shall not prevent removal of ceiling tiles or panels, and shall not block access to mechanical or electrical equipment. Provide offsets as required to avoid obstruction of pathway systems with

other trades.

3.03 INSTALLATION

A. Hangers and Straps

1. Install hangers so they are accessible through the ceiling grid and are not blocked by other building infrastructure.
2. Install hangers above ceiling grid to result in cables sag 6 to 12 inches (150 to 300 mm), minimum, above ceiling grid. Cables shall not rest on the ceiling grid and/or ceiling tiles.
3. Where hangers have loops/retainers, close loop/retainer (latch after cable installation).

B. Fire Rated Sleeve

1. Install the sleeves in strict accordance with the UL System drawing, with the approved shop drawings, and with the equipment manufacturer's instructions.
2. Framed Walls – Pre-Framed and Cut-In
   a. Coordinate location of penetration with other trades such as framing (wall studs), electrical (lighting), mechanical (ducts), and other trades.
   b. For cut-in instances, cut wallboard to fit rated sleeve system – no more wallboard than is necessary to fit the system.
   c. Apply the factory-supplied gasket prior to the installation of the wall plates.
   d. Secure wall plates to sleeves per the equipment manufacturer's recommendations.
3. Affix a label at each fire sleeve location onto the wall or floor – within 2 to 3 feet. Place label in a location that will not be obscured after cables get installed through the sleeve. Label shall describe the system's applicable ratings, such as F, T, and L ratings.

3.04 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 270000.

B. Comply with system acceptance and certification requirements of Section 270000.

END OF SECTION

SECTION 27 0811

COMMUNICATIONS TWISTED PAIR TESTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Testing of communications Backbone and Horizontal twisted pair cabling subsystem.

B. Base Bid Work

1. Testing of a completed communication infrastructure cabling system, which includes:
   a. Submittals
   b. Testing of the twisted pair cabling as follows:

Table 270811-1.1: Tests For UTP Cabling

Subsystem	Type	Test	Configuration	Notes
Backbone	ISP/Riser	*see “Notes”	-	Wire map, length
Horizontal	CAT6A	Category 6A	Permanent Link	per TIA-568

   c. Record Documents, including test results.

C. Work Provided Under Other Sections

1. Backbone twisted pair cabling
2. Horizontal twisted pair cabling
3. HDBaseT cabling

D. Related Sections

1. Comply with the Related Sections paragraph of section 270000.
2. Section 271313, “Communications Backbone ISP Twisted Pair Cabling”
3. Section 271513, “Communications Horizontal Twisted Pair Cabling”

1.02 REFERENCES

A. Comply with the References requirements of section 270000.

B. In addition to the References of section 270000, the following references apply to this specification:

1. ANSI/TIA-1152, “Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling”

1.03 DEFINITIONS

A. Refer to Definitions of section 270000, section 271313, section 271314, and section 271513.

B. In addition to those Definitions of section 270000, the following list of terms as used in this specification defined as follows:

1. “CAT3”: Shall mean Category 3 cabling (per TIA-568)
2. “CAT5E”: Shall mean Enhanced Category 5 cabling (per TIA-568)
3. “CAT6”: Shall mean Category 6 cabling (per TIA-568)
4. “CAT6A”: Shall mean Augmented Category 6 cabling (per TIA-568)
5. “Channel”: Shall mean a testing configuration which includes the Permanent Link and the line cord (at the workstation), the equipment cord, and, if a full crossconnection is implemented, a patch cord and the crossconnect termination/connecting apparatus.
6. “Connect”: Shall mean install all required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
7. “Cord”: Shall mean a length of cordage having connectors at each end. The term “Cord” is synonymous with the term “Jumper” and “Lead”.
8. “MPTL”: modular plug terminated link (a permanent link terminated at the work

area end via a plug as opposed to a jack)

9. "Permanent Link": Shall mean the 'permanent' portion of the Horizontal cabling to each outlet with the test cords de-embedded from the measurements; this includes cable, consolidation point (if used), termination/connecting apparatus in the IDF and the connector at the outlet.
10. "System Cord": Shall mean the cord used in the operating transmission circuit.
11. "Test Cord": Shall mean the cord certified for use in testing, as described in this section.

1.04 SYSTEM DESCRIPTION

A. Refer to section 270000, section 271313, section 271314, and section 271513 for addition system description information.

1.05 SUBMITTALS

A. Comply with the Submittal requirements of section 270000.

B. Submittal Requirements prior to the Start of Testing

1. Testing Procedures Submittal: Submit as a PDF file the step-by-step procedures that the field technicians will follow during testing.
2. Product/Equipment Submittal: Submit as a PDF file cutsheets of testing equipment and applicable accessories to be used. As applicable, note software/firmware versions and last factory calibrations.
3. Schedule Submittal: Submit as a PDF file a proposed schedule of work. This schedule may be combined with the schedule developed for the work of Related Sections (listed above).

C. Submittal Requirements at Closeout

1. Test Reports and Measurement Data: After completing testing of cabling and before final closeout, submit test reports and measurement data. This report may be combined with the test reports of section 270821.
    a. Test Reports Content and Organization
        1) Cover Page, with the following information:
            a) Client/Owner Name
            b) Project Name and Address
            c) Report Name (e.g., "Test Reports for Horizontal Cabling System")
            d) Date of Submittal – date format: **Month Day, Year** (e.g., "January 1, 2018")
            e) Testing Company Name
        2) Table of Contents
        3) Warranty Certificate: include a certificate stating that the testing company warrants the validity of the test reports; this may be a letter on company letterhead or a traditional certificate format.
        4) Test Reports: report per link showing tested parameters and results from prescribed performance levels (e.g., CAT6A PASS); organize test reports by backbone cabling/horizontal cabling, by building, by floor, and by telecom room.
    b. Test Reports Format
        1) Submit test reports as a PDF file. The Table of Contents shall have links to organized sections.
    c. Measurement Data
        1) Submit native measurement data format (for example, an *.FLW file from a Fluke tester). Include 'Viewer' software necessary to view, sort, filter, and print individual and summary test results from the native data format.

d. Transmittal
1) The preferred method of transmitting closeout submittals is via a cloud-based file transfer platform (such as Dropbox or similar).
2) If by data storage disc (not preferred), 'burn' the test reports and measurement data onto one storage disc (e.g., CD-ROM or DVD). Clearly label the disc with the "Cover Page" information described above.

1.06 QUALITY ASSURANCE
A. Comply with the Quality Assurance requirements of section 270000.
B. Under no circumstances shall any cable's and/or conductor's test results be substituted for another's. If an instance of falsification is confirmed, the Contractor is liable for a complete retest of the cabling system at no additional cost to the Owner. This includes the retaining the services of a neutral party to observe all retesting.

1.07 WARRANTY
A. Testing procedures shall comply with all SYSTIMAX Structured Connectivity Solutions Extended Product Warranty and Application Assurance Requirements.

PART 2 - PRODUCTS

2.01 CATEGORY 6A HORIZONTAL CABLE TESTER
A. Certification: Test equipment and accessories (adapters, cords, etc.) shall be independently verified to and compliant with ANSI/TIA-1152-A Level 2G field tester accuracy requirements to 2000 MHz.
B. Test Standards (minimum): TIA-568 Category 6A under a permanent link, MPTL, and channel configuration; IEEE 802.3 100Base-TX, 1000Base-T, and 10Base-T; screen continuity along path of cabling;
C. Equipment, or equal:
1. Fluke Networks
a. #DSX-5000 or DSX-8000 (or DSX2-8000); "CableAnalyzer" test kit (main unit, remote unit, CAT6A permanent link adapters, CAT6A channel adapters, CAT6A patch cord adapters, accessories), loaded with the latest firmware version.
b. "LinkWare" PC management software, latest version of and documentation software

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL
A. Calibrate test sets and associated equipment per the manufacturers printed instructions at the beginning of each day's testing and after each battery charge. Fully charge the test sets prior to each day's testing to ensure proper operation.
B. Ensure test equipment and test cords are clean and undamaged during testing activities. At the Engineer's discretion, halt testing activity and clean testing equipment, test cords, and related apparatus.

3.02 BACKBONE TWISTED PAIR CABLING TESTING REQUIREMENTS AND PROCEDURES
A. Precautions
1. Adhere to the equipment manufacturer's instructions during all testing.
2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).
3. Fully charge power sources before each day's testing activity

B. Testing Requirements
1. Test backbone cabling per “Base Bid Requirements” in Part 1 of this Section.
2. The installation will be accepted when testing has indicated availability of 100% terminated pairs.

C. Testing Procedures
1. Test continuity and wire map for all pairs.

D. Acceptable Test Result Measurements
1. Overall:
a. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail. All individual test results must result in a Pass to achieve an overall Pass.
b. Any reconfiguration of a link components required as a result of a test Fail, must be re-tested for conformance.
c. Remove and replace any cabling links failing to meet the criteria described in this specification, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.
2. Length
3. Wire Map: Provide continuous cable link and terminate all pairs correctly at both ends. No exceptions accepted.
4. Attenuation: The acceptable attenuation measurements for any CAT3/CAT5E cabling link is that which is no greater than that listed in TIA-568.1-D and as adjusted to length measurement.
5. Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss: The acceptable worst pair-to-pair NEXT loss no greater than that listed in TIA-568.1-D for CAT3/CAT5E cabling.

3.03 HORIZONTAL CATEGORY 6A TESTING PROCEDURES

A. Precautions
1. Adhere to the equipment manufacturer’s instructions during all testing.
2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).
3. Fully charge power sources before each day’s testing activity

B. Test Equipment Set Up
1. Set up the tester to perform a full CAT6A test, as a Permanent Link configuration.
2. If the tester has cable-specific test parameters pre-loaded, set up the tester as product-specific setting. If not, set as generic CAT6A.
3. Set the tester to save the full test results (all test points, graphs, etc.).
4. Save the test results with the associated cable link identifier.
5. Calibrate the test set per the manufacturer’s instructions.

C. Acceptable Test Result Measurements
1. Overall Test Results:
a. The Owner shall accept only individual test results that result in a Pass.
b. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail.
c. Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.
d. Remove and replace any cabling links failing to meet the criteria described in this specification, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.

2. Wire Map: Correctly terminate all pairs of the cabling link at both ends. Provide only continuous pairs. No exceptions.
3. Length: Ninety-four meters is the maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration, including test cords.
4. Insertion Loss: The acceptable insertion loss measurements for any CAT6A cabling link is that which is no greater than that listed in TIA-568.1-D.
5. Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss: The acceptable worst pair-to-pair NEXT loss for any CAT6A cable is that which is no greater than that listed in TIA-568.1-D.
6. Power Sum NEXT Loss: The acceptable power sum PS-NEXT loss for any CAT6A cable is that which is no greater than that as listed in TIA-568.1-D.
7. Worst Pair-to-Pair ELFEXT and FEXT Loss: The acceptable worst pair-to-pair ELFEXT and loss for any CAT6A cable is that which is no greater than that listed in TIA-568.1-D.
8. Power Sum ELFEXT and FEXT Loss: The acceptable PS-ELFEXT and loss for any CAT6A cable is that which is no greater than that listed in TIA-568.1-D.
9. Alien Near End CrossTalk (ANEXT) Loss: The acceptable ANEXT loss for any CAT6A cable is that which is no greater than that listed in TIA-568.1-D.
10. Alien Far End CrossTalk (AFEXT) Loss: The acceptable AFEXT loss for any CAT6A cable is that which is no greater than that listed in TIA-568.1-D.
11. Return Loss: The acceptable return loss measurements for any CAT6A cable is that which is no greater than that listed in TIA-568.1-D.
12. Propagation Delay and Delay Skew: The acceptable propagation delay and delay skew measurements for any CAT6A cable is that which is no greater than that listed in TIA-568.1-D.

3.04 TEST REPORTS

A. Permanently record measurements and test results.

B. Submit test results to the Engineer after testing for approval. The Engineer will check these test reports for a format acceptable to the Owner, or Owner's Representative. Each cabling link test record shall contain the following information:
   1. Project name and address
   2. Testing Company's name and Operator's name
   3. Date of measurement/test
   4. Test equipment, including the following:
      a. Manufacturer, model, and serial number
      b. Date and time of last calibration
   5. Cable identification and (as applicable) pair identification
   6. Overall test result

C. Cable and pair identifiers of the test reports shall match the identifiers as labeled in the field – i.e., use the ID on the cable label/termination label in the test reports.

END OF SECTION

SECTION 27 0821

COMMUNICATIONS FIBER OPTIC TESTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Testing of telecommunications fiber optic cabling.

B. Scope Of Work of this Section

1. Pre-Testing Submittals (also see “Submittals” for more details)
2. Inspection of completed fiber optic passive link segment(s) per IEC 61300-3-35.
3. Testing of completed fiber optic passive link segment(s) per the following table (also see “Part 3” for elaboration of testing requirements), according to ANSI/TIA-568-C.0 Annex E:

Subsystem	Type	Test	Direction	Wavelength
Backbone	Singlemode	Tier 1, Method A.1 (per TIA-526-7)	Both	1310nm and 1550nm

4. Pre-Acceptance Submittals

C. Work Provided Under Other Sections

1. Fiber optic cabling and patching

D. Related Sections

1. Comply with the Related Sections paragraph of Section 270000.
2. Section 271323, “Communication Backbone ISP Fiber Optic Cabling”

1.02 REFERENCES

A. Comply with the References requirements of Section 270000.

B. In addition, the following standards are referenced to this Section:

1. American National Standards Institute (ANSI) Z136.2, “American National Standard for the safe use of optical fiber communication systems utilizing laser diode and LED sources”
2. TIA-455-77, “Procedures To Qualify A Higher-Order Mode Filter For Measurements On Singlemode Fibers”
3. TIA-455-78A, “Spectral-Attenuation Cutback Measurement for Singlemode Optical Fibers”
4. EIA-455-95, “Absolute Optical Power Test for Optical Fibers and Cables”
5. EIA-455-171A, “Attenuation By Substitution Measurement – For Short-Length Multimode Graded-Index And Single-Mode Optical Fiber Cable Assemblies”
6. TIA-526-7, “Measurement of Optical Power Loss of Installed Singlemode Fiber Cable Plant”
7. TIA-TSB-4979, “Practical Considerations for Implementation of Multimode Launch Conditions in the Field”
8. ISO/IEC 14763-3, “Testing of Optical Fibre Cabling”
9. IEC 6100-3-35 (end faces)
10. IEC 61300-3-35, “Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-35: Examinations and measurements – Fibre optic connector endface visual and automated inspection”
11. IEC 61280-4-1
12. IEC 61280-4-2, “Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant”
13. BICSI Telecommunication Distribution Methods Manual (TDMM)

1.03 DEFINITIONS

A. Refer to Definitions of sections 270000 and 271323. The definitions of these sections apply to this section.

B. In addition to those definitions in referenced sections, the following list of terms as used in this specification defined as follows:

1. “Adapter” (associated with fiber connectivity): a connecting device that joins 2 fiber connectors, either like or unlike
2. “Approved cleaning equipment”: includes dry “one-click” probe type cleaners and/or other approved cleaning apparatus; also see “Cleaning Apparatus under Pat 2
3. “Connect”: install all required test cords, patch cords, system cords, etc. to complete an optical circuit
4. “Cord”: a length of cordage (simplex, duplex, or ribbon) having connectors at each end; the term “Cord” is synonymous with the term “Jumper”
5. “Defect”: detectable (via microscope) non-linear features on the end face of a fiber including particulates, debris, pits, chips, edge chipping, etc. as defined in 3.1 of IEC 61300-3-35 Edition 1
6. “High Resolution” (microscope): as defined in 4.4.3 of IEC 61300-3-35 Edition 1
7. “Jumper”: see “Cord”
8. “Low Resolution” (microscope): as defined in 4.4.2 of IEC 61300-3-35 Edition 1
9. “OLTS”: Optical Loss Test Set
10. “OTDR”: Optical Time Domain Reflectometer
11. “Scratch”: detectable (via microscope) permanent linear surface features on the end face of a fiber as defined in 3.1 of IEC 61300-3-35 Edition 1
12. “Segment”: cabling (cable, splices, couplings, splitters, connectors, etc.) between termination points / 2 endpoints or between points of access to the conductors within the cabling sheath, including the termination apparatus/components
13. “System Cord”: the cord used in the operating electrical or optical circuit
14. “Test Record”: a record (electronic and/or printed) of a the measured performance of a conductor against a standardized set of metrics
15. “Test Report”: a report containing a set of test records meeting a defined scope
16. “Tier 1”: testing of installed fiber optic cabling for loss (optical link power loss) with an OLTS, and verifying the cabling length and polarity – also refer to ANSI/TIA-568-C.0 Annex E
17. “Tier 2”: testing of installed fiber optic cabling which includes Tier 1 tests plus characterization of the optical fiber with an OTDR – also refer to ANSI/TIA-568-C.0 Annex E
18. “Test Cord”: the cord certified for use in testing, and meeting the requirements of this section

1.04 SYSTEM DESCRIPTION

A. Refer to section 271323 for description of cabling systems.

1.05 SUBMITTALS

A. Comply with the Submittal requirements of section 270000.

B. Pre-Testing Submittals: Prior to the start of testing, submit the following:

1. Product Data, submitted at least 8 weeks in advance the start of field measurements
2. Testing Procedures, submitted at least 8 weeks in advance the start of field measurements
3. Pre-Testing Loss Calculations, submitted at least 4 weeks in advance the start of field measurements
4. Testing Schedule, submitted at least 4 weeks in advance the start of field

measurements

C. Pre-Acceptance Submittals: Prior to owner's acceptance, submit the following:
   1. Test Reports: Submit test reports in a format acceptable to the Owner. Submit one electronic copy and one printed copy of test reports. This may be combined with the reports of Section 270811.
   2. Warranty Certificate: Submit SYSTIMAX Structured Connectivity Solutions Extended Product Warranty and Application Assurance Certification to the Owner.

D. Submittal: Product Data
   1. Testing equipment ('mainframes', modules, remotes, etc.) including the following information (minimum):
      a. Manufacturer and model number
      b. Serial number
      c. Date of last factory calibration
      d. Software/firmware versions (as applicable)

E. Submittal: Testing Procedures
   1. Describe step-by-step procedures the technicians will use in the field during actual testing – standards-based test methods, test equipment including the test cords and conditioners used, equipment configuration, how the reference gets established, etc. – something to which the engineer could compare the testing witnessing (observe testing technicians actually following these written step-by-step procedures).

F. Submittal: Pre-Testing Loss Calculations
   1. Calculate the loss of each segment (not necessarily each fiber strand). The cable length may be based on the footage markings printed on the cable jacket. Include a brief description of each segment (such as endpoints).

G. Submittal: Schedule
   1. Consists of proposed schedule of work (this schedule may be combined with the schedule developed for Division 27)

H. Submittal: Test Reports

1. Each test record shall include information per test as noted following:

CONTENT	LOSS – SMF	CHARACTERIZATON
Owner/Project Name and Address	X	X
Contractor (Company) Name and Technician (test equipment operator) name	X	X
Date of Test	X	X
Test Equipment, including Serial Numbers (must match pre-testing submittal)	X	X
Test Procedure	X (e.g., OFSTP-7, Method A.2)	X
Test Cords – Type and Length	X	–
Test Cords – Measured Loss	X	–
Launch Fiber – Type and Length	–	X
Fiber/Strand Identifier and Fiber Type (e.g., “OM3”)	X	X
Test Equipment Set Up Parameters: wavelength, pulse width, refractive index, event threshold	–	X
End Locations and Measurement Direction	X	X
Wavelength	X	X
Reference Power Level	X	–
Optical Loss Measurement / Overall Loss	X	X
Characterization Trace	–	X
Fiber Length	X	X

2. Cable and fiber identifiers of the test reports shall match the identifiers as labeled in the field – i.e., the ID stored with the test result shall be the same ID as on the cable label/fiber port label.
3. Test Report Format – Electronic Submittal of Tier 1 and Tier 2 Testing:
   a. Submit test report files as native data format (for example, an *.FLW file from a Fluke tester) and printed to PDF format assembled into a single file. Organize reports by building, by backbone/horizontal cabling, by floor, and by IDF.
   b. For the native data format files, include the ‘Viewer’ or ‘Reader’ software necessary to view, sort, filter, and print individual and summary test results.
   c. Organize the test records by (in this hierarchy): backbone cabling / horizontal cabling, by building, by floor, by IDF, by sheath and by strand.
4. Test Report Format – Printed Submittal of Tier 1 Optical Loss Testing:
   a. Submit printed test reports, on 8.5”x 11” paper, color, one cabling link per page
   b. Assemble prints into a 3-ring binder
   c. Include a Table Of Contents at the beginning that lists the contents
   d. Organize the test records by (in this hierarchy): backbone cabling / horizontal cabling, by building, by floor, by IDF, by sheath and by strand. Include tabbed separators for improved navigation through the manual. Per tabbed section, sort records in ascending cable ID order.

5. Format – Printed Submittal of Tier 2 Characterization:
    a. Use feet for the units for distance measurements (i.e., the “X” axis of the graph).
    b. Adjust the loss scale (i.e., the “Y” axis of the graph) to maximize the curve.
    c. Print records such that strands of a given cabling link have matching axis scales; the x-axis shall be the same report-to-report and as well as the y-axis shall match report-to-report.
    d. The trace of the printed test report shall show the launch cord.
    e. For each segment, include either a schematic graphic or a brief narrative accurately describing the test set up. The description shall include test/launch cord (with length), expected events (connectors, slices, etc.) with expected distances, etc. This information will eliminate many questions the Engineer will have while reviewing the reports.

I. Submittal: Warranty Certificate
1. Submit one printed copy of warranty certificate warrantying the accuracy and validity of the test reports.

1.06 QUALITY ASSURANCE

A. Comply with the Quality Assurance requirements of section 270000.

B. Test equipment shall be fully functional and in proper working order (not broken adapters, connectors, buttons, battery cover, etc.). Test equipment shall have loaded the latest firmware/operating software.

C. Calibration: Test equipment shall be factory calibrated within the manufacturer’s published calibration period. The manufacturer, where applicable, shall calibrate test equipment against National Institute of Standards and Technology (NIST) standards.

D. Technician Training: Technicians that operate test equipment shall have successfully attended an appropriate training program, which includes testing with an OLTS and an OTDR, and shall have obtained a certificate as proof thereof. Training may have been conducted by any of the following:
1. Manufacturer of the test equipment used for the field certification
2. Manufacturer of the fiber optic cable system
3. Training organizations (such as BICSI)

E. Cleaning: Throughout testing, clean connector end faces and adapter alignment sleeves using an approved cleaner and cleaning method – also refer to “Field Quality Control” in Part 3.

1.07 WARRANTY

A. Warrant the validity of the test results and that no test measurements have been falsified. Issue such warranty in writing. Under no circumstances shall any cable’s and/or optical conductor’s test results be substituted for another’s. If an instance of falsification is confirmed, the Contractor will be liable for a complete retest of the cabling system at no additional cost to the Owner. This includes the retaining the services of a neutral party to observe all retesting.

PART 2 - PRODUCTS

2.01 DIGITAL INSPECTION MICROSCOPE

A. Digital inspection microscope shall be suitable for inspecting and certifying connector end faces. The microscope shall be a digital video camera type with probe tips (to permit inspection through adapters) and shall be capable of storing the end face images for inclusion in the test reports.

B. Microscope shall be compatible with IEC 61300-3-35, particularly 4.2 “Method B: video microscopy”.

C. Microscope shall have adapters that match/are compatible with the connector(s) being

inspected.

D. Magnification: low resolution or high resolution

E. Manufacturer, or equal:

1. AFL
   a. “FOCIS PRO”; fiber optic connector inspection system, including a #DFS1 digital inspection microscope and a #DFD1 touchscreen tablet preloaded with ‘SimpleView PRO’ fiber inspection software
   b. #DFS1; ‘FiberScope’ digital inspection microscope with USB connection used in conjunction with ‘SimpleView PRO’ fiber inspection software on a laptop or with Link WiFi unit and FOCUS MOBILE app loaded on an iPhone, iPad, or Android mobile device
2. Corning
   a. #VIPROBE-DUAL; video inspection probe (for use with OV-1000 V2 OTDR mainframe)
3. Fluke Networks
   a. #FI-7000; ‘FiberInspector Pro’ series digital inspection microscope

2.02 OPTICAL LOSS TEST SET (OLTS) – SINGLE STRAND TESTING

A. OLTS can be an integrated set or separate light source and power meter. The test equipment shall, either as an integrated set or as separates, meet the following specifications/requirements.

B. Singlemode Light Source: The light source used for testing singlemode fibers shall meet the requirements of TIA-526-7, 3.1.1. Additional requirements:

1. Type: laser
2. Central wavelengths: selectable to 1310 nm ±20 nm, 1550 nm ±20 nm
3. Output stability +/- 0.40 dB from 0 to 50 degrees C
4. Long term output stability +/- 0.10 dB at 25 degrees C
5. Output power: –10 dBm, minimum

C. Power Meter

1. Type: multi-wavelength photodetector
2. Measurement wavelengths: selectable to 850 nm, 1300 nm, 1310 nm, and 1550 nm
3. Measurement range: –60 dBm to +10 dBm
4. Measurement resolution 0.01 dB
5. Measurement accuracy: +/-10% at +10 to 0 dBm, +/- 5% at 0 to –50 dBm, and +/-10% at –50 to –60 dBm
6. Measurement uncertainty: +/- 0.25 dB
7. Storage: internal data storage for reference power measurement and test measurements
8. Connections (for data transfer to computer): serial and/or USB

D. Length Measurement: The OLTS should be capable of measuring the optical length of the fiber.

E. Manufacturer, or equal:

1. AFL
2. Corning
   a. OTS-600 series optical loss test set
3. Fluke Networks
   a. DSX-5000 CableAnalyzer series test set equipped with fiber modules
   b. CertiFiber Pro series test set
4. Fluke Networks MultiFiber Pro series test set
   a. #MFPOWERMETER; MultiFiber Pro optical power meter
   b. #MFMULTIMODESOURCE; MultiFiber Pro 850 nm multimode source

c. #MF1310SOURCE; MultiFiber Pro 1310 nm multimode source
d. #MF1550SOURCE; MultiFiber Pro 1550 nm multimode source

5. Fluke Networks CertiFiber Pro series test set
6. JDS Uniphase
7. Softing
   a. WX4500; WireXpert test set with below test kit
      1) WX_AD_EF_MM2 kit for testing on single strand multimode links
      2) WX_AD_SM2 kit for testing on single strand singlemode links

2.03 OPTICAL TIME DOMAIN REFLECTOMETER (OTDR)

A. OTDR features:

1. Integrated display – bright, color backlit LCD display
2. Internal power source – rechargeable battery
3. Internal non-volatile memory; capacity as needed to store full test data for at least 1 work day
4. USB and/or serial ports (for data transfer data to a computer)
5. Visual fault locator (for continuity checks and dead zone fault location)

B. Singlemode OTDR/Module

1. Central wavelength: selectable to 1310 nm, +/-25 nm, and 1550 nm, +/-30 nm
2. Selectable/programmable index of refraction
3. Selectable/programmable pulse width (in ns)
4. Event dead zone (maximum): 3.5 m at 1310 nm and 1550 nm
5. Attenuation dead zones (maximum): 10 m at 1310 nm, 12 m at 1550 nm.
6. Dynamic range (minimum): 10 dB at 1310 nm, 10 dB at 1550 nm
7. Distance range (minimum): 10,000 m

C. Manufacturer, or equal:

1. Corning
   a. OV-1000 V2 OTDR series
2. Fluke Networks
   a. OptiFiber Pro OTDR series test set

2.04 FIBER OPTIC TEST CORDS AND LAUNCH CORDS

A. The fiber of the test cords and launch cords shall match as closely to the fiber of the segment-under-test as possible. At a minimum, the fiber type and performance (e.g., OS2) shall match and, ideally, the fiber should be by the same manufacturer.

B. Connectors of the test cords shall be compatible with (the same type as) the equipment (light source, power meter, OTDR) and with the segment-under-test.

C. Test cords shall meet the following:

REQUIREMENT	SINGLEMODE
TIA Compliance	TIA-526-7, 3.1.3
ISO/IEC Compliance	ISO/IEC 14763-3
Reference Grade	Yes (per ISO/IEC 14763-3)
End Face Compliance	IEC 6100-3-35
Loss Performance, per Connector	≤ 0.2dB at 1310nm and 1550nm
Loss Measurement Technique	Per FOTP-171 D3
PC Finish	Connectors shall inhibit Fresnel reflections (i.e., have a “PC” finish)
Length for Tier 1 Loss	1 m to 5 m

2.05 CLEANING APPARATUS

A. Cleaning apparatus shall remove skin oil, isopropyl alcohol, graphite, dust, and other contaminants from connector end faces, and shall be able to clean both unattached connectors and connectors inserted into adapters.

B. Manufacturer, or equal:

1. AFL
   a. #8500-05-0001MZ; one-click cleaner for 2.5mm ferrules (SC, ST, FC)
   b. #8500-05-0002MZ; one-click cleaner for 1.25mm ferrules (LC/MU)
2. Corning
   a. CLEANER-PORT-2.5
   b. CLEANER-PORT-LC
   c. CLEANER-PORT-OTAP
3. Fluke
   a. #NFC-IBC-1.25mm; IBC OneClick cleaner, for 1.25 mm ferrules (LC, MU connectors)
   b. #NFC-IBC-2.5mm; IBC OneClick cleaner, for 2.5 mm ferrules (SC, ST, FC connectors)
   c. #NFC-IBC-MPO; IBC OneClick cleaner, for MPO connectors

PART 3 - EXECUTION

3.01 SAFETY

A. Safety: Operate test equipment that contains a laser or LED in accordance with ANSI Z136.2.

B. Adhere to the precautions described in TIA-526-14-B, 5.1.

C. Adhere to the equipment manufacturer’s instructions during testing.

3.02 FIELD QUALITY CONTROL

A. Charge test equipment’s batteries to full capacity prior to each day's testing to ensure proper operation.

B. Cleaning:

1. Only use approved cleaning apparatus and methods.
2. Keep test equipment, connectors and adapters/coupling alignment sleeves clean at the test points prior to and during testing activities and measurements. During testing, clean connector end faces with each reconnection. The Engineer may, at their discretion, request the contractor halt testing activity and have the technician clean testing equipment, test cords, launch cords, connectors of the cables under test, and related apparatus.

3.03 TEST CORD VERIFICATION

A. Visual Verification: Prior to accepting test cords for use in testing, inspect cords and

connectors.

1. Visually inspect each cord to ensure the cordage has no damage and the connectors are firmly attached to the cordage. If the cordage is undamaged and the connectors are firmly and properly attached, then the connector end faces may be inspected (go to next step). Otherwise, the cord may not be used for testing.
2. Visually inspect each connector end face using a digital inspection microscope to ensure each end face is clean (no contamination) and free of defects (scratches, pits, chips, etc.) that would adversely affect measurement and repeatability. If the connector end face is clean with no defects and meets IEC 6100-3-35, then the cord may be used for testing. Otherwise, go to next step.
3. If contamination is seen during end face visual inspection (step described above), then clean the end face using equipment and methods of TIA-526-7 5.7 [for singlemode]. After cleaning, visually inspect the connector end faces using a digital microscope. If the connector end face is clean with no defects and meets IEC 6100-3-35, then the cord may be used for testing. If, after cleaning, the end faces still exhibit scratches, pits, and/or other defects/imperfections, do not use this cord for testing.
4. Once the cord is acceptable and if the microscope has storage capability, record an image of the connector end face (for inclusion in the test report).

B. Test Cord Performance Verification

1. Validate performance of cords for testing only if no defects are observed during visual inspection.
2. Connect Test Cord #1 to the light source and to the power meter.
3. Store the measured light value into the power meter as the reference power (P_{ref}).
4. Disconnect Test Cord #1 from the power meter. Do not disconnect Test Cord #1 from the light source.
5. Connect the ‘open’ end of Test Cord #1 to an adapter (of matching connector type). Connect one end of Test Cord #2 to that adapter and the other end of Test Cord #2 to the power meter.
6. The value displayed on the power meter represents the test cord #2 connector loss at the adapter.
7. Flip the ends of Test Cord #2 so that the end connected to the power meter is now connected to the adapter (attached to test cord #1), and the end connected to the adapter is now connected to the power meter.
8. The value displayed on the power meter represents the test cord #2 connector loss at the adapter (opposite end as previous measurement).
9. Only accept and use test cords meeting the loss values noted in Part 2.
10. Repeat this test procedure from the beginning reversing the test cords in order to verify the performance of test cord #1.
11. Documentation of test cord verification is not required.

3.04 TIER 1 | OPTICAL POWER LOSS TESTING REQUIREMENTS AND PROCEDURES

A. Test Equipment Preparation

1. Bring test equipment to room temperature – approximately 72 degrees F.
2. Power on the OLTS (or light source and power meter) for at least 5 minutes prior to setting a reference or obtaining measurements.
3. Do not power off test equipment during testing activity. Should the test equipment power off, fully complete setting a reference.
4. Set the test routine parameters to meet the testing requirements of this section.

B. Connection Preparation
   1. Prior to connecting test cords to the test equipment and to the cable-under-test, prepare connector end faces of the test cords and cable-under-test in accordance with IEC 6100-3-35 using approved cleaning equipment.

C. Visual Inspection:
   1. Prior to connecting test cords, visually inspect each connector end face of the cable-under-test using a digital inspection microscope to ensure each end face is clean (no contamination) and free of defects (scratches, pits, chips, etc.) that would adversely affect performance. Once the connector end face is clean with no defects and meets IEC 6100-3-35, record the image for inclusion in the test report submittal.
   2. If contamination is seen during end face visual inspection, then clean the end face using equipment and methods of TIA-526-14-B 5.6 [for multimode] or TIA-526-7 5.7 [for singlemode]. After cleaning, inspect the end faces using a digital inspection microscope. If the connector end face is clean with no defects and meets IEC 6100-3-35, then record the image for inclusion in the test report submittal. If, after cleaning, the end faces still exhibit scratches, pits, and/or other defects/imperfections, remove the connector and reterminate the fiber with a new connector.

D. Setting a Reference
   1. Follow the test equipment manufacturer's initial adjustment and set up instructions.
   2. Set the light source and power meter to the same wavelength.
   3. Set the power meter to relative power measurement mode
   4. Set the meter to display power levels in dBm.
   5. Upon a stable power reading, set this as the reference power level following the manufacturer's instructions.
   6. Do not remove Test Cord #1 from the light source at any time (unless the test cord must be replaced, testing is complete, or the equipment is being put away for the evening).
   7. Do not bend the test cords smaller than 20 times the cord diameter (this may induce loss into the cord, which will reduce the accuracy of the measurement).

E. Measuring Singlemode Passive Link Insertion Loss
   1. Connect test equipment, test cords, and cable-under-test per the Method noted in the Table under article 1.01 of this section.
   2. Use launch conditions described in FOTP-78 and employ a method to remove high-order propagating modes. A method to select a mode filter is described in FOPT-77.
   3. Do not disconnect the test cord from the light source. Should the test cord be disconnected from the light source, fully complete setting a reference.
   4. Do not bend the test cord smaller than 20 times the cord diameter during testing activities (this may induce loss into the cord, which will reduce the accuracy of the measurement).
   5. Test each segment of installed cable plant according to the table under article 1.01 of this section.
   6. Store the measured insertion loss per segment into the test equipment.

F. Recorded Test Measurements.
   1. Measurements shall carry a precision through at least one significant decimal place.

END OF SECTION

SECTION 27 1100

COMMUNICATIONS EQUIPMENT ROOMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Buildout / fit-up of communications equipment rooms.

B. Base Bid Work

1. The work under this section includes materials, accessories, fasteners, etc., and the labor and associated services required to buildout / fit-up telecommunications equipment rooms, and includes coordination through the General Contractor with other trades. This specification lists major equipment but not every fastener, anchor, assembly hardware, support, brace, etc., required for a complete and professional installation.
2. Submittals – pre-construction and closeout submittals
3. Coordination Requirements and Final Layout
    a. The contract drawings show basic room layouts and the minimum anticipated equipment. The layouts and equipment shown are neither final nor exhaustive. Undoubtedly, there will be more equipment, other building system equipment panels, etc., that will end up in telecom rooms. Therefore, it is imperative that an entity coordinate the final constructed layout of telecom rooms and placement of inevitable equipment and services that ultimately land in these rooms. The work of this section includes assuming responsibility for coordinating final layout for other equipment not necessarily identified in the contract drawings (or even known at this time, such as equipment panels for other systems) within telecom rooms as required for a complete and professional installation. Coordinate throughout the entire construction team regarding others' needs to house equipment (such as equipment panels and control panels – BMS, fire alarm, etc.) within telecom rooms. Determine the final layout for telecom rooms.
    b. Electrical: Coordinate the power service with electrical contractor to ensure proper placement of lighting, sequencing of power service to rack bay, and other issues related to electrical trade.
    c. Mechanical: Coordinate the cooling service with mechanical contractor to ensure proper placement of equipment, ducts, etc., and other issues related to mechanical trade.
    d. Owner: Coordinate room-ready requirements and schedule with Owner (to allow Owner to plan and execute installation of OFOI telecommunications/network equipment).
    e. Based on this coordination, determine final equipment locations and final layout per telecom room.
4. Backboards:
    a. Provide sheet hardwood/plywood and fasteners as a backboard within telecom rooms as shown on the drawings.
    b. Provide painting of the plywood as a finish and to improve space illumination.
5. Rack Bays:
    a. Provide completely assembled equipment racks, including seismic anchoring of the racks to the building structure. Provide fasteners and

parts required to complete the installation.

b. Provide vertical management sections as shown on the drawings. If not shown (as a default), provide one vertical management section between each rack and at either end of the bay.

c. Provide horizontal management panels as shown on the drawings. If not shown (as a default), provide one management panel above each patch panel and on below the bottom patch panel in each rack bay where patch panels occur.

d. Provide non-seismic stiffeners (or “kickers”) at the end of each rack bay to the structure above or to overhead cable support as needed to mitigate sway and to stabilize the rack bay.

e. Provide bonding (also refer to 270526).

6. IT Cabinets:

a. Provide IT cabinets and cabinet bays, seismic anchoring to building structure, accessories, fasteners, etc., required for a complete installation. For the IT cabinets, provide frames, doors, sides, tops, accessories, etc., as shown on the drawings. If not explicitly shown, provide a side panel on each end of cabinet bays, a perforated front door for each cabinet, a solid ‘split’ back door for each cabinet, and a top for each cabinet.

b. Provide bonding (also refer to 270526).

7. Overhead and Vertical Cable Support:

a. Provide overhead cable support system, trapeze and wall supports, anchoring (e.g., to the underside of the structure above), accessories, fasteners, etc., required for a complete installation.

b. Provide seismic bracing for the overhead cable support system, including layout, configuration, detailing, and seismic calculations.

c. Provide drop-out as shown on Drawings. If not shown, provide a default of one dropout over each vertical management section.

8. Cable, wire and patch cord management

9. Identification tags, plates and labeling

10. Warranty

C. Work Covered Under Other Sections

1. Bonding
2. Grounding busbars
3. Conduit and device boxes
4. Power service to and within the room, and power service to the racks and cabinets
5. Cooling service to and within the room and controls
6. Lighting
7. Fire / life safety

D. Related Divisions and Sections

1. Consult other Divisions, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
2. Drawings, general provisions of the Agreement, and Division 01 apply to this Section.
3. Comply with the Related Sections requirements of section 270000 “Basic Communications Requirements”
4. Refer to section 270526, “Communications Bonding”, for related work.
5. Seismic Calculation requirements of section 270000, Article 1.05, apply to this Section.

1.02 REFERENCES

A. Comply with the References requirements of section 270000.

B. In additional to those codes, standards, etc., listed in section 270000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. EIA/ECA-310-E, “Cabinets, Racks, Panels, and Associated Equipment”
2. National Fire Protection Association (NFPA):
   a. NFPA 255, “Standard Method of Test of Surface Burning Characteristics of Building Materials”
   b. NFPA 703, “Standard for Fire Retardant—Treated Wood and Fire–Retardant Coatings for Building Materials”
3. ASTM E 84, “Standard Test Method for Surface Burning Characteristics of Building Materials”

1.03 DEFINITIONS

A. Definitions as described in section 270000 shall apply to this section.

B. In addition to the “Definitions” of section 270000, the following list of terms as used in this specification defined as follows:

1. “BDF”: Building Distribution Facility
2. “IDF”: Intermediate Distribution Facility
3. “MDF”: Main Distribution Facility
4. “MPOE”: minimum point of entry – applicable to telecom utilities, as defined in Public Utilities Commission regulations
5. “MTR”: Main Telecommunications Room
6. “TR”: Telecommunications Room
7. “UPS”: Uninterruptible Power Supply – a system that provides conditioned power with batteries acting as a continuous power source for equipment during a utility power interruption

1.04 SYSTEM DESCRIPTION

A. General: Communications rooms shall fall into one of the following space titles:

1. Entrance Facility

B. Telecommunications rooms shall fall into one of the following space titles and functions:

1. Entrance Facility will serve the following functions:
   a. House the MPOE for telecommunications utility/ies (e.g., AT&T)
   b. House telecom utility’s termination fields and interface between telecom utility’s facilities and premises facilities

C. Clearances: Refer to the drawings for minimum clearances associated with racks, rack bays, and IT cabinets.

1.05 SUBMITTALS

A. Submittals of this section shall comply with the “Submittal” requirements of section 270000.

B. Quantity: Furnish quantities of each submittal as noted in section 270000.

C. Submittal Requirements at Start of Construction:

1. Product Data Submittal
2. Shop Drawings Submittal: Consisting of any proposed changes to room plans.
3. Seismic Calculations:
   a. Equipment rack anchorage to flooring with overall rack bay bracing, based on racks’ maximum rated load capacities.
   b. Overhead cable support, including anchorage into structure above and seismic bracing detailing

D. Submittal Requirements at Closeout:

1. As-Built drawings; showing room layouts (floor layouts, overhead layouts), rack

elevations, and other information pertinent to the built conditions
2. O&M Manual, containing the final approved products and maintenance instructions

E. Substitutions
1. Requests for substitutions shall conform to the general requirements and procedure outlined in section 270000.

1.06 QUALITY ASSURANCE
A. Comply with “Quality Assurance” requirements of section 270000.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Comply with “Delivery, Storage and Handling” requirements of section 270000.

1.08 WARRANTY
A. Warrant work and products described within this section for a period of 1 year. Correct deficiencies within 24 hours of notification.

PART 2 - PRODUCTS

2.01 SHEET HARDWOOD / PLYWOOD (AS BACKBOARD)
A. Application: Sheet hardwood/plywood used as backboard in telecommunications rooms, “Use Category” UCFA per AWPA U1-17.
B. Plywood shall be new and free from defects, and shall be interior “Type A” with a veneer grade of A-C.
C. Size: 8' x 4' plywood sheets, 11/16" to 13/16" thick.
D. Plywood shall be fire retardant treated with a flame spread rating of 25 or less / Class A, when tested in accordance with ASTM E84. Plywood shall be:
1. Chemically treated and pressure impregnated
2. Kiln dried after treatment to maximum moisture content of 15%.
3. Stamped with the fire rating and the certifying lab.
E. Plywood shall not contain VOCs, urea formaldehyde or formaldehyde, halogens, sulfates, chlorides, or ammonium phosphate.
F. Manufacturers, or equal:
1. Hoover Treated Wood Products, Inc. “Pyro-Guard” plywood

2.02 EQUIPMENT RACK – 4-CHANNEL TYPE
A. Application: Suitable for the support of termination apparatus, cable and cord management apparatus, network equipment, and other similar equipment, within a telecommunications room.
B. Material: Steel or High strength, lightweight 6061-T6 aluminum, extrusion construction.
C. Channel:
1. Size: 3" deep, with flanges on each side (“double sided”)
2. Flange: 1.265" wide by 0.25" thick, with mounting holes
3. Mounting Holes: Threaded/tapped hole, spaced at 5/8" - 5/8" - 1/2", compatible with EIA/ECA-310-E
4. Threading: #12-24 rolled, compatible with EIA/ECA-310-E
5. RMU Markings: The RMU markings shall be permanently stamped on the ‘outside’ of both flanges on both channels.
D. Assembled Rack: Assembled racks shall feature 4 mounting channels, and shall be 7'-0" high (overall) by 19" mounting width (20.25" wide overall), 35" from front mounting plane to back mounting plane, and shall contain 45 EIA mounting spaces (1.75”).
E. Load Rating: 2,000 lbswhen evenly distributed for the height of the racks. (The rack’s load bearing capacity shall be certified.)
F. Finish: Black, powder coat
G. Compliances: Racks shall be UL Listed.

H. Manufacturers, or equal:
1. CPI “Adjustable QuadraRack”
a. #15217-703; 4-channel rack, 7'-0"H (45U) x 19"Mnt x 29.53"-35.43"D (adjustable), black

2.03 EQUIPMENT RACK – 2-CHANNEL TYPE=3” DEEP

A. Application: Suitable for the support of termination apparatus, cable and cord management apparatus, network equipment, and other similar equipment, within a telecommunications room.
B. Material: High strength, lightweight 6061-T6 aluminum, extrusion construction.
C. Channel:
1. Size: 3" deep, with flanges on each side (“double sided”)
2. Flange: 1.265" wide by 0.25" thick, with mounting holes
3. Mounting Holes: Threaded, spaced at 5/8" - 5/8" - 1/2", compatible with EIA/ECA-310-E
4. Threading: #12-24 rolled, compatible with EIA/ECA-310-E
5. RMU Markings: The RMU markings shall be permanently stamped on the ‘outside’ of both flanges on both channels.
D. Assembled Rack: Assembled rack shall feature 2 mounting channels, and shall be 7'-0" high (overall) by 19" mounting width (20.25" wide overall), and shall contain 45 EIA mounting spaces (1.75")
E. Load Rating: 1,000 lbs when evenly distributed for the height of the rack (The rack’s load bearing capacity shall be certified.)
F. Finish: Black, powder coat
G. Compliances: The rack shall be UL listed.
H. Manufacturers, or equal:
1. CPI “Universal” Rack, UL Listed
a. #48353-703; 2-channel rack, 7'-0"H (45U) x 19"Mnt, black

2.04 EQUIPMENT RACK – 2-CHANNEL TYPE-6” DEEP

A. Application: Suitable for the support of termination apparatus, cable and cord management apparatus, network equipment, and other similar equipment, within a telecommunications room.
B. Material: High strength, lightweight 6061-T6 aluminum, extrusion construction.
C. Channel:
1. Size: 6” deep, with flanges on each side (“double sided”)
2. Flange: 1.265" wide by 0.25" thick, with mounting holes
3. Mounting Holes: Threaded, spaced at 5/8" - 5/8" - 1/2", compatible with EIA/ECA-310-E
4. Threading: #12-24 rolled, compatible with EIA/ECA-310-E
5. RMU Markings: The RMU markings shall be permanently stamped on the ‘outside’ of both flanges on both channels.
D. Assembled Rack: Assembled rack shall feature 2 mounting channels, and shall be 7'-0" high (overall) by 23" mounting width (24.25" wide overall), and shall contain 45 EIA mounting spaces (1.75")
E. Load Rating: 1,000 lbs when evenly distributed for the height of the rack (The rack’s load bearing capacity shall be certified.)
F. Finish: Black, powder coat
G. Compliances: The rack shall be UL listed.
H. Manufacturers, or equal:
1. CPI “Standard” Rack, UL Listed
a. #66383-703; 2-channel rack, 7'-0"H (45U) x 23"Mnt, black

2.05 BASE GUSSET, FOR 2-CHANNEL EQUIPMENT RACK

A. Application: Gusset kit for stiffening and stabilization of critical joints at the base of an equipment rack.

B. Manufacturers, or equal:

1. CPI

a. #11592-701; gusset kit, black

2.06 VERTICAL MANAGEMENT SECTIONS

A. Application: Suitable for cable routing, cord routing, and cord slack storage vertically within a rack bay.

B. The vertical management section shall be double-sided (i.e., the management section having covered cable guides on the front and flip-retainers on the rear).

C. Size & Capacity: 7'-0" high by 6" 8" 12" wide, with 5-1/3" deep (minimum) cable storage capacity in back and 6" deep (minimum) cord storage capacity in front.

D. Mounting: The vertical management section having matching bolt holes for attachment to the rack.

E. Color: black (guides and cover).

F. Manufacturers, or equal:

1. CPI “Evolution” Series Vertical Management Section

a. #35521-703; vertical management section, “G2” double sided, 7'-0"H x 6"W, black

b. #35522-703; vertical management section, “G2” double sided, 7'-0"H x 8"W, black

c. #35523-703; vertical management section, “G2” double sided, 7'-0"H x 10"W, black

d. #35524-703; vertical management section, “G2” double sided, 7'-0"H x 12"W, black

2.07 HORIZONTAL MANAGEMENT PANEL

A. Application: Suitable for installation into equipment rack for horizontal cord management. The horizontal management panel shall match (and fully integrate with) the vertical management sections.

B. The horizontal management panel shall be single-sided.

C. Size: 1U by 19” mounting.

D. Color: black (guides and cover).

E. Manufacturers, or equal:

1. CPI “Evolution” Series Horizontal Management Panels

a. #35441-702; horizontal management panel, single sided with pass-through ports, 2U, black

b. #35441-703; horizontal management panel, single sided with pass-through ports, 3U, black

c. #35441-704; horizontal management panel, single sided with pass-through ports, 4U, black

d.

2.08 IT EQUIPMENT CABINET

A. Application: Suitable for the support of IT equipment (servers, storage, etc.), network equipment (switches, routers, firewalls, etc.), power strips (vertical, horizontal), termination apparatus, cable and cord management apparatus, common communications equipment, and other similar equipment.

B. The cabinet shall be fundamentally comprised of a frame, mounting rails, front door, back doors, side panels and a top panel.

1. Frame

a. The frame shall be the primary structural portion onto which everything

else attaches. The frame shall be cubic in design/final construction.
b. The frame shall have the capacity for four mounting rails, minimum. The frame shall allow adjustability to the mounting rails, equipment installation/storage, and accessories.
c. Frame Material: steel or high strength, lightweight 6061-T6 aluminum.
2. Mounting Rails:
a. 45U (or more) capacity
b. RMUs shall be permanently marked on the mounting rails
c. The mounting 'holes' shall be square punches for caged nuts. Caged nuts shall be pre-threaded as #12-24 rolled threading.
3. Cable Management
a. The frame shall come equipped with 2 full-height vertical cable/cord managers, installed onto the back side of the frame.

C. Static load rating: 2,000 lbs, minimum.
D. Finish: power coat paint, black
E. Manufacturers, or equal:
1. DAMAC Fas Trak
a. #CZP84NSB1BSS3; Fas Trak series cabinet, 45U; overall dimensions: 84" (2133mm) H x; 30" (762mm) W x 48" (1219mm) D; equipped with: 1 ventilated front door, 1 ventilated back door, 2 side panels, 1 solid top panel, 2 rail pairs with punched/square holes; finish: black

2.09 BLANKING/FILLER PANELS
A. Application: Suitable for an IT cabinet or equipment rack to prevent/slow front-to-back air flow.
B. Manufacturers, or equal:
1. CPI
a. #30024-701; filler panel, 1U, black
b. #30024-702; filler panel, 2U, black
c. #30024-704; filler panel, 4U, black

2.10 RACK/CABINET BAY ACCESSORIES
A. Rack Mounting Screws
1. Manufacturers, or equal:
a. CPI
1) #40605-005; mounting screws, #12-24, package of 50, black finish, one per cabinet, 2 or 4-post rack
B. Cabinet Mounting Cage Nuts
1. Manufacturers, or equal:
a. CPI
1) #12639-001; cage nuts, #12-24, package of 25, black finish, two per cabinet
C.

2.11 CABLE RUNWAY
A. Application: Suitable for the support and management of telecommunications (and other low voltage) cables, either overhead or vertically on a wall, within telecommunications rooms.
B. Straight Sections and Fittings:
1. Construction: Straight sections and fittings shall be constructed of two longitudinal side elements – "stringer", with elements periodically crossing between stringers – "rung". Straight sections shall be manufactured in 9'-11 ½" lengths with rungs spaced 12" on center, and welded to stringers.
2. Material - stringer and rung: rectangular steel tube, 1-1/2" x 3/8" x 0.65" wall

thickness

C. Compliances: Cable runway shall be UL listed.

D. Manufacturers, or equal:

1. CPI “Adjustable Cable Runway” series#14300-124; adjustable cable runway, straight section, 24"W, black
   b. #10822-124; cable runway horizontal sweep/90-degree fitting, 24"W, black
   c. #10723-124; cable runway vertical outside sweep/90-degree fitting, 24"W, black
   d. #10724-124; vertical inside sweep fitting for 24"W cable runway, black
2. CPI Installation Accessories
   a. #11301-001; butt splice kit
   b. #11313-001; 45-degree junction kit
   c. #11314-001; 90-degree junction kit
   d. #11302-001; junction splice (“T”) kit
   e. #10488-001; swivel junction splice (“T”) kit
   f. #10608-001; vertical wall bracket kit
   g. #10642-001; end caps
   h. #11421-124; wall angle support kit for 24” wide cable runway, black
   i. #11770-124; end closing kit for 24” wide cable runway, black
   j. #12730-124; runway-to-rack attachment kit, for 20” or 24”W runway, black
   k. #14307-001; bonding strap
3. CPI Cable/Cord Management Accessories
   a. #14305-124; drop-out for rung, 24"W, black

2.12 FIBER RUNNER

A. Application: The 6x4 routing system shall be a system of channel, fittings, and brackets designed to segregate, route, and protect fiber optic and high performance copper cabling. Channel and fittings shall be assembled using pre-assembled couplers. A selection of spillout options shall be available that easily attach using the vertical tee. Fittings maintain a minimum 2" bend radius to protect against signal loss due to excessive cable bends. Available system colors shall be yellow, orange, and black. A full complement of brackets shall be available for attaching system components to ladder rack, threaded rod, auxiliary framing, strut, equipment racks, cabinets, and raised floor pedestals.

B. Straight Sections and Fittings:

1. Material – Rigid PVC (Channel), ABS (Fittings)

C. Compliances: Cable runway shall be UL listed.

D. Manufacturers:

1. Panduit FiberRunner#FR6X4BL6; 6x4 channel (6’), black
   b. #FRSHC6BL6;6x4 split hinged cover (6’), black
   c. # FRT6X4BL;Horizontal tee, black
   d. #FRTSC6BL; Horizontal tee cover, black
   e. # FREC6X4BL;End cap, black
   f. #FRTR6X4BL; Spillout for 6x4 exit, black
   g. #FRFWC6X4BL; 4-way cross, black
   h. #FRFWCSC6BL; 4-way cross cover, black
   i. #FRIVRA6X4BL; Inside vertical 90 degree, black
   j. #FROVRA6X4BL; Outside vertical 90 degree, black
   k. #FROVRASC6BL; Outside vertical 90 degree cover, black
   l. #FR6ALB; QL Adjust ladder rack bracket
   m. #FRBC6X4BL; QuickLock coupler, black

n. #FRVT6X4BL; QuickLock vertical tee, black

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the “Execution” requirements of section 270000.

3.02 EXAMINATION AND PREPARATION

A. Prior to installation, verify rooms are suitable for the construction scope of this section. Schedule work to prevent damage caused by other trades during their construction.

B. Prepare surfaces, such as floors, for permanent installation of products, such as racks.

3.03 INSTALLATION

A. Plywood Backboards

1. General
   a. Complete work in a neat, high quality manner. The final conditions shall conform to applicable codes, BICSI’s TDMM, TIA’s 569 standard, and telecom utility standards.
   b. Obtain written authorization from the General Contractor at least one week in advance of any drilling that may produce dust or particles in the air such as seismic anchorage into concrete sub-floor (so, for example, the Fire Protection System may be deactivated during such drilling).
   c. Coordinate the plywood installation with the outlets to result in a clean finish.
2. Preparation
   a. Prior to installing wood materials, condition wood to the prevailing humidity conditions in installation areas.
3. Plywood Installation
   a. Install plywood in accordance with WIC Custom or Premium Quality Standard, as scheduled. Ensure work complies with applicable codes and recognized standards.
   b. Install plywood as indicated on Drawings to the dimensions shown. In lieu of no dimensions, install plywood from +0'-6" to +8'-6" above the finished floor.
   c. Install plywood plumb, level, true, and straight with no distortions. Shim as needed using concealed shims.
   d. Trim plywood around electrical and telecommunications outlets to result in a clean finish.
   e. Install plywood such that the fire rating stamp is visible.
   f. Install plywood to a tolerance of 1/8" in 8' for plumb and level; and with 1/16" maximum offset in flush adjoining, 1/8" maximum offsets in revealed adjoining surfaces.
   g. Do not install plywood that has defects or is not new.
   h. Do not install pieces of plywood that are too small for the area (thus resulting in an excessive number of joints).
4. Fasteners
   a. Install plywood using screws, concrete anchors, or other fasteners suitable for the purpose/ required for application/mounting substrate.
   b. Do not use aluminum fasteners.
   c. Install fastener such that fastener heads are flush with and not protruding from the plywood finished surface. Countersink fastener heads as needed.
5. Painting
   a. Paint plywood with a low-gloss, white (or similar bright color) paint.
   b. Mask the plywood’s fire rated stamp from the paint such that the stamp is

still visible after painting.

6. Cleaning, Finishing, and Protection
   a. Clean exposed surfaces. Touch-up finishes to restore damaged or impaired areas.
   b. Protect and maintain protection to ensure finished work will be without damage. Repair or replace finished work and materials defaced or destroyed prior to acceptance.

B. Equipment Rack Bays
1. Equipment Racks
   a. Pre-Installation:
      1) Layout the racks within telecom rooms, and mark the floor where racks will be installed. Obtain written approval from either the Engineer and Owner prior to proceeding with the rack bay installation.
      2) The layout shall include the correct amount of space between each rack for proper installation (according to manufacturer's written instructions) of the vertical management sections.
      3) The layout shall satisfy the clearance requirements under "System Description".
   b. Anchoring
      1) Use anchors and methods of the approved seismic submittal.
      2) Drill the structure using means approved for this project.
      3) As required, scan the structural floor to identify reinforcing bar and other elements that cannot be interrupted using means approved for this project (e.g., X-ray).
      4) Anchor racks to the structural floor at four points.
      5) Brace racks overhead to overhead cable support where shown on the drawings.
   c. Seismic Bracing: As required for seismic bracing (determined during pre-construction seismic detailing and calculations), provide bracing to the structure using approved means and fasteners/anchors.
   d. Leave no fastener loose and un-torqued.
   e. Bonding: Bond rack bays to approved ground using approved means, configurations and products. Also refer to section 270526 for additional information on bonding.
2. Vertical Management Sections
   a. Bolt vertical management sections to the equipment racks at the points designed by the manufacturer and per the manufacturer's installation instructions.
   b. Leave no fastener loose and un-torqued.
3. Horizontal Management Panels
   a. Install horizontal management panels as required.
   b. Leave no fastener loose and un-torqued.
4. Accessories
   a. Furnish 1 bag of rack mounting screws per rack. Attach the screws directly to the rack (visible for the punch walk).

C. IT Equipment Cabinets
1. Pre-Installation:
   a. Layout the cabinets within equipment rooms, and mark the floor where cabinets will be installed. Obtain written approval from either the Engineer or Owner prior to proceeding with the installation.

b. The layout shall satisfy the clearance requirements under “System Description”.

2. Anchoring
   a. Use anchors and methods of the approved seismic submittal.
   b. Drill the structure using means approved for this project.
   c. As required, scan the structural floor to identify reinforcing bar and other elements that cannot be interrupted using means approved for this project (e.g., X-ray).
   d. Anchor cabinets to the structural floor at four points.
3. Leave no fastener loose and un-torqued.
4. Bonding: Bond cabinets to approved ground using approved means, configurations and products. Also refer to section 270526 for additional information on bonding.
5. Cabinet Set-Up
   a. Set the front doors to open leftward (hinged on the left).
   b. Set the front mounting rails to 2 inches from the front edge of the cabinet frame.
   c. Set the back mounting rails to 2 inches from the back edge of the cabinet frame.
   d. Install the 3rd mounting rails facing to the back to 16 inches from the back edge of the cabinet frame.
6. Accessories
   a. Install accessories, such as equipment shelves, pull-out drawers, etc. per the Owner’s instructions.
   b. Furnish 2 bags of cage nuts per cabinet. Attach the cage nuts directly to the cabinet rails (visible for the punch walk).
   c. Furnish 1 bag of rack mounting screws per cabinet. Attach the screws directly to the cabinet rails (visible for the punch walk).

D. Overhead Cable Support
1. Install support apparatus (e.g., brackets and threaded rod with strut) for overhead cable management system. Install the system per the manufacturer’s instructions and hung from overhead or braced to the wall using appropriate fasteners.
2. Install parts required for complete installation (e.g., mounting brackets, splice kits, hardware, etc.).
3. Tolerances
   a. Install overhead cable support as shown on the drawings. If not explicitly shown, center the overhead cable support to the equipment rack and 3” from the perimeter wall.
4. Interface with Other Work: Coordinate the installation of the overhead cable support with other trades. Trapeze supports and hanger rods (“all-thread”), for example, may be shared to lower overall construction cost.

E. Vertical Cable Support
1. Install cable runway installed vertically for use to support cables routing vertically within telecommunications rooms at the locations as shown on the drawings. If not explicitly shown, install vertical cable support at each floor sleeve.
2. Install parts required for complete installation (e.g., vertical mounting brackets, bolts, etc.).
3. When using cable runway, install the runway such that the rungs are facing outward (the greater distance from the rung to the stringer edge is facing inward).

3.04 FINAL INSPECTION AND CERTIFICATION

A. Punch the work of this section compliant to the requirements of section 270000.

B. Comply with system acceptance and certification requirements of section 270000.

END OF SECTION

SECTION 27 1313

COMMUNICATIONS BACKBONE ISP TWISTED PAIR CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Backbone ISP (inside plant/indoor) twisted pair cabling.

A. Base Bid Work

1. Provide pre-construction services (e.g., submittals, coordination with other trades, etc.), materials, apparatus, labor, tools, equipment, and transportation required for complete communications backbone twisted pair cabling described in this section and shown on related drawings.
2. The related drawings are diagrammatic in nature and require shop drawings to complete the detailed design of the telecommunications infrastructure.
3. In general, the base bid work includes:
   a. Submittals
   b. Backbone inside plant (riser) twisted pair (copper) cables and termination apparatus
   c. Cable management
   d. Cable identification tags and system labeling
   e. Closeout documents
   f. Warranty

B. Related Sections

1. Comply with the Related Sections requirements of section 270000.
2. 270527, “Communications Bonding”
3. 270811, “Communications Twisted Pair Testing”
4. 270528, “Communications Building Pathways”

C. Work Covered Under Other Sections

1. Pathways: The communications pathways (backbone conduits, riser sleeves, cable tray, etc.) work will be covered under another section. Refer to the drawings for size/capacity and route information.
2. Rooms: Build out (e.g., backboards, overhead and vertical cable runway, etc.) of the rooms (MPOE, DAS) will be covered under another section. Refer to the drawings for build out information.
3. Testing: The backbone twisted pair cabling testing requirements are covered under another section. Refer to section 270811 for testing requirements.

1.02 REFERENCES

A. Comply with References requirements of section 270000.

B. In addition to the codes and standards listed in section 270000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. National Fire Protection Agency (NFPA)
   a. NFPA 255, “Standard Method of Test of Surface Burning Characteristics of Building Materials”, 2006
   b. NFPA 259, “Standard Test Method for Potential Heat of Building Materials”, 2003
   c. NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”, 2007

2. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
    a. UL 444, “Communications Cables”
    b. UL 497, “Protectors for Paired-Conductor Communication Circuits”
    c. UL 497A, “Secondary Protectors for Communications Circuits”
    d. UL 497B, “Protectors for Data Communications and Fire-Alarm Circuits”
    e. UL 1863, “Communications-Circuit Accessories”
3. Insulated Cable Engineers Association (ICEA)
    a. ANSI/ICEA S-90-661, “Category 3, 5, and 5e Individually Unshielded Twisted Pair Indoor Cable for Use In General Purpose and LAN Communication Wiring Systems”
    b. ICEA S-116-732, “ICEA Standard For Category 6 and 6A Individually Unshielded Twisted Pair Indoor Cables (With Or Without An Overall Shield) For Use In Communications Wiring Systems Technical Requirements”

1.03 DEFINITIONS

A. Refer to section 270000 for Definitions.

B. In addition to those Definitions of section 270000, the following list of terms as used in this specification defined as follows:
1. “ALVYN”: sheath type consisting of corrugated polymer-coated aluminum shield with and adhered flame retardant jacket
2. “ARMM”: Bell system cable type (shielded riser)
3. “CMP”: Communications Media Plenum [NEC plenum rating]
4. “CMR”: Communications Media Riser [NEC riser/non-plenum rating]
5. “ISP”: Inside Plant [cabling]
6. “PE”: Polyethylene
7. “PIC”: Plastic Insulated Conductor
8. “PVC”: Polyvinyl Chloride
9. “PVDF”: Polyvinylidene fluoride

1.04 SYSTEM DESCRIPTION

A. Backbone twisted pair cabling shall consist of the cabling from the main telecommunications room to the telecommunications rooms or other locations that require analog, digital, or other non-network telecommunications services. Refer to the associated drawings for graphic representation of the system requirements, cabling routes, and quantities.
1. Refer to other sections for pathways and cable support.
2. Refer to other section for testing.

1.05 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements of section 270000.

B. Quantity: Furnish quantities of each submittal as noted in section 270000.

C. Substitutions: Conform to substitutions requirements and procedures in section 270000.

D. Submittal Requirements Prior To Start Of Construction:
1. Product Data submittal, indicating specifications and conformance with CEC, UL, TIA listings, and other applicable certifications.
2. Sample Submittal, consisting of the following components:
    a. <sample products>.
3. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations.

E. Submittal Requirements at Closeout:
1. As-built drawings
2. O&M Manuals

F. Substitutions
1. Requests for substitutions shall conform to the general requirements and procedure outlined in section 270000.

1.06 QUALITY ASSURANCE
A. Comply with Quality Assurance requirements of section 270000.
B. Contractor Qualifications
1. In addition to the Contractor Qualifications requirements of section 270000, the Contractor shall be a SYSTIMAX certified installer (authorized SYSTIMAX reseller) and capable of providing a “SYSTIMAX” warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid submission.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Comply with Delivery, Storage and Handling requirements of section 270000.

1.08 WARRANTY
specific category per TIA-568 performance criteria for backbone cabling.
A. The telecommunications cabling system, as specified in this section, shall carry a “SYSTIMAX Structured Connectivity Solutions Extended Product Warranty and Application Assurance Program” supporting applicable cabling systems.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. CommScope SYSTIMAX (no other substitutions allowed)

2.02 UNSHIELDED TWISTED PAIR CABLES CAT5E – PLENUM
A. Application:
1. Cable suitable for indoor installation, within conduit system and between floors in vertical riser system
2. Each cable run shall be a continuous single cable, homogenous in nature; splices are not permitted.
3. Twisted pair PIC type, air core cable.
B. Conductors:
1. Annealed solid copper, 24 AWG
2. Fully insulated, consisting of FEP or other thermoplastic.
3. Conductors twisted into pairs are stranded into 25-pair bundles.
4. Color Coding: Twisted pairs and units individually color-coded to industry standards (ANSI/ICEA Publication S-80-576, and EIA-230).
C. Core and Sheath:
1. Cable sheath shall consist of an overall flame-retardant PVDF, or equivalent, jacket.
2. NEC rated as CMP and UL listed as such.
D. Performance:
1. Electrical performance of the twisted pairs and overall cable shall comply with the performance requirements of TIA-568 for Category 5e “Backbone Cable Transmission Performance”.
E. Certifications
1. UL 444, UL 1666
2. C22.2 No. 214-02
3. ETL Listed, or equal
F. Manufacturer:
1. CommScope #2061B WH 25/24 R1000 (760026518); Category 5e (PowerSUM), 25 pair, 24 AWG, white, CMP rated

2.03 BACKBONE CABLE – CAT6A U/UTP PLENUM RATED (CMP)
A. Application: Suitable for indoor installation, within ceiling space in primary and secondary

pathways, within access/raised floor space.

B. Conductors:
   1. Insulated Conductors: 23 AWG solid copper, fully insulated with a flame retardant thermoplastic material (material = FEP, or similar).
   2. Twisted Pairs: Two insulated conductors “twisted” into a “pair” (twisted pair) color-coded to industry standards (EIA-230).

C. Cable Sheath:
   1. Shielding: none
   2. Outer Jacket: seamless outer jacket (material = LS-PVC, or similar) applied to and completely cover the internal components (twisted pairs).

D. Flame Rating: CMP, UL listed as such, and the rating shall be printed on the jacket.

E. Electrical and Mechanical Performance: Meet or exceed requirements of TIA-568 standard series, ANSI/ICEA S-116-732, ISO 11801 Class E_A Edition 2.2, and IEEE Std. 802.3an channel for CAT6A cabling.

F. Limited Power: UL certified as “Limited Power (LP)”, and the rating shall be printed on the jacket.
   1. Listed to 0.5 A per conductor.

G. Jacket marking: “CMP–LP (0.5A)”

H. Manufacturer:
   1. CommScope SYSTIMAX “GigaSPEED X10D” Series CAT6A U/UTP Plenum Rated (CMP) Cable
      a. #2091BBL; CAT6A 4 pair U/UTP cable “GigaSPEED X10D”, CMP, blue

2.04 TERMINATION APPARATUS – CAT6A PATCH PANEL, PUNCH DOWN TYPE

A. Application: Panels shall be suitable for installation within a TR for the termination of the horizontal cables specified herein. Panels shall be horizontally oriented for a rack-mounted configuration. Panels shall be capable of supporting, organizing, labeling and patching/crossconnecting between the horizontal termination field and the equipment termination field.

B. Modular patch panel shall have 110-type termination, and shall be compatible with the specified horizontal cables both electrically and physically.

C. Mechanical Performance: Each port shall be an 8-position modular jack, compliant to ANSI/TIA-568.

D. Electrical Performance: Each port shall meet or exceed TIA-568 standard series and ISO/IEC 11801 requirements for CAT6A U/UTP cabling through the cable termination and patch cord connection.

E. Manufacturer:
   1. CommScope “SYSTIMAX 360” “GigaSPEED X10D” “Evolve” Series
      a. #360-IPR-1100-AE-GS6-2U-48; angled patch panel, 1U, 48 CAT6 ports

2.05 BACKBONE CABLE SUPPORT BAR

A. Application: Suitable to support horizontal cables behind patch panels from vertical cable managers to termination point.

B. Color: Match rack color

C. Manufacturer:
   1. CPI
      a. #12176-701; cable management bar / patch panel dressing bar

2.06 LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Labels for Cables
   1. Labels shall be adhesive-backed and have a self-laminating feature.
   2. Labels shall fit the backbone cables listed above (i.e., shall fully wrap around the cable's jacket).
   3. Printable area should be 1 inch wide x 0.5 inch high, or larger.
   4. Printable area color shall be white.
   5. Manufacturer:
      a. Commscope

C. Termination Apparatus Labels
   1. Labels shall be adhesive backed
   2. Printable area color shall be white for backbone termination field and gray for '2nd level' backbone termination field
   3. Manufacturer:
      a. CommScope SYSTIMAX #110WA2-4500L; 5-pair marked label inserts, white

PART 3 - EXECUTION

3.01 GENERAL
   A. Comply with the Execution requirements of section 270000.

3.02 EXAMINATION AND PREPARATION
   A. Rooms: Prior to installation, verify equipment rooms are suitable to accept the backbone twisted pair cables and terminations.
   B. Pathways: Prior to installation verify that pathways and supporting devices, provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, "True Tape" the conduits).
   C. Cable Integrity: Prior to installation, verify the twisted pair cable is fully operational – both cable sheath and twisted pair conductors. Documentation of pre-installation testing is not a close out requirement and is the responsibility of the Contractor.

3.03 INSTALLATION
   A. Backbone Cable Installation and Routing
      1. Cable runs shall have continuous sheath continuity, homogenous in nature; splices are not permitted.
      2. The maximum electrical length of any permanent link shall not exceed 90 meters. If consolidation points or multi-user outlets are used, then the lengths shall not exceed those listed in the TIA-568 standard and the cabling system manufacturer's guidelines (whichever is shorter).
      3. The maximum electrical length of any channel shall not exceed 100 meters. If consolidation points or multi-user outlets are used, or if the total length of cords needs to exceed 10 meters, then the permanent link lengths shall not exceed those listed in the TIA-568 standard and the cabling system manufacturer's guidelines (whichever is shorter).
      4. Placement
         a. Place cables within designated pathways.
         b. Maintain a minimum bend radius of 6 times the cable diameter during and after installation.
         c. Maintain pulling tension within manufacturer's limits.
         d. Place and suspend cables in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables if damaged during installation
         e. Place a pull rope along with cables where run in conduit and spare

capacity still exists in the conduit. Tie off ends of the pull rope.

5. Routing
   a. When routing horizontally within telecommunications rooms, utilize the overhead cable support. When routing vertically within telecommunications rooms, utilize the vertical cable support and provide cable ties every 24 inches on center using.
   b. Route cables a minimum of 6" away from power sources to reduce interference from EMI.
6. Termination
   a. Provide 15 feet cable slack loop at each end of the run. Store slack in overhead cable support or as noted on drawings.
   b. Properly relieve strain from cables at termination points per manufacturer's instructions.
   c. Terminate twisted pairs onto the termination apparatus in accordance with manufacturer's latest instructions and TIA-568 standard installation practices.
   d. Perform post-installation testing as described in section 270811.

B. Termination Apparatus
1. Provide accessories required for a complete installation.
2. Install the termination apparatus to the dimensions shown on the drawings. If the dimensions are not shown, install the termination apparatus such that the bottom row of terminations is no lower than 24 inches (+/- 3") AFF and the top row of terminations is no higher than 60 inches (+/- 3") AFF.
3. Mount termination apparatus plumb and square.

3.04 LABELING

A. General Requirements
1. Labeling and identifier assignment and the label colors shall conform to the TIA-606 Administration Standard and as approved by Owner or Owner's Representative before installation.
2. Provide permanent and machine-generated labels; hand written labels will not be accepted.

B. Cable Labels
1. Label Format:
   a. Label type shall be wrap-around self-laminating.
   b. Label color shall be white background with clear laminating window.
   c. Text color shall be black; text height shall be 1/8" high, minimum, or #12 font size.
2. Provide labels on both ends of cables. Fully wrap label around the cable jacket. Install labels no more than 4 inches from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.

C. Termination Apparatus Labels
1. Use labels included in the product packaging. For substitutions, request approval by the Engineer.
2. Label color shall be white for respective field type, per TIA-606.
3. Text color shall be black, 3/32" high, minimum, or #10 font size.

D. Identifier Assignment
1. General: Separate label fields of the identifier with a hyphen.
2. Backbone ISP Twisted Pair Cables
   a. The first field shall identify the cable type: "CBT" (for Cable, Backbone, Twisted pair).
   b. The second field shall identify the originating termination room identifier as

shown on the plans; e.g., “BDF2.1”.

c. The third field shall identify the ending termination room identifier as shown on the plans; e.g., “IDF2.2”.

d. The fourth field shall identify the beginning and ending pair counts.

e. Identifier Example: “CBT-BDF2.1-IDF2.2-0401-0600”

3. Termination Positions at the 110 Termination Blocks

a. The first field shall identify the origination / destination room; for example “TO IDF2.2”.

b. The second field shall identify the pair count range; for example, “0401-0450”

c. Identifier Example: “TO IDF2.2 0401 - 0450”.

3.05 FINAL INSPECTION AND CERTIFICATION

A. Punch the work of this section compliant to the requirements of section 270000.

B. Remove and replace with new, at no cost to the Owner, cables or conductors failing to meet the indicated standards and not passing the testing requirements of section 270811. The Owner, or Owner’s Representative, will not accept the installation until testing has indicated a 100% availability of all cables and conductors or the Owner or Owner’s Representative has approved any deviation from this requirement.

C. Comply with system acceptance and certification requirements of section 270000.

END OF SECTION

SECTION 27 1314

COMMUNICATIONS BACKBONE OSP TWISTED PAIR CABLING

PART 1 - GENERAL

1.01 SUMMARY
- A. Section Includes: Backbone OSP (outside plant) twisted pair cabling.
- B. Related Sections
  1. Comply with the Related Sections requirements of Section 270000.

1.02 REFERENCES
- A. Comply with References requirements of Section 270000.
- B. In addition to the codes and standards listed in Section 270000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
  1. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
     a. UL 497, “Protectors for Paired-Conductor Communication Circuits”
     b. UL 497A, “Secondary Protectors for Communications Circuits”
     c. UL 497B, “Protectors for Data Communications and Fire-Alarm Circuits”
     d. UL 497C, “Protectors for Coaxial Communications Circuits”
     e. UL 1863, “Communications-Circuit Accessories”
     f. UL 1863, “Communications-Circuit Accessories”
     g.

1.03 DEFINITIONS
- A. Refer to Section 270000 for Definitions.
- B. In addition, define the following list of terms as used in this specification as follows:
  1. “BEP”: Building Entrance Protection [systems]
  2. “CMP”: Communications Media Plenum [NEC plenum rating]
  3. “CMR”: Communications Media Riser [NEC riser/non-plenum rating]
  4. “HDPE”: High Density Polyethylene
  5. “ISP”: Inside Plant [cabling]
  6. “LDPE”: Light Density Polyethylene
  7. “OSP”: Outside Plant [cabling]
  8. “PE”: Polyethylene
  9. “PIC”: Plastic Insulated Conductor
  10. “PVC”: Polyvinyl Chloride

1.04 SYSTEM DESCRIPTION
- A. Work Provided Under Other Sections
  1. Telecommunications Pathways
     a. Pathways (underground conduits, maintenance holes, pull boxes, pull ropes, etc.) will be provided under other Sections.
     b. Refer to the Drawings for size/capacity and route information.
  2. Telecommunications Rooms
     a. Buildout (e.g., backboards, overhead and vertical cable runway, etc.) of the telecommunications rooms (MPOE) work will be covered under another Section.
     b. Refer to the Drawings for buildout information.
- B. Base Bid Work
  1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working telecommunications

backbone twisted pair cabling system installation described in these specifications and shown on related Drawings.

2. The Drawings are diagrammatic in nature, and require shop drawings to complete the detailed design of the communications infrastructure.
3. Consider Backbone cabling as shown on Drawings as base bid work, unless otherwise noted. This includes terminations at both ends.
4. In general, the base bid work includes:
   a. Submittals
   b. Backbone outside plant (interbuilding) twisted pair (copper) cables and terminations
   c. Building entrance protection and terminal
   d. Cable management
   e. Cable identification tags and system labeling
   f. Record Documents
   g. Warranty

1.05 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements of Section 270000.
B. Submittal Requirements Prior To Start Of Construction:
   1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.
   2. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations.
C. Submittal Requirements at Closeout:
   1. As-Built Drawings.
   2. O & M Manuals.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 270000.
B. Contractor Qualifications
   1. In addition to the Contractor Qualifications requirements of Section 270000, the Contractor shall be manufacturer certified to install the proposed and submitted cabling system and to provide an extended warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid submission.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 270000.

1.08 WARRANTY

A. The communications cabling system, as specified in this Section, shall carry a 15-year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover electrical performance of cabling system to the specific category per ANSI/TIA-568-C performance criteria for backbone cabling.

PART 2 - PRODUCTS

2.01 SPLICE CLOSURES AND ACCESSORIES

A. Splice Closure – Building Entrance Type
   1. Application: Splice closure system shall be suitable for indoor installation within an entrance facility for splicing between OSP and ISP cable.
   2. Closure:
      a. Re-enterable
      b. Solid sleeve, or slip sleeve acceptable.
      c. End caps shall accept eight single collared or having multiple holes.

3. Manufacturer:
    a. 3M Telecom Systems
        1) #5-26; solid closure, up to 600 pair,
        2) #5DS-26; split closure, up to 600 pair
        3) #C5-100-6; end caps (to be sized to cable entry and exits)
        4) #4460; shield bond connector for cables 100-pair or larger
        5) #4460-D; shield bond connector for cables 100-pair or smaller
        6) #25T ground braid or #25T ground braid with eyelets

2.02 BUILDING ENTRANCE PROTECTION

A. BEP Terminal – 25' 26AWG, RJ21 male Output
1. Application: BEP terminal shall be suitable for indoor installation, within a telecom room (such as an Entrance Facility or 'MPOE'). BEP terminals shall provide termination of the backbone twisted pair cables specified within this Section, shall protect premises equipment against induced voltages and stray currents, and shall accept '5-pin' protector modules specified within this Section.
2. Configuration: BEP terminal shall be designed for a rack-mounted configuration, and shall have the capacity to accept 300-pair incoming and outgoing pairs.
3. Input: 25' 26AWG. Output: RJ21 male.
4. Manufacturer:
    a. Circa
        1) #RMP300XLBET-LWM-25; 300-pair BEP terminal with 25' 26AWG input, RJ21 male output
        2) #MM15-0129; 23" Mounting Bar
        3) #MM15-0130; Small Wire Management System
        4) #MM15-0131; Large Wire Management System
        5) #332305B1.5RJ; 300 Pair Female Pre-Wired
        6) #332306B2.5RJ 300 Pair Male Pre-Wired
        7) #332304 RJ Connector Plate

B. BEP Modules – With Sneak Current Protection
1. Standard 5-pin type BEP, suitable for installation into BEP terminals.
2. Overvoltage Device: solid state. DC Breakdown Voltage: 220 V. Response time: <100 nsec.
3. Sneak Current Device: heat coil. Sneak Current: 1 A. Response Time: < 15 sec.
4. Manufacturer:
    a. Circa
        1) #4B1FS-240; solid-state module, 240V breakdown voltage, black

2.03 LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Labels for Cables
1. Labels shall be adhesive-backed and have a self-laminating feature
2. Labels shall fit the backbone cables listed above (i.e., shall fully wrap around the cable's jacket).
3. Printable area should be 1 inch wide x 0.5 inch high, or larger
4. Printable area color shall be white
5. Manufacturer:
    a. Panduit
        1) #S200X400YAJ; labels for 25 to 100 pair cables [0.32" (8.09mm) - 0.95" (24.26mm) dia.]
        2) #S200X650YAJ; labels for 100 to 400 pair cables [0.48" (12.13mm) – 1.59" (40.43mm) dia.]

b. Or equal

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 270000.

3.02 EXAMINATION AND PREPARATION

A. Rooms: Prior to installation, verify equipment rooms are suitable to accept the backbone twisted pair cables and terminations.

B. Pathways: Prior to installation verify that pathways and supporting devices, provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, “True Tape” the conduits).

C. Cable Integrity: Prior to installation, verify the twisted pair cable is fully operational – both cable sheath and twisted pair conductors. Documentation of pre-installation testing is not a close out requirement, and is the responsibility of the Contractor.

3.03 INSTALLATION

A. Building Entrance Splicing Systems

1. Furnish entrance splice system as shown on the Drawings, including closure, and end capsBuilding Entrance Protection

1. Provide BEP system as shown on the Drawings, including terminals, modules, and accessories required for a complete installation. Install BEP per manufacturer’s instructions.

2. Install BEP terminals plumb and square, and at height shown on Drawings.

3. Grounding and Bonding

a. Bond BEP terminal to TGB in accordance with NEC Article 800, and follow the installation requirements described in Article 800.

b. Provide 6 AWG bonding conductor up to 25 feet in length; if longer than 25 feet, size bonding conductor as 1000 circular mils per foot.

4. Labeling

a. Provide and permanently affix label on the terminal’s cover.

b. Provide label in the label holder at the terminal’s “outgoing” connection.

5. Provide quantity of protector modules to completely populate terminals.

3.04 LABELING

A. General Requirements

1. Labeling and identifier assignment and the label colors shall conform to the TIA/EIA-606-A Administration Standard and as approved by Owner or Owner’s Representative before installation.

2. Provide permanent and machine-generated labels; hand written labels will not be accepted.

B. Cable Labels

1. Label Format:

a. Label type shall be wrap-around self-laminating.

b. Label color shall be white background with clear laminating window.

c. Text color shall be black; text height shall be 1/8” high, minimum, or #12 font size.

2. Provide labels on both ends of cables. Fully wrap label around the cable jacket. Install labels no more than 4 inches from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.

C. Protection and Termination Apparatus Labels

a. Use labels included in the product packaging. Request approval by the Engineer for substitutions.

b. Label color shall be brown for respective field type, per TIA/EIA-606-A.
c. Text color shall be black, 3/32" high, minimum, or #10 font size.

D. Identifier Assignment
1. General: Separate label fields of the identifier with a hyphen.
2. Cables
a. The first field shall identify the cable type: "CBT" (for Cable, Backbone, Twisted pair).
b. The second field shall identify the originating termination room identifier as shown on the plans; e.g., "MDF1.1".
c. The third field shall identify the ending termination room identifier as shown on the plans; e.g., "BDF2.1".
d. The fourth field shall identify the beginning and ending pair counts.
e. Identifier Example: "CBT-MDF1.1-BDF2.1-0401-0600"
3. Termination Positions on the BEP Terminal Cover
a. The first field shall identify the opposite end's room; for example "TO BDF2.1".
b. The second field shall identify the pair count range; for example, "0401-0500"
c. Identifier Example: "TO BDF2.1 0401 - 0500"

3.05 FINAL INSPECTION AND CERTIFICATION
A. Punch the Work of this Section compliant to the requirements of Section 270000.
B. Remove and replace with new, at no cost to the Owner, cables or conductors failing to meet the indicated standards and not passing the testing requirements of Section 270811. The Owner, or Owner's Representative, will not accept the installation until testing has indicated a 100% availability of all cables and conductors or the Owner or Owner's Representative has approved any deviation from this requirement.
C. Comply with system acceptance and certification requirements of Section 270000.

END OF SECTION

SECTION 27 1323

COMMUNICATIONS BACKBONE ISP FIBER OPTIC CABLING

PART 1 - GENERAL

1.01 SUMMARY
- A. Section Includes: Backbone ISP (indoor) fiber optic cabling.
- B. Related Sections
  1. Comply with the Related Sections paragraph of Section 270000.
  2. 270821 Communications Fiber Optic Testing

1.02 REFERENCES
- A. Comply with References requirements of Section 270000.
- B. In addition to the codes and standards listed in Section 270000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
  1. National Fire Protection Agency (NFPA)
     a. NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”, 2007
  2. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
     a. UL 1569, “Metal-Clad Cables”
     b. UL 1651, “Optical Fiber Cable”
  3. Telcordia
     a. GR-409-CORE, Issue 2, “Generic Requirements for Indoor Fiber Optic Cable”

1.03 DEFINITIONS
- A. Refer to Section 270000 for Definitions.
- B. In addition to those Definitions of Section 270000, the following list of terms as used in this specification defined as follows:
  1. “OFCP”: Optical Fiber Conductive Plenum, plenum rating
  2. “OFCR”: Optical Fiber Conductive Riser, non-plenum riser rating
  3. “OFNP”: Optical Fiber Non-conductive Plenum, plenum rating
  4. “OFNR”: Optical Fiber Non-conductive Riser, non-plenum riser rating
  5. “OFN”: Optical Fiber Non-conductive, general purpose indoor rating
  6. “PVC”: PolyVinyl Chloride
  7. “SM”: Singlemode [fiber type]

1.04 SYSTEM DESCRIPTION
- A. Work Covered Under Other Sections
  1. Pathways: The communications pathways (backbone conduits, riser sleeves, basketway, cable tray, etc.) work will be covered under another Section. Refer to the drawings for size/capacity and route information.
  2. Rooms: Build out (e.g., backboards, overhead and vertical cable support, etc.) of the telecommunications rooms will be covered under another Section. Refer to the drawings for build out information.
- B. Base Bid Work
  1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working telecommunications backbone fiber optic cabling system installation described in these specifications and shown on related drawings.
  2. The drawings are diagrammatic in nature, and require shop drawings to complete

the detailed design of the telecommunications infrastructure.

3. Consider Backbone cabling, as shown on drawings, as base bid work, unless otherwise noted, including terminations at both ends.
4. In general, the base bid work includes:
   a. Submittals
   b. Backbone inside plant (riser) fiber optic cables and terminations
   c. Bonding (cable armor, termination apparatus, etc)
   d. Cable management
   e. Cable identification tags and system labeling
   f. Record Documents
   g. Warranty

1.05 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements of Section 270000.
B. Submittal Requirements Prior To Start Of Construction:
   1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.
   2. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations
C. Submittal Requirements at Closeout:
   1. Copy of the manufacturer's printed reel documentation, including the following.
      a. Manufacturer's reel number
      b. Manufacturer's traceable batch number
      c. Length of the fiber cable on the reel
      d. Maximum attenuation
      e. Minimum bandwidth
   2. As-Built Drawings
   3. O&M Manuals
D. Substitutions
   1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 270000.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 270000.
B. Contractor Qualifications
   1. In addition to the Contractor Qualifications requirements of Section 270000, the Contractor shall be a CommScope SYSTIMAX certified installer (authorized CommScope SYSTIMAX reseller) and capable of providing a "CommScopeSYSTIMAX" warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid submission.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 270000.

1.08 WARRANTY

A. The backbone fiber optic cabling system, as specified in this section, shall carry a "SYSTIMAX Structured Connectivity Solutions Extended Product Warranty and Application Assurance Program" supporting applicable media syatems.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. CommScope SYSTIMAX (no other substitutions allowed)

2.02 FIBER OPTIC CABLE – INTERLOCKED ARMOR PLENUM RATED

A. Application:
   1. Cable shall be suitable for indoor installation, between floors in vertical riser

system, under access flooring, and through overhead ceiling space (in basketway, cable tray, conduit, and/or hangers).

2. Optical transmission performance shall not be significantly affected by environmental fluctuations, installation, or aging.
3. Materials shall not evolve hydrogen in quantities that will increase light attenuation.

B. Singlemode fiber strands shall meet or exceed the following geometry criteria:
1. Core diameter = 8.3 μm
2. Mode field diameter = 8.8 μm, ±0.5 μm
3. Cladding diameter = 125 μm, ±1.0 μm
4. Core/Cladding Concentricity = ≤ 0.8 μm
5. Minimum Tensile Strength = 100,000 psi

C. Singlemode fiber strands shall meet or exceed the following performance criteria:
1. Attenuation = 0.5 dB/km at 1310 nm and 0.5 dB/km at 1550 nm wavelengths, maximum
2. Cutoff wavelength = 1260 nm
3. Dispersion = 3.5 ps/nm•km at 1285-1330 nm and 18 ps/nm•km at 1550 nm

D. Primary Coating:
1. Each fiber shall be completely covered with a “primary coating” (acrylate material).
2. Coating diameter = 250 μm, ±5 μm

E. Buffering:
1. Each coated fiber shall be fully covered with a material extruded over and directly onto the coating. This shall be the tight buffer. Tight buffer diameter = 900 μm, ±5 μm. Material = PVC, or equivalent flame retardant thermoplastic.
2. Buffered strands shall be individually color-coded to meet the requirements of ANSI/TIA/EIA-598-A-1995. (Also, ref. ANSI/ICEA S-83-596-1994, and EIA-230)

F. Cable Sheath:
1. Strength Element: The cable shall have an internal strength element such as aramid yarn (e.g., Kevlar).
2. Inner Jacket: The cable shall have a seamless inner jacket (material = PVC, or equivalent) applied to and completely covering the internal components (fiber strands, strength element, other).
3. Armor: The cable shall have an interlocking metallic armor applied spirally and longitudinally to and completely covering the cable.
4. Outer Jacket: The cable shall have a seamless outer jacket (material = PVC, or equivalent) applied to and completely covering the armor.
5. Tensile Strength: The cable shall have a 150-lb, minimum, rated load.
6. Flame Rating: NEC (Article 770) rated as OFCP, and UL listed as such.

G. Manufacturer:
1. CommScope SYSTIMAX
a. #P-096-DZ-8W-FMUYL; 96 strand, singlemode, interlock armor, yellow, OFCP rated

2.03 TERMINATION APPARATUS – FIBER OPTIC PATCH PANELS

A. Application:
1. Fiber optic patch panels shall be an enclosed housing for protecting, storing and organizing the termination of fiber cable(s) and fiber strands, shall provide means to strain relieve and support of the specified cables, shall contain facilities to store fiber slack, and shall provide patch cord management.
2. Fiber optic patch panels shall be passive physical equipment and apparatus used

in terminating, interconnecting, and cross-connecting fiber optic cabling, shall possess a minimum fire resistant rating of UL94V-1, and shall conform to existing OSHA Health and Safety Laws.

3. Fiber optic patch panels shall be rack-mountable.

B. Fiber optic patch panels shall come equipped with safety labels such as laser identification or warning labels as required by system considerations.

C. Manufacturer:

1. CommScope SYSTIMAX
   a. #760209965; “HD-4U” type patch panel, sliding, 4U, retains 16 “360G2” modules
   b. #760109413; “360G2 Singlemode Distribution Adapter Pack w/6 SC Blue (non-shuttered)

2.04 FIBER OPTIC CONNECTORS

A. Singlemode Fiber Optic Connectors – SC Type

1. Materials:
   a. Ferrule: ceramic (zirconia or alumina) with pre-radiused finish/face.
   b. Connector housing: plastic.
2. Connector shall meet or exceed Ultra PC performance (LC-UPC).
3. Connector shall have an integral strain relief feature, including a bend limiting rear boot.
4. Connector shall be installable via either epoxy or anaerobic method.
5. Manufacturer:
   a. CommScope SYSTIMAX
      1) #P6001B-Z-125; SC type connector, SM, zirconia ceramic, blue boot, for 0.9 mm buffered fiber

2.05 LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Labels for Cables

1. Labels shall be adhesive-backed and have a self-laminating feature
2. Labels shall fit the backbone cables listed above (i.e., shall fully wrap around the cable’s jacket).
3. Printable area should be 1 inch wide x 0.5 inch high, or larger
4. Printable area color shall be white
5. Manufacturer:
   a. Commscope

2.06 MISCELLANEOUS

A. Fiber Slack Storage Reel: Leviton #48900-OFR, or equal

B. Velcro Cable Ties

1. Width: .75”.
2. Color: Velcro cable ties the same color as the cable to which it is being applied.
3. Manufacturers:
   a. Panduit
      1) #HLS-15R-0 Black, 15’ roll, cut to length.
   b. Or equal

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with Execution requirements of Section 270000.

3.02 EXAMINATION AND PREPARATION

A. Pathways: Prior to installation verify pathways (conduits, etc.) and supporting devices,

provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, “True Tape” the conduits).

B. Rooms: Prior to installation, verify equipment rooms are ready for cables and terminations.

C. Prior to installation, verify cables and conductors are fully operational – both cable sheath and fiber strands. Pre-installation testing is the responsibility of the Contractor, though documentation of pre-installation testing is not a close out requirement.

3.03 INSTALLATION

A. Backbone Cable Installation, Routing, and Termination

1. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.
2. Placement
   a. Place cables within designated pathways.
   b. Maintain a minimum bend radius of 20 times the cable diameter during installation, and a minimum bend radius of 10 times the cable diameter after installation.
   c. Maintain pulling tension within manufacturer's limits.
   d. Place and suspend cables in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation.
   e. Do not use cable-pulling compounds for indoor installations.
   f. Provide 20 to 30 feet of cable slack at each end within the Telecommunications Rooms; store slack in the overhead cable support.
   g. Place a pull rope along with cables where run in pathways and spare capacity in the pathway remains. Tie off ends of the pull rope.
3. Routing
   a. When routing overhead within Telecommunications Rooms, neatly dress and organize cables on designated cable support apparatus (for example, overhead and vertical cable support), and fasten cables to cable support apparatus via tie wraps or Velcro-type straps.
4. Termination
   a. Properly relieve strain from cables at termination points (at/within the fiber optic termination panels) per manufacturer’s instructions.
   b. Bond cable armor to grounding point (busbar) – refer to section 270526 for additional information.
   c. Terminate fiber strands via pigtail splicing at both ends using the specified fiber optic pigtail appropriate for the mode type of the fiber. Splicing type shall be fusion; mechanical splicing will not be accepted. Perform terminations in accordance with manufacturer’s instructions.
   d. Provide required accessories and consumables for the complete termination of fiber strands.
   e. Provide 3 feet of unsheathed fiber (tight buffer) slack within the patch panel/termination enclosure at each end of the link. Properly store fiber slack in rear of patch panel into the ‘routing rings’, per manufacturer’s instructions.

B. Fiber Optic Cable Termination Panel

1. Provide fully assembled termination panel in designated equipment rack; locate per drawings (if not shown, locate at the top). “Fully assembled” includes installation and mounting components and accessories such as adapter panels, coupling adapters, etc. required for operation.

2. Provide accessories required for proper installation of each termination panel, including connector panels and adapters.
3. Bond termination apparatus to grounding point (busbar) – refer to section 270526 for additional information.

3.04 LABELING

A. General Requirements
1. Labeling, identifier assignment, and the label colors shall conform to the TIA/EIA-606-A Administration Standard and as approved by Owner or Owner's Representative before installation.
2. Provide permanent and machine generated labels; hand written labels will not be accepted.

B. Cable Labels
1. Label Format:
a. Label type shall be wrap-around self-laminating.
b. Label color shall be white background with clear laminating window.
c. Text color shall be black; text height shall be 1/8" high, minimum, or #12 font size.
2. Provide labels on both ends of cables. Fully wrap label around the cable jacket. Install labels no more than 4 inches from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.

C. Termination Apparatus Labels
1. Use labels included in the product packaging. For substitutions, request approval by the Engineer.
2. Label color shall be white for respective field type, per TIA/EIA-606-A.
3. Text color shall be black, 3/32" high, minimum, or #10 font size.

D. Identifier Assignment
1. General: Separate all label fields of the identifier with a hyphen.
2. Backbone ISP Fiber Optic Cables
a. The first field shall identify the cable type: "CBF" (for Cable, Backbone, Fiber optic).
b. The second field shall identify the originating termination room identifier as shown on the plans; e.g., "BDF2.1".
c. The third field shall identify the ending termination room identifier as shown on the plans; e.g., "IDF2.2".
d. The fourth field shall identify the type and number of strands; for example, "Mxxx" where "M" stands for multimode and xxx stands for the ending fiber strand sequential count
e. Identifier Example: "CBF-BDF2.1-IDF2.2-M025-M048"
3. Termination Positions at the Termination Panels
a. Make the first field of the identifier the destination room; for example "TO IDF2.2".
b. Make the second field of the identifier the strand count range; for example, "M025-M048"
c. Identifier Example: "TO IDF2.2 M025-M048".

3.05 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 270000.

B. Remove and replace with new, at no additional cost, cables with conductors failing to meet the indicated standards and not passing the testing requirements of Section 270821. The Owner, or Owner's Representative, will not accept the installation until testing has indicated a 100% availability of cables and conductors or the Owner or Owner's Representative has approved in writing any deviation from this requirement.

C. Comply with system acceptance and certification requirements of Section 270000.

END OF SECTION

SECTION 27 1513

COMMUNICATIONS HORIZONTAL TWISTED PAIR CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Horizontal twisted pair cabling

B. Base Bid Work

1. Provide pre-construction services (e.g., submittals, coordination with other trades, etc.), materials, apparatus, labor, tools, equipment, and transportation required for complete communications horizontal twisted pair cabling described in this section and shown on related drawings.
2. In general, the base bid work includes:
   a. Submittals
   b. Horizontal cables, terminations, and outlets
   c. Cable support and management
   d. Cable identification tags and system labeling
   e. Closeout documents
   f. Warranty
3. Identifiers and Labeling: The scope of work herein includes the responsibility for assigning identifiers to each horizontal cabling link and related cabling media in addition to providing physical labeling to each component.

C. Related Divisions and Sections

1. Comply with the Related Divisions and Sections requirements of section 270000
2. 270811, “Communication Twisted Pair Testing”
3. 271313, “Communications Backbone Twisted Pair Cabling”
4. 270528, “Communications Building Pathways”

D. Work Provided Under Other Sections

1. Pathways: Communications pathways (cable tray, conduits, stubs, etc.) are covered under another section. Refer to the drawings for type, size/capacity and route information. Refer to section 270528 and to the drawings for requirements, buildout information and layouts.
2. Rooms: Telecommunications room buildout (e.g., backboards, rack bays, overhead and vertical cable support, etc.) is covered under another section. Refer to section 271100 and to the drawings for requirements, buildout information and layouts.
3. Testing: The horizontal cabling system testing requirements are covered under another section. Refer to section 270811 for testing requirements.

1.02 REFERENCES

A. Comply with the References requirements of section 270000.

B. In addition to the codes and standards listed in section 270000, comply with the latest edition (or as noted) of the following applicable specifications and standards except as otherwise shown or specified:

1. National Fire Protection Agency (NFPA)
   a. NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”
2. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
   a. UL 444, “Communications Cables”
   b. UL 497, “Protectors for Paired-Conductor Communication Circuits”

c. UL 1863, “Communications-Circuit Accessories”

3. Insulated Cable Engineers Association (ICEA):
   a. ANSI/ICEA S-90-661, “Category 3, 5, and 5e Individually Unshielded Twisted Pair Indoor Cable (With or Without an Overall Shield) for Use in General Purpose and LAN Communication Wiring Systems”
   b. ICEA S-116-732, “Standard for Category 6 and 6A, 100 Ohm, Individually Unshielded Twisted Pairs, Indoor Cables (With Or Without An Overall Shield) for Use in LAN Communications Wiring Systems”

1.03 DEFINITIONS

A. The Definitions in section 270000 apply to this section.

B. In addition, define the following list of terms as used in this specification as follows:
   1. “Cabling”: cabling consists of cables, connectors (jacks, plugs), termination apparatus (panels, blocks, outlets, etc.), consolidation points, connecting media (patch cords, line cords, crossconnect wire, etc.), and labeling/identification.
   2. “CAT3”: Category 3 performance grade
   3. “CAT5E”: Category 5 Enhanced performance grade
   4. “CAT6”: Category 6 performance grade
   5. “CAT6A”: Category 6 Augmented performance grade
   6. “Channel”: End to end transmission path; e.g., the Permanent Link and connecting media such as line cord (at the workstation), patch cord, and (if a full crossconnection is implemented) the crossconnect termination/connecting apparatus and equipment cord.
   7. “CMP”: Communications Media Plenum [plenum rating]
   8. “CMR”: Communications Media Riser [riser {non-plenum} rating]
   9. “FEP”: Fluorinated Ethylene Propylene
   10. “F/UTP”: twisted pair cabling with an overall foil shield
   11. “FTP”: synonymous with “F/UTP”, unless otherwise noted
   12. “ID”: identifier
   13. “MDF”: Main Distribution Facility
   14. “PE”: Polyethylene
   15. “Permanent Link”: Test configuration for a horizontal cabling link excluding patch cords, equipment cords, and line cords; e.g., the permanent portion of the horizontal cabling to each outlet consisting of cable, consolidation point (if used), termination/connecting apparatus in the telecommunications and the connector at the outlet.
   16. “PVC”: Polyvinyl chloride
   17. “U/UTP”: twisted pair cabling with no shield
   18. “UTP”: synonymous with “U/UTP”, unless otherwise noted

1.04 SYSTEM DESCRIPTION

A. Horizontal twisted pair cabling shall consist of the cabling from telecommunications rooms to outlets/connectors at work areas, to equipment, to devices, or other items that require network connections or other telecommunications services.
   1. Refer to other sections for pathways and cable support.
   2. Refer to other section for testing.

B. Cabling Length Requirements: Note that cable length means the electrical length (pair length), not the sheath length. Also, length requirements must account for test equipment accuracy tolerances (for example, TIA568-C.2 allows for 10% uncertainty).
   1. The maximum electrical length of any permanent link shall not exceed 90 meters. If consolidation points or multi-user outlets are used, then the lengths shall not exceed those listed in the TIA-568 standard and the cabling system manufacturer’s guidelines (whichever is shorter).

2. The maximum electrical length of any channel shall not exceed 100 meters. If consolidation points or multi-user outlets are used, or if the total length of cords needs to exceed 10 meters, then the permanent link lengths shall not exceed those listed in the TIA-568 standard and the cabling system manufacturer's guidelines (whichever is shorter).
3. The minimum electrical length of any permanent link shall be no shorter than 5 meters.

C. Jack Wiring: Jacks shall be wired to T568B configuration.

D. Existing Conditions

1. Assume existing patch panel termination apparatus for the MDF side termination.

1.05 SUBMITTALS

A. Comply with the Submittals requirements of section 270000.

B. Quantity: Furnish quantities of each submittal as noted in section 270000.

C. Substitutions: Conform to substitutions requirements and procedures in section 270000.

D. Submittal requirements prior to the start of construction:

1. Product Data submittal, indicating specifications and conformance with CEC, UL, TIA listings, and other applicable certifications.
2. Shop Drawings submittal, consisting of <proposed changes to cable routing, or termination locations/configurations> <the following:>
   a. service areas
   b. the location of every complement of cabling
   c. rack elevations showing termination sequences

E. Submittal requirements at closeout:

1. As-Built Drawings: Submit a set of floor plans and (as appropriate) RCPs showing the location of every complement of cabling with its respective ID – these as-built drawings may be combined with those showing the pathways (cable trays, conduits, etc.). The IDs on the shop drawings shall exactly match the physical labeling applied to cabling components.
2. Link ID –to– Office Number Key: Submit a "link ID-to-office number key" as an electronic format (such as an MS-Excel spreadsheet file or cloud-based medium) that lists every permanent link associated with the final location / office number.
3. Operations and Maintenance (O&M) Manuals

1.06 QUALITY ASSURANCE

A. Comply with the Quality Assurance requirements of section 270000.

B. Contractor Qualifications

1. In addition to the Contractor Qualifications requirements of section 270000, the Contractor shall be a SYSTIMAX certified installer (authorized SYSTIMAX reseller) and capable of providing a "SYSTIMAX" warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid submission.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Delivery, Storage and Handling requirements of section 270000.

1.08 WARRANTY

A. The horizontal cabling system, as specified in this section, shall carry a "SYSTIMAX Structured Connectivity Solutions Extended Product Warranty and Application Assurance" supporting applicable cabling systems.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. CommScope SYSTIMAX cabling system (no other substitutions allowed)

2.02 SUBSTITUTIONS

A. Comply with the Substitutions requirements of section 270000.

2.03 HORIZONTAL CABLE – CAT6A U/UTP PLENUM RATED (CMP)

A. Application: Suitable for indoor installation, within ceiling space in primary and secondary pathways, within access/raised floor space.

B. Conductors:

1. Insulated Conductors: 23 AWG solid copper, fully insulated with a flame retardant thermoplastic material (material = FEP, or similar).
2. Twisted Pairs: Two insulated conductors “twisted” into a “pair” (twisted pair) color-coded to industry standards (EIA-230).

C. Cable Sheath:

1. Shielding: none
2. Outer Jacket: seamless outer jacket (material = LS-PVC, or similar) applied to and completely cover the internal components (twisted pairs).

D. Flame Rating: CMP, UL listed as such, and the rating shall be printed on the jacket.

E. Electrical and Mechanical Performance: Meet or exceed requirements of TIA-568 standard series, ANSI/ICEA S-116-732, ISO 11801 Class E_A Edition 2.2, and IEEE Std. 802.3an channel for CAT6A cabling.

F. Limited Power: UL certified as “Limited Power (LP)”, and the rating shall be printed on the jacket.

1. Listed to 0.5 A per conductor.

G. Jacket marking: “CMP–LP (0.5A)”

H. Manufacturer:

1. CommScope SYSTIMAX “GigaSPEED X10D” Series CAT6A U/UTP Plenum Rated (CMP) Cable
   a. #2091BBL; CAT6A 4 pair U/UTP cable “GigaSPEED X10D”, CMP, blue

2.04 TERMINATION APPARATUS – CAT6A PATCH PANEL, PUNCH DOWN TYPE

A. Application: Panels shall be suitable for installation within a TR for the termination of the horizontal cables specified herein. Panels shall be horizontally oriented for a rack-mounted configuration. Panels shall be capable of supporting, organizing, labeling and patching/crossconnecting between the horizontal termination field and the equipment termination field.

B. Modular patch panel shall have 110-type termination, and shall be compatible with the specified horizontal cables both electrically and physically.

C. Mechanical Performance: Each port shall be an 8-position modular jack, compliant to ANSI/TIA-568.

D. Electrical Performance: Each port shall meet or exceed TIA-568 standard series and ISO/IEC 11801 requirements for CAT6A U/UTP cabling through the cable termination and patch cord connection.

E. Manufacturer:

1. CommScope “SYSTIMAX 360” “GigaSPEED X10D” “Evolve” Series
   a. #360-IPR-1100A-E-GS6-2U-48; angled patch panel, 2U, 48 CAT6A ports

2.05 HORIZONTAL CABLE SUPPORT BAR

A. Application: Suitable to support horizontal cables behind patch panels from vertical cable managers to termination point.

B. Color: Match rack color

C. Manufacturer:

1. CPI
   a. #12176-701; cable management bar / patch panel dressing bar

2.06 TERMINATION APPARATUS – CAT6A MODULAR 8-POSITION CONNECTORS, UNSHIELDED

A. Application: Modular connectors, i.e., jacks and plugs, shall be used for the termination of 4-pair U/UTP cables, and shall be compatible – both electrically and physically – with the cables specified herein.
B. Mechanical Performance: Modular connectors shall be 8-position, compliant to TIA-568 standard series.
C. Electrical Performance: Modular connectors shall meet or exceed TIA-568 standard series and ISO/IEC 11801 requirements for CAT6A U/UTP cabling.
D. Manufacturer:
    1. CommScope SYSTIMAX “GigaSpeed X10D” Series CAT6A Jacks

2.07 WORK AREA OUTLETS – SURFACE OUTLETS

A. Application: Surface outlets shall be suitable for indoor installation for surface-mount device and shall be fully compatible with the specified modular connectors/jacks.
B. Color: Blue.
C. Manufacturer:
    1. CommScope “M-Series”

2.08 LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.
B. Labels shall be permanent, unless otherwise noted.
C. Cable and Wire Labels
    1. Labels for cables and wires shall be either of the following types:
        a. Tape – adhesive-backed, wrap-around, self-laminating
        b. Strip – adhesive backed, under shrink-wrap
    2. Face stock (print area) shall be white.
    3. Size: as needed per cable size/diameter and to fit the full identifier (at least 1" wide).
    4. Manufacturer, or equal:
        a. Brady
        b. Brother
        c. DYMO XTL or Rhino
D. Patch Panel Labels
    1. Application: For patch panels that do not have an integrated labeling feature and do not come packaged with labeling parts.
    2. Patch panel labels shall be adhesive backed, and shall fit within the area suitable for labeling the ports on the panel.
    3. Face stock (print area) shall be white.
    4. Size: as needed.
    5. Manufacturer, or equal:
        a. Brady
        b. Brother
        c. DYMO XTL or Rhino
E. Surface Outlet Labels
    1. Application: For surface outlets that do not have an integrated labeling feature and do not come packaged with labeling parts.
    2. Labels for surface mount outlets shall be adhesive backed, and shall fit within the area for labeling the outlet box and for labeling ports of the outlet box.
    3. Face stock (print area) shall be white.
    4. Size: as needed.
    5. Manufacturer, or equal:

a. Brady
b. Brother
c. DYMO XTL or Rhino

F. Velcro Cable Ties
1. Width: .75".
2. Color: Velcro cable ties the same color as the cable to which it is being applied.
3. Manufacturer, or equal:
a. Panduit "Tak-Ty" series cable ties
b. Panduit
1) #HLS-15R0; black, 15' roll, cut to length

G. Plenum Cable Ties
1. Application: for use in plenum or air handling spaces
2. Compliance: AH-2

PART 3 - EXECUTION

3.01 GENERAL
A. Comply with the Execution requirements of section 270000.

3.02 EXAMINATION AND PREPARATION
A. Rooms: Prior to installation, verify equipment rooms are suitable to accept the horizontal cables and terminations.
B. Pathways: Prior to installation verify that pathways and supporting devices, provided under other sections, are properly and completely installed (at least the portions into which cables will be placed), and that temporary supports, devices, etc., have been removed. Cable tray shall be complete prior to placing cables within them, per CEC (at least the portions into which cables will be placed). Verify dimensions of pathways, including length (for example, "True Tape" the conduits) to ensure that the resulting cable lengths will not exceed the maximum allowable length specified herein.
C. Cable Integrity: Prior to installation, verify the cable's integrity – both sheath and conductors. Documentation of pre-installation testing is not a close out requirement, and is the responsibility of the Contractor.

3.03 INSTALLATION
A. Cable Installation and Routing
1. No cable length shall violate the requirements stated in "System Description".
2. Cables shall have continuous sheath continuity. Splices are not permitted anywhere.
3. Install cables within the cable manufacturer's published installation temperature range.
4. Place cables within designated pathways, such as cable tray, cable hangers, etc. Do no fasten (such as with cable ties) or attach cables to other building infrastructure (such as ducts, pipes, conduits, etc.), other systems (such as ceiling support wires, wall studs, etc.), or to the outside of conduits, cable trays, or other non-approved pathway systems.
5. Place and suspend cables during installation and termination in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation or termination.
6. In general, route cables at 90-degree angles, along corridors (for improved maintenance and access).
7. Do not bend cables tighter than 2 inches during and after installation.
8. Do not exceed manufacturer's limits for pulling tension.
9. Do not use cable-pulling compounds / pulling lubricants for indoor installations.

10. Route cables under building infrastructure (such as ducts, pipes, conduits, etc.) – to result in easy accessibility to the cables for future maintenance.
11. Place cables at least 6 inches away from power sources – to reduce interference from EMI.
12. Neatly dress and organize cables using designated cable routing facilities, and fasten to support devices via velcro straps.
13. When exiting primary pathways (such as cable tray) to the work area, exit via the top of the pathway.
14. Cable Ties: Install cables ties, where allowed, tight enough to keep cables organized/managed but loose enough to be moved about the cables/cable bundles. Cable ties shall not deform or cinch cables too tightly. Tie installed too tightly per the Engineer's opinion shall be subject to removal upon direction from the Engineer.

B. Cable Routing and Dressing within the MDF
1. Place cables within the overhead cable support. When routing vertically, fasten the cables onto vertical cable support approximately every 24 inches using velcro straps.
2. At the rack bay, route cables within the back of the vertical management sections (do not route cables into the front as this space is reserved for patch cords only). Divide the cables equally between both sides of an equipment rack such that a cable does not travel past the midpoint of the rack prior to termination. Dress and cut cables to length required to reach the designated termination point (maintaining bend restrictions) with no excess cable slack left in the horizontal cable manager (if used) and vertical management section.
3. Provide 10-15 feet, minimum, sheathed cable slack – length not to exceed permanent link maximum length requirement. Place the slack in the overhead cable support

C. Termination in the MDF
1. Install and assemble termination apparatus, accessories and associated management apparatus according to the manufacturer's instructions.
2. Properly strain relieve cables at termination points per manufacturer's instructions.
3. Terminate cables and twisted pairs in accordance with manufacturer's latest installation requirements and TIA-568 series standard installation practices. Terminate cable pairs onto the termination apparatus. Terminate twisted pairs compliant to TIA-568 series standards and wired per 1.04 System Description.
4. Patch Panels and Horizontal Management Panels
   a. Quantity: Provide patch panels to support termination of cables. Provide horizontal management panels based on the quantity of patch panels.
   b. Install and assemble discrete port patch panels and horizontal management panels according to the manufacturer's instructions.
   c. Install the patch panels and the horizontal management panels as shown on the contract drawings. If configuration is not shown, install the patch panels in association with the horizontal management panels such that a management panel is mounted above and below given patch panel.
5. Termination Sequence
   a. Terminate the cables in sequential order using the link's identifier starting at the top left and completing a panel before moving to the next panel below.

D. Cable Routing and Dressing at the Work Areas
1. Leave 2-4 feet sheathed cable slack – length not to exceed permanent link

maximum length requirement. Store slack within ceiling space neatly on a cable hanger.

E. Termination at the Work Areas
   1. Mount faceplates plumb, square, and at the same level as adjacent device faceplates.
   2. Patch gaps around faceplates so that faceplate covers the entire opening.
   3. Terminate cables and twisted pairs in accordance with manufacturer's latest installation requirements and TIA-568 series standard installation practices and wired per 1.04 System Description.

F. Perform post-installation testing as described in the Telecommunication Testing specification (refer to section 270811). Replace permanent links (cables, terminations and connectors) not passing the required tests.

3.04 LABELING

A. General Requirements
   1. Labeling, identifier assignment, and label colors shall conform to the TIA-606 standard and as approved by the Ownder before installation.
   2. Label text shall be machine-generated; hand written labels will not be accepted.

B. Label Formats and Text Attributes
   1. Horizontal Cable Labels
      a. Labels for cables shall be wrap-around self-laminating type.
      b. Labels shall be permanent.
      c. Text Attributes: color: black; size: approx. 1/8” high (#12 font size).
   2. Termination Field \ Patch Panel Labels
      a. Use labels included in the patch panel packaging. Any deviation from this requirement must be approved in writing by the Engineer.
      b. Use a label color for the respective field type, per TIA-606.
      c. Text Attributes: color: black; size: approx. 1/8” high (#12 font size)
   3. Termination Port \ Patch Panel Labels
      a. (These labels are in the case that the patch panel does not have port numbers stenciled.)
      b. Labels for patch panel ports shall be adhesive-backed polyester (or similar) type.
      c. Label color shall be white.
      d. Text Attributes: color: black; size: approx. 3/32" high (#10 font size).
   4. Outlet Labels
      a. Use labels included in the faceplate/surface outlet packaging. Any deviation from this requirement must be approved in writing by the Engineer
      b. Label color shall be white.
      c. Text Attributes: color: black; size: approx. 1/8” high (#12 font size).
   5. Outlet Port Labels
      a. (These labels are in the case that the faceplate/surface outlet does not have port numbers stenciled or molded into the product.)
      b. Labels for cables shall be adhesive-backed polyester (or similar) type.
      c. Label color shall be white.
      d. Text Attributes: color: black; size: approx. 1/8” high (#12 font size).

C. Identifier System
   1. General: Separate fields of the identifier with a hyphen.
   2. Patch Panels
      a. First field: the destination room number; for example: “207”.
      b. Second field: the cable’s intended service type – for example: “D” (data),

and a unique sequential number – for example: “2”.

c. Example: “207–D2”

3. Individual Ports at Patch Panels
   a. First field: the destination room number; for example: “207”.
   b. Second field: a unique sequential number, for example “01”.
   c. Third field: port identifier, for example “A”.
   d. Example: “207–01–A”
4. Outlets (Faceplates, Surface Outlets, etc.)
   a. First field: the originating telecom room identifier; for example: “A2.1”.
   b. Second field: the destination room number; for example: “207”.
   c. Third field: a unique sequential number; for example: “01”.
   d. Example: “A2.1–207–01”
5. Individual Ports at the Outlets
   a. The specified faceplate has individual port numbers molded into the product. However, if a substitution is accepted that does not have port numbers, provide port labels as follows.
   b. First field: port identifier, for example “A”.
6. Horizontal Cables
   a. First field: the originating room identifier; for example: “A2.1”.
   b. Second field: the destination room number; for example: “207”.
   c. Third field: a unique sequential number, for example “01”.
   d. Fourth field: port identifier, for example “A”.
   e. Example: “A2.1–207–01–A”

D. Label Installation
1. Horizontal Cable Labels
   a. Install labels on both ends of cables no more than 4" from the edge of the cable jacket.
   b. Install labels such that they are visible during normal maintenance.
2. Termination Group\Patch panel ports
   a. Install labels on the front and on left side.
   b. Install labels such that they are visible during normal maintenance.
3. Termination Port\Patch panel ports
   a. If the patch panel does not have individual port numbers stenciled on the product, then install port labels at each port – above the top row and below the bottom row.
4. Outlet Labels
   a. Install label in the top label window. Leave the bottom label window blank.
5. Outlet Port Labels
   a. If the outlet does not have individual port numbers stenciled or molded into the product, then install port labels at each port – either to the sides (preferred) or above the top row and below the bottom row.

3.05 FINAL INSPECTION AND CERTIFICATION

A. Punch the work of this section compliant to the requirements of section 270000.

B. Remove cables and replace with new without impact to cost and schedule those failing to meet the indicated standards and not passing the testing requirements of section 270811. The Owner will not accept the installation until testing has indicated a 100% availability of cables and conductors. Any deviation from this requirement must be approved in writing by the Owner.

C. Comply with system acceptance and certification requirements of section 270000.

END OF SECTION

SECTION 28 3100
FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01. DESCRIPTION:

A. This section includes the furnishing, installation, and connection of the fire alarm equipment required to form a complete coordinated agent releasing system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, auxiliary control devices, annunciators, power supplies, releasing devices and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of NFPA 72 Standard for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

C. Sprinkler system components shall be provided as specified in Section 15500 - fire protection.

D. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

E. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

F. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and shall be installed in compliance with the UL listing.

1.02. SCOPE:

A. A new agent release system shall be provided in accordance with this specification.

B. Basic Performance:

1. Initiation Device Circuits (IDC) shall be wired Class B (NFPA Style B).
2. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style B).
3. Releasing circuits shall be wired to supervise the solenoid coil.
4. A single ground or open on any initiating device circuit or notification appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

C. Basic System Functional Operation:

When a fire alarm condition is detected and reported by two of the system initiating devices which are cross-zoned the following functions shall immediately occur:

1. A programmed delay timer shall be started.
2. Warning audible circuits shall sound.
3. If abort is activated, the timer shall stop.
4. Manual release shall override abort.
5. At completion of the delay timeout, the release solenoid(s) shall be activated.

1.03. SUBMITTALS:

A. General:

1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout, configurations, and terminations.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications:

1. Provide the services of a qualified technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

1.04. GUARANTY:

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance.

1.05. POST CONTRACT MAINTENANCE:

A. Complete maintenance and repair service for the fire alarm system shall be available from a

factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

1.06. APPLICABLE PUBLICATIONS:

The publications listed below form a part of this specification.

A. National Fire Protection Association (NFPA) - USA:

No. 72	National Fire Alarm Code
No. 101-91	Life Safety Code
No. 2001	Clean Agent Fire Extinguishing Systems

B. Underwriters Laboratories Inc. (UL) - USA:

UL 38 Manually Actuated Signaling Boxes
UL 217 Smoke Detectors, Single and Multiple Station
UL 268 Smoke Detectors for Fire Protective Signaling Systems
UL 268A Smoke Detectors for Duct Applications
UL 464 Audible Signaling Appliances
UL 864 Standard for Control Units for Fire Protective Signaling Systems UL 1481 Power Supplies for Fire Protective Signaling Systems
UL 1638 Visual Signaling Appliances
UL 1971 Signaling Devices for Hearing Impaired

C. Local and State Building Codes.

D. All requirements of the Authority Having Jurisdiction (AHJ).

1.07. APPROVALS:

Each system must have proper listing and/or approval from the following nationally recognized agencies.

UL Underwriters Laboratories Inc FM Factory Mutual

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIAL, GENERAL:

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a fire protective signaling system, meeting the National Fire Alarm Code.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

D. All equipment must be available through authorized Engineered Systems Distributors experienced and trained in systems installation.

2.02 CONDUIT AND WIRE:

A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.

2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.

4. With the exception of telephone connections, wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.

6. Conduit shall be 3/4 inch (19.1 mm) minimum.

B. Wire:

1. All fire alarm system wiring shall be new.

2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and 14 AWG (1.63 mm) for Notification Appliance Circuits.

3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NEC 760 (e.g., FPLR).

5. All field wiring shall be electrically supervised for open circuit and ground fault.

C. Terminal Boxes, Junction Boxes and Cabinets:

1. All boxes and cabinets shall be UL listed for their purpose.

D. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod. The control panel enclosure shall feature a quick removal chassis to facilitate rapid replacement of the FACP electronics.

2.03 CONTROL PANEL:

A. The control panel shall be a Gamewell-FCI model GF506R and shall communicate with and control the following types of equipment used to make up the system: smoke detectors, manual release/abort stations, alarm notification appliances, releasing components and other system controlled devices.

1. The control panel shall be a UL listed and FM approved microprocessor controlled agent releasing Control Panel.

2. Function: The control panel shall perform the following functions:

a. Supervise and monitor all initiating device circuits and alarm notification circuits for trouble and alarm conditions.

b. Supervise the release solenoid(s).

c. Detect the operation of any initiating device circuit and the location of the alarm condition. Operate all notification appliances and release devices as designed.

d. Visually and audibly annunciate any trouble, supervisory or alarm condition on panel display.

B. System Capacity

The Control Panel shall include six programmable initiating device circuits, four programmable output circuits, three programmable Form-C relays, A 7.0 Amp integral power supply and 80 character LCD.

1. The IDCs (Initiating Device Circuits) shall be individually programmable as conventional two-wire smoke detector circuits, as well as any dry contact input device. Examples of dry contact input devices include four-wire smoke detectors, manual pull stations, abort switches, heat detectors, pressure switches, and waterflow switches. The IDCs shall support Style D (Class A) operation by adding an expansion board. The IDCs shall support conventional two-wire smoke detectors as well as conventional smoke detectors capable of generating a maintenance signal when the detector becomes dirty and a separate supervisory 'freeze' signal when ambient temperature falls below the detector rating of approximately 45 degrees F.

2. The four programmable outputs shall be individually programmable as conventional supervised NACs (Notification Appliance Circuits) or for releasing solenoids. Each NAC may be individually programmed as any of the following: Silence Inhibit, Auto-Silence, Strobe Synchronization, Selective Silence (horn- strobe mute), Temporal or Steady Signal, Silenceable or Non-silenceable, or Release Stage Sounder. The system shall also provide resettable and non- resettable output power for general use.

3. The FACP shall be capable of coding Notification Appliance Circuits in March Time Code (120 PPM), Temporal (NFPA 72), and California Code. Main panel notification circuits (NACs 1, 2, 3 & 4) shall also automatically synchronize any of the following manufacturer's notification appliances connected to them: System Sensor, Wheelock, Gentex, Faraday and Amseco, with no need for additional synchronization modules.

4. The three programmable relays shall be individually programmable as Alarm, Trouble, Supervisory, Discharge, and AC Power Loss. When programmed as a Trouble relay, the relay shall be fail-safe.

5. The on board power supply shall be capable of 7.0 Amps of regulated, filtered power.

C. System Display

The system shall have eight LED indicators as well as an 80 character LCD (Liquid Crystal Display). The LCD shall be capable of displaying a custom description for each input and output circuit. The system LEDs shall indicate the status of the following system parameters:

Fire Alarm	Red LED
Supervisory	Yellow LED
Trouble	Yellow LED
AC Power	Green LED
Alarm Silence	Yellow LED
Discharge	Red LED
Pre-Discharge	Red LED
Abort	Yellow LED

1. The main system display shall be an integral, eighty character LCD with a keypad. The keypad shall have full programming capability without requiring the use of a laptop computer.

2. The FACP shall include a history log with a 256 event storage. The history shall be accessible from the main system display.

3. The system shall include a real-time clock/calendar with daylight savings time control.

D. System Control Switch Operation.

1. ACK/Step Silence Switch:
   a. Activation of the control panel tone silence switch in response to alarms troubles and supervisory conditions shall silence the local panel piezo electric signal and change the LED from flashing-mode to steady-ON mode. Occurrence of any new conditions in the system shall cause the control panel to resound the Local Piezo sounder and repeat the alarm, trouble, or supervisory sequences.
   b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

2. Alarm Silence Switch:
   Activation of the alarm signal silence switch shall cause all alarm notification appliances to return to the normal condition after an alarm condition.

3. System Reset Switch:
   Activation of the System Reset Switch shall cause all electronically-latched initiating devices, as well as all associated output devices and circuits, to return to their normal condition. Holding system reset switch down shall perform a LAMP TEST function and will activate the piezo sounder.

4. Alarm Activate Switch (Drill):
   The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

5. Lamp Test:
   The System RESET switch shall also function as a Lamp Test switch and shall activate all system LEDs and light each segment of the liquid crystal display.

E. System Operation

1. Zone Status LEDs:

The alarm, supervisory, or trouble LED(s) shall flash until event(s) have been acknowledged LED(s) shall then illuminate steady. Any subsequent alarm, supervisory or trouble will flash the new event only.

2. Supervisory:
   A short circuit on this zone shall cause the supervisory LED and
   Zone 4 yellow LED to flash, and shall activate the supervisory notification circuit.
   An open circuit shall report as a zone trouble.

3. Zone Disable:
   Disable/Enable shall be accomplished for any input circuit by a special sequence of the 4 control switches. If a zone has been disabled, an alarm shall activate the red zone LED, but not the piezo or any output circuit.

F. Programming and System Commissioning

1. The FACP shall have a configuration option which allows the user to program the FACP with one of seven factory preprogrammed templates or one custom template which can be programmed by the user. Templates shall include:

   CROSS-ZONE SYSTEM ZONES 1 & 4
   SINGLE ZONE SYSTEM WITH HORN

G. The control panel shall support the following modules:

1. 80 character Remote LCD Annunciator which mimics the FACP main display.

2. I/O LED Driver which provides LED outputs for connection to a custom graphics annunciator.

3. Printer Module which provides a serial output for connection to a UL listed event printer.

4. Relay Module which provides 10 form C relays

5. LED Annunciator Module which mounts on the FACP door and provides three LEDs for each zone: Alarm, Trouble and Supervisory.

6. Optional Digital Communicator (complies with NFPA 72).

7. Optional transmitter module which complies with NFPA-72 Auxiliary and Remote Station Protective Signaling systems.

8. Optional Class A Converter Module

H. The control panel shall also include the following functions:

1. Output circuits shall be protected against false activations by using a 2-step electronic activation circuit.

2. Battery/Earth fault supervision shall be provided.

3. Adjustable pre discharge timer shall be available, 00 to 60 seconds.

4. Adjustable discharge timer shall be available, “always on” or 01-20 minutes.

5. Four abort functions options shall be selectable: (1) Standard UL method; (2) IRI method; (3) NYC method, and (4) local AHJ method.

6. 7 AH to 26 AH battery options shall be available, providing up to 24 hours standby.

7. Watchdog timer to supervise microprocessor shall be provided.

l. Mechanical Design

The control panel shall be housed in a cabinet designed for mounting directly to a wall or vertical surface. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. The cabinet shall be approximately 5.21 inches (13.23 cm) deep and 16.8 inches (42.73 cm) wide. Height shall be approximately 19.26 inches (48.92 cm). An optional trim ring shall be used for flush mounting of cabinet. Space shall be provided in the cabinet for 7 AH or 18 AH batteries. If 26 AH batteries are used, a separate battery enclosure shall be available from the same manufacturer.

2.04 BATTERIES

A. Shall be 12 volt, Gel-Cell type (2 required).

B. Battery shall have sufficient capacity to power the fire alarm system for not less than 24 hours plus 5 minutes of alarm upon a normal AC power failure.

C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

2.05 SYSTEM COMPONENTS:

A. Horns, Strobes, and Horn/Strobes

1. General
All horns, strobes and horn/strobes shall be System Sensor SpectrAlert Advance series. Horns, strobes and horn/strobes shall mount to a standard 4 × 4 × 1½-inch back box, 4-inch octagon back box or double-gang back box. Two-wire products shall also mount to a single-gang 2 × 4 × 1 7/8-inch back box. A universal mounting plate shall be used for mounting ceiling and wall products. The notification appliance circuit wiring shall terminate at the universal mounting plate. Indoor SpectrAlert Advance products shall operate between 32 and 120 degrees Fahrenheit from a regulated DC, or full-wave rectified, unfiltered power supply. Strobes and horn/strobes shall have field-selectable candela settings including 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, 185.

2. Strobes
The strobe shall be a System Sensor SpectrAlert Advance Model SWL with supporting AGENT cover Model No. BZW-AG listed to UL 1971 and shall be approved for fire protective service. The strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system.

3. Horn/Strobe Combination
The horn/strobe shall be a System Sensor SpectrAlert Advance Model P2WL with supporting AGENT cover Model No. BZW-AG listed to UL 1971 and UL 464 and shall be approved for fire protective service. The horn/strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. The horn shall have three audibility options and an option to switch between a temporal three-pattern

and a non-temporal (continuous) pattern.

4. Bell
   Model shall be a SSM24-6 Series alarm bell. Bells shall have underdome strikers and operating mechanisms. Gongs on said bells shall be no smaller than nominal 6″ with an operating voltage of 24VDC. Bells shall be suitable for surface or semi-flush mounting. Bells shall mount to a standard 4″ square electrical box having a maximum projection of 2½″. Bells shall be located as shown on the drawings or as determined by the Authority Having Jurisdiction. Bells shall be listed for indoor/outdoor use by Underwriters Laboratories and the California State Fire Marshal, and approved by Factory Mutual and MEA.

5. Synchronization Requirements
   All Horns, Strobes, and Horn/Strobes shall be synchronized without the need for additional synchronization hardware or modules. Synchronization shall be provided by the GF506R FACP Power Supply or from an additional field power supply. All Horns, Strobes, and Horn/Strobes shall be synchronized at 1Hz and horns at temporal three. Also, while operating the strobes, the FACP shall silence the horns on horn/strobe models over a single pair of wires.

B. Manual Fire Alarm Stations

1. Manual Fire Alarm Stations shall be Gamewell-FCI MS-7 Series and non-code, with a key- or hex-operated reset lock in order that they may be tested, and so designed that after actual Emergency Operation, they cannot be restored to normal except by use of a key or hex. An operated station shall automatically condition itself so as to be visually detected as activated.

2. Manual stations shall be constructed of red colored LEXAN (or polycarbonate equivalent) with clearly visible operating instructions provided on the cover. The word AGENT RELEASE shall appear on the front of the stations in white letters, 1.00 inches (2.54 cm) or larger.

3. Stations shall be suitable for surface mounting on matching back box SB-10 or SB-I/O; or semi-flush mounting on a standard single-gang, double-gang, or 4" (10.16 cm) square electrical box, and shall be installed within the limits defined by the Americans with Disabilities Act (ADA) or per national/local requirements. Manual Stations shall be Underwriters Laboratories listed.

C. Conventional Photoelectric Area Smoke Detectors

1. Smoke detector shall be a System Sensor i3 Series conventional photoelectric smoke detector, listed to Underwriters Laboratories UL 268 for Fire Protection Signaling Systems. The detector shall be a photoelectric type (Model 2W-B, 4W-B) or a combination photoelectric/thermal (Model 2WT-B, 4WT-B) with thermal sensor rated at 135°F (57.2°C).

2. The detector shall include a mounting base for mounting to 3½-inch and 4-inch octagonal, single gang, and 4-inch square back boxes with a plaster ring. Wiring connections shall be made by means of SEMS screws. The detector shall allow pre- wiring of the base and the head shall be a plug-in type.

3. The detector shall have a nominal sensitivity of 2.5 percent-per-foot nominal as measured in the UL smoke box. The detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms. The detector shall provide dual color LED indication which blinks to indicate power up, normal standby, out of sensitivity, alarm, and freeze trouble (Model 2WT-B, 4WT-B) conditions.

4. Two-wire models shall include a maintenance signal to indicate the need for maintenance at the alarm control panel, and shall provide a loop testing capability to verify the circuit without testing each detector individually.

D. Duct Smoke Detectors

1. The air duct smoke detector shall be a System Sensor Model D2 or D4120 Series Duct Smoke Detector.

2. The detector housing shall be UL listed per UL 268A specifically for use in air handling systems. The detector shall operate at air velocities of 100 feet per minute to 4000 feet per minute (0.5 to 20.32 m/sec.).

3. It shall be capable of local testing via magnetic switch or remote testing using the RTS451KEY Remote Test Station. The unit shall be reset by local reset button or RTS451KEY.

4. The duct detector housing shall incorporate an airtight smoke chamber in compliance with UL 268A, Standard for Smoke Detectors for Duct Applications. The housing shall be capable of mounting to either rectangular or round ducts without adapter brackets. An integral filter system shall be included to reduce dust and residue effects on detector and housing, thereby reducing maintenance and servicing.

5. Sampling tubes shall either be metal or be easily installed after the housing is mounted to the duct by passing through the duct housing. The enclosure shall meet all applicable NEC and NFPA standards regarding electrical junction boxes. Terminal connections shall be of the strip and clamp method suitable for 12–18 AWG (3.25 to 0.75 mm2) wiring.

E. Manual Release/Abort Station

1. Manual release/abort stations shall be non-code, non-break glass type, equipped with key lock in order that they may be tested without operating the handle.

2. Stations must be so designed that after an actual activation, they cannot be restored to normal except by key reset.

3. Stations shall include a momentary ("dead-man") switch that may be manually held in to cause abort of the release process.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D. At the final inspection a factory trained representative of the manufacturer of the major equipment shall perform the tests in Section 3.2 TESTS.

3.02 TEST:

Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

3. Verify activation of all flow switches.

4. Open initiating device circuits and verify that the trouble signal actuates.

5. Open and short notification appliance circuits and verify that trouble signal actuates.

6. Ground device circuits and verify response of trouble signals.

7. Open release solenoids and verify response of trouble signals.

8. Check presence and audibility of tone at all alarm notification devices.

9. Check installation and supervision of heat detectors to ascertain that they will function as specified.

10. Conduct tests to verify trouble indications for common mode failures, such as alternating current power failure.

11. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and that the release solenoid(s) will activate.

3.03 FINAL INSPECTION:

At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.04 INSTRUCTION:

Provide instruction as required to the building personnel. "Hands-on" demonstrations of the operation of all system components and the entire system shall be provided.

END SECTION

SECTION 31 23 33

TRENCHING, BACKFILLING, AND COMPACTING

PART 1 – GENERAL

1.1 SUMMARY:

A. Provide labor, material, equipment, and services necessary to complete the backfilling and compacting as necessary for this project. Section includes, but is not limited to:
1. Initial Backfill Material.
2. Subsequent Backfill.
3. Detectable Tape.
4. Trench Excavation.
5. Pipe Bedding.
6. Trench Backfill.
7. Trench Surfacing.

B. Work specified in Related Sections include:
1. Section 31 22 00 – EARTHWORK AND GRADING.
2. Section 33 10 00 – WATER SYSTEMS.
3. Section 33 30 00 – SANITARY SEWER.
4. Section 33 50 00 – NATURAL GAS DISTRIBUTION SYSTEMS.
5. Section 33 40 00 – STORM DRAINAGE.

1.2 DEFINITIONS:

A. Engineered Fill:
1. Soil or soil-rock material approved by the Geotechnical Engineer and transported to the site by the Contractor in order to raise grades or to backfill excavations.
2. Contractor shall provide sufficient tests, and a written statement that all materials brought onto the project site comply with specification requirements.

B. Excavation: Consists of the removal of material encountered to subgrade elevations.

C. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below base.

D. Base: The layer placed between the subgrade and surface pavement in a paving system.

E. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure American Society for Testing and Materials (ASTM) D1557.

1.3 SYSTEM DESCRIPTION:

A. Requirements:
1. Comply with the recommendations of the Geotechnical Engineer.
2. Protect existing trees to remain. No grading is permitted under the drip line of protected trees.
3. Excavations for appurtenant structures, such as, but not limited to, manholes, transition structures, junction structure, vaults, valve boxes, catch basins, thrust blocks, and boring pits, shall be deemed to be in the category of trench excavation.
4. Unless otherwise indicated in the Drawings, all excavation for pipelines shall be open cut.

1.4 SUBMITTALS:

A. Comply with provisions of Section 01 33 00 – SUBMITTAL PROCEDURES.

B. Test Reports: Submit the following report for import material directly to the Owner's Representative from the Contractor's testing services:
   1. Compaction test reports for aggregate base.

C. Submit description of compactors proposed for use when requesting placement of base material.

1.5 QUALITY ASSURANCE:

A. Requirements of Regulatory Agencies:
   1. Comply with State of California Business and Transportation Agency, Department of Transportation (Caltrans) latest edition of "Standard Specifications." (Caltrans Standard Specification).
   2. Comply with State of California Code of Regulations (CCR).
   3. Comply with State of California Construction Safety Orders, Latest Edition (CAL/OSHA).

B. Soil Testing:
   1. Contractor shall engage a geotechnical testing agency, to include compaction testing and for quality control testing during fill operations.
   2. Test results will be submitted to the District's/Owner's Representative.

C. Codes and Standards:
   1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
   2. Storm Water Pollution Prevention Plan to comply with Section 01520 – STORM WATER POLLUTION PREVENTION.
   3. California Department of Transportation Standard Specifications (Caltrans Standard Specification):
      a. Section 19: Earthwork.
      b. Standard Test Methods: No. 202.
   4. American Society for Testing and Materials (ASTM):
      a. D1556: Density of Soil by the Sand Cone Method.
      b. D1557: Moisture Density Relations of Soils and Soil-Aggregate Mixtures.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Protect materials before, during and after installation.

B. Comply with provisions of Section 01 57 00 – TEMPORARY FACILITIES AND CONTROLS where necessary to control dust and noise on and near the work caused by operations during construction activities.

1.7 PROJECT CONDITIONS:

A. Environmental Requirements:
   1. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District/Owner.
   2. Protect existing streams, ditches and storm drain inlets during work on this project.

B. Barricade open excavations and post with warning lights.

1. Comply with requirements of Section 01 57 00 – TEMPORARY FACILITIES AND CONTROLS.
2. Operate warning lights and barricades as required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout, and other hazards.

C. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.

D. Transport all excess soils materials by legally approved methods to disposal areas.
1. Coordinate with the [District's/Owner's] Representative.
2. Any additional fill requirements shall be the responsibility of the Contractor.

1.8 EXISTING UTILITIES:

A. Locate existing underground utilities in the areas of work. For utilities that are to remain in place, provide adequate means of protection during excavation operations.

B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility agency immediately for directions.
1. Cooperate with the Owner's Representative and public and private utility companies in keeping their respective services and facilities in operation.
2. Repair damaged utilities to the satisfaction of the utility owner.

C. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Owner's Representative and then only after acceptable temporary utility services have been provided.

1.9 SEQUENCING AND SCHEDULING:

A. The sequence of operations shall be reviewed by the Owner's Representative prior to commencement of any work.

PART 2 – PRODUCTS

2.1 MATERIALS:

A. General:
1. Backfill materials will be subject to approval of the Engineer.
2. For approval of backfill fill material, notify the Owner's Representative at least 7 days in advance of intention to import material.
3. Consideration shall also be given to the environmental characteristics as well as the corrosion potential of backfill materials. Laboratory testing, including pH, soluble sulfates, chlorides, and resistivity shall be reviewed. Backfill materials shall not be more corrosive than the native materials.

B. Trench Sand:
1. Material free from clay, organic materials, and other deleterious substances and conforming to Caltrans Standard Specification Section 19-3.02F(2).

C. Trench Gravel:
1. Granular material free from clay, organic materials, and other deleterious substances and conforming to Class 1 Type A Permeable Material, per Caltrans Standard Specification Section 68-2.02F.

D. Approved Native Fill:
   1. See Section 31 22 00 – EARTHWORK AND GRADING.

E. Imported Fill:
   1. See Section 31 22 00 – EARTHWORK AND GRADING.

F. Class II Aggregate Base: ¾" maximum, Class II AB, free from organic matter and other deleterious substances and conforming to Caltrans Standard Specification Section 26-1.02A.

G. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

2.2 BURIED WARNING AND IDENTIFICATION TAPE

A. Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 75 mm 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.
   1. Warning Tape Color Codes.
      Red: Electric.
      Yellow: Gas, Oil; Dangerous Materials.
      Orange: Telephone and Other Communications.
      Blue: Water Systems.
      Green: Sewer Systems.
      White: Steam Systems.
      Gray: Compressed Air.
   2. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.
   3. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 920 mm 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.3 DETECTION WIRE FOR NON-METALLIC PIPING

A. Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

PART 3 – EXECUTION

3.1 GENERAL:

A. Prior to commencement of work, become thoroughly familiar with site conditions.

B. In the event discrepancies are found, immediately notify the Owner's Representative in writing, indicating the nature and extent of differing conditions.

C. Backfill excavations as promptly as work permits.

D. Do not place engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the Owner's Representative.

E. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

F. In excavations, use satisfactory excavated or borrow material.

G. Under grassed areas, use satisfactory excavated or borrow material.

3.2 COMPACTING:

A. Compact by power tamping, rolling or combinations thereof.
1. Where impractical to use rollers in close proximity to walls, stairs, etc., compact by mechanical tamping.
2. Scarify and re-compact any layer not attaining compaction until required density is obtained.

3.3 SITE PREPARATION:

A. Protect structures, utilities, sidewalks, pavements, and other facilities, which are to remain, from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the Owner.

3.4 EXISTING UTILITIES:

A. Identity the location of existing utilities.
1. Prior to trenching, the Contractor shall excavate at locations specifically indicated on the Drawings, if any, and where new lines cross other utilities of uncertain depth and determine the elevation of the utility in question to ensure that the new line will clear the potential obstruction.
2. The Contractor shall contact Underground Service Alert (USA) at 1-800-227-2600 for assistance in locating existing utilities.
3. If, after the excavation, a crossing utility does present an obstruction, then the line and grade of the new line will be adjusted as directed by the Owner's Representative to clear the utility.

B. Protect all existing utilities to remain in operation.

C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at Contractor's risk.

D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.
1. Use hand or light equipment for excavating immediately adjacent to known utilities or for excavations exposing a utility or buried structure.
2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
3. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.

4. Report damage of utility line or subsurface structures immediately to the Owner's Representative.

E. Backfill trenches resulting from utility removal in accordance with this section.

3.5 TRENCH EXCAVATION

A. General:
1. Excavation shall include removal of all water and materials that interfere with construction. The Contractor shall remove any water which may be encountered in the trench by pumping or other methods during the pipe laying, bedding and backfill operations. Material shall be sufficiently dry to permit approved jointing.
2. Excavation shall include the construction and maintenance of bridges required for vehicular and pedestrian traffic, support for adjoining utilities.
3. The Contractor shall be responsible to safely direct vehicular and pedestrian traffic through or around his/her work area at all times.
4. The Contractor shall relocate, reconstruct, replace or repair, at his/her own expense, all improvements which are in the line of construction or which may be damaged, removed, disrupted or otherwise disturbed by the Contractor.

B. Existing Paving and Concrete:
1. Existing pavement over trench shall be saw cut, removed, and hauled away from the job. Existing pavement shall be neatly saw cut a minimum of 6-inches beyond the limits of excavations.
2. Existing concrete over the trench shall be saw cut to a full depth in straight lines either parallel to the curb or right angles to the alignment of the sidewalk.
3. Boards or other suitable material shall be placed under equipment out rigging to prevent damage to paved surfaces.

C. Trench Width:
1. The maximum allowable trench widths at the top of the pipe shall be as follows:

Pipe Type	Trench Width (Maximum)
Copper	Outside diameter of barrel plus 18 inches
Plastic	"
Vitrified Clay	"
Cast-Iron	Outside diameter of barrel plus 24 inches
Concrete Cylinder	"
Ductile-Iron	"
Reinforced Concrete	"

a. The maximum trench width shall be inclusive of all shoring.
b. If the maximum trench width is exceeded, the [District's/Owner's] Representative or Inspector of Record may direct the Contractor to encase or cradle the pipe in concrete at no additional charge.
2. For pipes 3 inch diameter and larger, the free working space on each side of the pipe barrel shall not be less than 6 inches.

D. Open Trench:
1. The maximum length of open trench shall be 300 feet or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is greater. No trench shall be left open at the end of the day.
2. Provisions for trench crossings and free access shall be made at all street crossings, driveways, water gate valves, and fire hydrants.

E. Excavation Bracing:
1. The excavation shall be supported and excavation operations shall be conducted in accordance with the California Industrial Accident Commission and CAL/OSHA.
2. The Contractor shall, at his/her own expense, furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of all excavations (whether above or below the pipe grade), and to prevent any movement which could in any way diminish the required trench section or otherwise injure or delay the work. The sheeting and bracing shall be withdrawn in a manner such as to prevent any earth movement that might overload the pipe.

F. Excavated Material:
1. All excavated material not required for backfill shall be immediately removed and properly disposed of in a legal manner by the Contractor.
2. Material excavated in streets and roadways shall be laid alongside the trench no closer than 2 feet from the trench edge and kept trimmed to minimize inconvenience to public traffic.
3. Provisions shall be made whereby all storm and wastewater can flow uninterrupted in gutters or drainage channels.

3.6 PIPE BEDDING

A. Bedding Excavation: The trench shall be excavated below the grade of the pipe bottom to the following minimum depths:

Pipe Type	Depth
Copper	3 inch
Reinforced Concrete	3 inch
Plastic: 2 inch diameter and smaller	3 inch
Cast/Ductile Iron	6 inch
Plastic: over 2 inch diameter	6 inch

1. Stabilization of Trench Bottom: When the trench bottom is unstable due to wet or spongy foundation, trench bottom shall be stabilized with gravel or crushed rock. The Inspector of Record will determine the suitability of the trench bottom and the amount of gravel or crushed rock needed to stabilize a soft foundation. Soft material shall be removed and replaced with gravel or crushed rock as necessary.
2. Placement of Bedding Material: The trench bottom shall be cleaned to remove all loose native material prior to placing pipe bedding material. Pipe bedding shall be trench sand or trench gravel, as defined in these specifications. Sufficient pipe bedding material shall be placed in trench and tamped to bring trench bottom up to grade of the bottom of pipe, plus 1/8th of the pipe diameter. The relative compaction of tamped material shall be not less than 90 percent. It is the intention of these requirements to provide uniform bearing under the full length of pipe to a minimum width of 60 percent of the external diameter.

3.7 TRENCH BACKFILL

A. Initial Backfill:
1. Prior to trench backfill, the condition of the trench and lying of pipe must be inspected and approved by the Inspector of Record.
2. Trench Sand and Trench Gravel shall be used for initial backfill. After the pipe has been properly laid and inspected, initial backfill material shall be placed on both sides of the pipe and compacted to final depth as follows:

Pipe Type	Depth
Copper	6 inches above top of pipe
Cast Iron	6 inches above top of pipe
Plastic: less than 3 inches diameter	6 inches above top of pipe

Plastic: 3 inches diameter and larger	12 inches above top of pipe
Ductile Iron	12 inches above top of pipe
Reinforced Concrete	½ outside diameter of pipe (pipe spring line)

3. Compaction: Initial backfill compaction shall be by mechanical means. The initial backfill material shall be hand tamped in layers not exceeding 4 inches in un-compacted depth and shall be brought up uniformly on both sides of the pipe to avoid bending or distortional stress. After hand tamping, the relative compaction of the initial backfill material shall be not less than 90 percent.
4. Pipe Detection: In trenches containing pressurized plastic pipes, tracer wire shall be placed directly above the pipe and shall be connected to all valves, existing exposed tracer wires, and other appurtenances as appropriate.

B. Subsequent Backfill:
1. Subsequent backfill material shall consist of approved native material, imported fill, or Class II AB conforming to these specifications.
2. Structure and utility trench backfill should be moisture conditioned, placed in lifts eight inches or less in loose thickness, and mechanically compacted to at least 90 percent relative compaction except the relative compaction shall not be less than 95 percent within 2-1/2 feet of finished permanent surface grade or 1-1/2 feet below the finished subgrade, whichever is greater; jetting will not be permitted. The moderately expansive clay soils exposed in trenches should not be allowed to dry out prior to placement of trench backfill materials.
3. It must be the contractor's responsibility to select equipment and procedures that will accomplish the grading as described above. He/she must organize his/her work in such a manner that the Soil Engineer can test and/or observe each element of grading.

C. Jetting and Ponding:
1. Jetting of trench backfill is not permitted.

D. Compaction Testing:
1. Compaction testing shall be in accordance with California Test Method ASTM D1556 or D1557.

3.8 TRENCH SURFACING

A. Unpaved Areas:
1. In unimproved areas, the trench surface shall be restored to its original condition. No mounds of earth shall be left along the trench. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
2. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

B. Temporary Surfacing:
1. Temporary surfacing shall be a minimum of 2 inches of cutback asphalt on 10 inches of Class 2 aggregate base and shall be placed at all trench locations subject to vehicular or pedestrian traffic.
2. Temporary surfacing shall be laid within one day after backfilling (except where the Contractor elects to place permanent surfacing within this time period).
3. Before the trenching area is opened for traffic, all excess dirt, rock, and debris shall be removed, the street surface shall be swept clean and the pavement shall be washed down with a water truck and pressure nozzle.
4. Temporary surfacing shall be maintained to prevent the occurrence of mud holes and prevent the surface from settling below 1 inch or rising more than 1 inch from the existing pavement grade.

3.9 MOISTURE CONTROL:

A. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.

3.10 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Testing Services: Allow testing agency to test each backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

B. When testing agency reports that backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact and retest until required density is obtained.

3.11 PROTECTION:

A. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

3.12 CLEAN-UP:

A. Remove all debris, equipment, tools and materials upon completion prior to final inspections to the satisfactions of the engineer.

B. In unpaved areas without landscaping, cover with straw erosion control blanket. Follow manufacturer’s recommendations for installation. Provide and place straw wattles or biodegradable fiber logs across the slope at the midpoint and along the downhill edge of site. No soil is to be left uncovered at the completions of construction.

END OF SECTION

SECTION 32 3114

VINYL COATED CHAIN LINK FENCING

PART 1 - GENERAL

1.01 SUMMARY

A. Vinyl Coated Chain Link Fencing and Gates as indicated on Drawings.

1.02 RELATED WORK

A. Section 03 3300 – Cast-in-place concrete

1.03 REFERENCES AND STANDARDS

A. Federal Specifications (FS).

B. Chain Link Fence Manufacturer's Institute's (CLFMI, CLF PM 0610) – Product Manual; Chain Link Fence Manufacturers Institute, latest edition.

C. Steel Chain Link Galvanized Fence Fabric (CS 246).

D. Industrial Steel Specifications for Fence-Posts, Gates and Accessories.

E. American Society for Testing and Materials, (ASTM).

F. ASTM F552 Standard Terminology Relating to Chain Link Fencing.

G. ASTM F567 Standard Practice for Installation of Chain Link Fence.

H. ASTM F668 Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric.

1.04 QUALITY ASSURANCE

A. Vinyl coated chain link fencing and gates shall conform with these specifications and all applicable sections of the above named references.

B. Provide chain link fences and gates as complete units produced by a single manufacturer, including necessary erection accessories, fittings, and fastenings.

C. Installation: Performed only by the manufacturer or an experienced chain link fence installer having 5 years experience installing similar projects in accordance with ASTM F567.

1.05 SUBMITTALS

A. Submit manufacturer's product data for each type of fencing and finish required.

B. Submit shop drawings. Include plan layout and details illustrating height, location, and sizes of posts, rails, braces, gates, and anchorage. Provide hardware list and erection procedures. Include a layout drawing showing the spacing of all posts and location of all gates; abrupt changes in grade; and all corner, gate, anchor, end and pull posts.

C. Submit the following material samples in required finish:

1. Fabric, 6" square.

D. Submit installer's certification that furnished materials meet specification requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver chain link fence materials in the manufacturer's original packaging with tags and labels intact and legible.

B. Handle and store material to prevent damage and deterioration.

1.07 PROJECT CONDITIONS

A. Do not begin chain link fencing installation until final grading has been completed and approved by the Architect.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Calco Fencing, Livermore, California 925.449.5081.

B. Anchor Fence Company, Daly City, California; 650.588.5000.

C. Or equal.

2.02 MATERIALS

A. Chain Link Fabric: One-piece width, full height up to 12'- 0", 2" diamond mesh, 9 gauge (0.150") steel wire.
1. Galvanized or Zinc-coated finish.
2. Galvanized Coated Finish: ASTM A-392, Class I, 0.3 ounces zinc per sq. ft. of surface. Coated after fabric fabrication.
3. Vinyl Coating: Polyvinyl chloride (PVC), plastic resin finish over galvanized steel wire, not less than 7 nor more than 20 mils thick. Coated before fabric fabrication.
4. Color: Matte Black
5. Selvages: Top selvages knuckled and bottom selvages twisted.

B. Framework: Type I Steel Pipe.
1. Type I: Schedule 40 steel pipe with galvanized coating, ASTM F1043 or ASTM F1083, not less than 1.8 ounces zinc per sq. ft. of surface. Minimum steel yield strength of 30,000 psi (205MPa).
   a. All coatings applied inside and outside after welding.
2. Vinyl Coating: Polyvinyl chloride (PVC), plastic resin finish over galvanizing, not less than 10 mils thick. Color matching chain link fabric color.
3.

Pipe Size	Type I
O.D.	Weight Lbs/l.f.
1.660"	2.27
1.900"	2.72
2.375"	3.65
2.875"	5.79
3.500"	7.58

	4.000"	9.11

C. Hardware and Accessories: Provide manufacturer's standard hardware and accessories, except as otherwise indicated.

1. Finish and Vinyl Coating: As specified for framework.

2.03 COMPONENTS

A. Fence Posts:

Fabric height	Line O.D.	Terminal/Corner O.D.
to 6'	1.900"	2.375"
6' to 9'	2.375"	2.875"
9' to 12'	2.875"	4.000"

B. Gate Posts:

Single Gate Width	Double Gate Width	Post O.D.
to 6'	to 12'	3.000"
6' to 12'	13' to 25'	4.000"

C. Top and Brace Rails: 1.660" O.D.

1. Provide continuous top rails in manufacturer's longest lengths, with expansion type couplings for each joint. Provide necessary fittings for attaching top rail to each gate, corner, pull, and end post.

D. Gate Frames: 1.900" O.D.

E. Bottom Tension Wire: 7 gauge (.177") coiled spring wire, finish matching fabric finish.

F. Post Braces: Provide bracing assemblies, for fences 6'-0" high or over, at each end and gate posts, and at both sides of corner and pull posts.

1. Locate 1.900" horizontal brace at mid-height of fabric.
2. Use 0.375" diameter rod with turnbuckle for diagonal truss.

2.04 ACCESSORIES

A. Finish and Vinyl Coating to match framework.

B. Post Caps: Weather tight pressed steel or cast iron closure caps, 1 top for each post. Provide tops with openings to accommodate top rails.

C. Sleeves, stretcher bars, stretcher bar bands, clips, ties, rail ends, fasteners, fittings, and accessories: Provide manufacturer's standard complying with CLMI specifications. Finish matching framework finish.

D. Concrete: ASTM C94 ready-mixed concrete, minimum 28-day compressive strength of 2,500 psi, air-entrained 2% to 4%.

E. Non-Shrink Grout: Embeco 153, as manufactured by Master Builders.

2.05 GATES

A. Fabricate gate perimeter frames of steel pipe members assembled by welding or with special fittings at corners. Provide additional horizontal and vertical members to ensure proper operation and for attachment of fabric, hardware, and accessories.

B. Gate Fabric: Metal and finish matching fence fabric.

C. Gate Hardware: Provide manufacturer's standard hardware, complete with latches, stops, keepers, and hinges complying with CLMI specifications. Provide hardware of sufficient design and strength for satisfactory gate operation.

1. Hinges: Galvanized pressed steel or malleable iron to suit gate size, nonlift-off type, offset to permit 180 degree gate opening. Provide 1 pair of hinges for each leaf of each gate.
2. Latch Assembly for Double Gates: Provide center drop-rod type latch assembly to permit operation from either side of gate. Provide padlock eye as integral part of the latch assembly requiring one padlock for locking both gate leaves.
3. Latch Assembly for Single Gates: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
4. Gate Stops: Provide gate stops consisting of mushroom type or flush plate type with anchors, to be set in concrete to engage the center drop-rod.
5. Keeper: Provide keeper, which automatically engages the gate leaf and holds it in the open position until it is manually released, for all gate leaves.
6. Padlock: Provide one padlock for each gate. Padlocks shall conform to FS FF-P-101E (1) and as follows: Type EPC, Size 2-inches (solid brass body), 6 pin tumbler mechanism, stainless steel spring extension type shackles with 2-inch clearance, 2 nickel-chrome plated keys per padlock.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the substrate under which chain link fencing is to be installed. Notify the Architect, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Contractor shall secure all field measurements required for proper and adequate fabrication and installation of the work covered by this section. Exact measurements are the Contractor's responsibility.

B. Provide sleeves and inserts for embedment in other work and templates and measurements for their placement.

C. Lay out complete fence line.

D. Locate and mark post positions. Space line posts equally and at maximum 10'-0" on center spacing.

E. Provide corner posts at positions where fence changes direction more than 10 degrees.

3.03 INSTALLATION

A. Install the chain link fence system in accordance with the manufacturer's installation instructions and complying with CLMI specifications.

B. Provide a rigid, plumb, finished fence structure with fabric tight and in tension; of the height herein specified.

C. Drill post footing holes into firm, undisturbed, or compacted earth.
   1. Footing diameter: Minimum 3 times the post diameter.
   2. Footing depth: Minimum 3" deeper than the post setting depth.
   3. Post depth: Minimum of 36" depth.
   4. Gate post depth: In accordance with manufacturer's recommendations for gate size indicated, minimum of 36" depth.
   5. Remove excavated posthole soil from the site.

D. Install gate, end, corner, pull, and line posts in concrete foundations.

E. Place foundation concrete and tamp for consolidation. Align each post both vertically and laterally. Hold in position during concrete placement and finishing operation.
   1. Trowel finish tops of footings, and slope to direct water away from posts.
   2. Set keeps, stops, sleeves, and other accessories into concrete as required.
   3. Grout-in posts set into sleeved holes with non-shrink grout.

F. Top Rails: Install continuously through post caps or extension arms.

G. Center Rails: Provide center rails where required.

H. Brace Assemblies: Install brace assemblies where required.

I. Tension Wire: Install tension wires before stretching fabric and tie to each post with wire ties or clips.

J. Stretch fabric tight between terminal posts. Install on security side of fence, and anchor securely to framework.

   1. Position bottom of fabric maximum of 2" above ground level at each post.

K. Cut fabric to form continuous piece between terminal posts.

   1. Pull the fabric taut and clip or tie to posts, top rail, and bottom tension wire.
   2. Do not splice fabric.
   3. Anchor to framework so that the fabric remains in tension after the pulling force is released.
   4. Bend wire ties to minimize hazard to persons.
   5. Peen bolt threads to prevent removal of nuts. Bolts shall not protrude more than 1/4 inch beyond nuts after tightening. File rough edges smooth. All posts shall be plumb and rigid after installation. Rails shall be straight and tight. Chain-link fabric shall be smooth and uniformly stretched tight and straight.

L. Install gates plumb, level, and secure for full opening without interference.
   1. Adjust hardware for smooth operation.
   2. Lubricate where necessary.

3.04 CLEANING

Perform cleaning during installation of the work and upon completion of the work. Remove from site all debris and equipment. Repair all damage resulting from chain link fence system installation.

END OF SECTION

SECTION 32 5000

RESTORATION OF SURFACES

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes but not limited to:
1. General surface restoration.
2. Asphalt concrete surface restoration.
3. Concrete surface restoration.
4. Pavement Marking
5. Landscape/Planting restoration.

B. Related Sections:
1. Section 31 2333 – TRENCHING, BACKFILLING, AND COMPACTING.
2. Section 32 1233 – PAVING AND SURFACING.
3. Section 32 1723 – PAVEMENT MARKING.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Refer to Section 31 2333 – TRENCHING, BACKFILLING, AND COMPACTING.

B. Refer to Section 32 1233 – PAVING AND SURFACING.

C. Refer to Section 32 1723 – PAVEMENT MARKING.

PART 3 – EXECUTION

3.1 GENERAL

A. Surface restoration shall be in kind or better.

3.2 ASPHALT CONCRETE SURFACE RESTORATION

A. The base course for permanent asphalt concrete surface restoration shall be Class II Aggregate Base, equal in depth to the existing pavement structural section, but not less than 8 inches in depth.

B. The wearing surface for permanent surface restoration on improved streets shall be asphalt concrete equal in thickness to the existing pavement, but not less than 3 inches in depth. The asphalt concrete shall be 1/2'' max medium Type B Asphalt Concrete, in accordance with Section 32 1233 – PAVING AND SURFACING.

3.3 CONCRETE SURFACE RESTORATION

A. The base for permanent concrete surface restoration shall be Class II Aggregate base, equal in depth to the existing section, but not less than 6 inches in depth.

B. The weaving surface for permanent concrete surface restoration shall be concrete equal in thickness to the existing concrete section, but not less than 4 inches in depth. The concrete shall be 6-sack concrete, in accordance with Section 32 1233 – PAVING AND SURFACING.

3.4 PAVEMENT MARKING RESTORATION

A. Replace pavement marking disturbed by construction operations/activity to the satisfaction of the Owner's Representative in kind in accordance with Section 32 1723 – PAVEMENT MARKING.

3.5 LANDSCAPE RESTORATION

A. Replace landscaping, planting, trees, shrubs, ground cover, irrigations systems disturbed by construction operations/activity to the satisfaction of the Owner's Representative in kind or better.

B. Grass areas disturbed or damaged by construction shall be replaced with Sod. Hydroseed is permitted upon confirmation by Owner's Representative.

END OF SECTION

CHABOT COLLEGE

25555 HESPERIAN BLVD HAYWARD, CA 94545

MPOE REPLACEMENT - BLDG. 300

LEARNING SKILLS TESTING RELOCATION - BLDG 100

PRELIMINARY SUBMITTAL - 7/3/2019

PROJECT TRACKING #:NA / DSA APPLICATION #:01-118445 / DSA FILE#:1-C2

APPLICABLE CODES AND REGULATIONS

PARTIAL LIST OF APPLICABLE CODES AS OF January 1, 2017

- 2016 California Administrative Code (CAC), Part 1, Title 24 CCR*
- 2016 California Building Code (CBC), Part 2, Title 24 CCR
  (2015 International Building Code, Vol. 1 & 2, and 2016 California amendments)
- 2016 California Electrical Code (CEC). Part 3. Title 24 CCR
  (2014 National Electrical Code and 2016 California Amendments)
- 2016 California Mechanical Code (CMC), Part 4, Title 24 CCR
  (2015 IAPMO Uniform Mechanical Code and 2016 California amendments)
- 2016 California Plumbing Code (CPC), Part 5, Title 24 CCR
  (2015 IAPMO Uniform Plumbing Code and 2016 California amendments)
- 2016 California Energy Code (CEC), Part 6, Title 24 CCR
- 2016 California Fire Code (CFC), Part 9, Title 24 CCR
  (2015 International Fire Code and 2016 California Amendments)
- 2016 California Existing Building Code (CEBC), Part 10, Title 24 CCR
  (2015 International Existing Building Code and 2016 California Amendments)
- 2016 California Green Building Standards Code (CALGreen), Part 11, Title 24 CCR
- 2016 California Referenced Standards Code, Part 12, Title 24 CCR
- Title 19 CCR, Public Safety, State Fire Marshal Regulations
- 2013 ASME A17.1/CSA B44-13 Safety Code for Elevators and Escalators

PARTIAL LIST OF APPLICABLE STANDARDS

• 2010 ADA Standards for Accessible Design	
• NFPA 13 Standard for the Installation of Sprinkler Systems (CA amended)	2016 Edition
• NFPA 14 Standard for the Installation of Standpipe and Hose Systems	2013 Edition
• NFPA 17 Standard for Dry Chemical Extinguishing Systems	2013 Edition
• NFPA 17A Standard for Wet Chemical Extinguishing Systems	2013 Edition
• NFPA 20 Standard for the Installation of Stationary Pumps for Fire Protection	2016 Edition
• NFPA 22 Standard for Water Tanks for Private Fire Protection	2013 Edition
• NFPA 24 Standard for the Installation of Private Fire Service Mains and Their Appurtenances	2016 Edition
• NFPA 72 National Fire Alarm and Signaling Code (CA amended);	2016 Edition
• NFPA 80 Standard for Fire Doors and Other Opening Protectives	2016 Edition
• NFPA 2001 Standard on Clean Agent Fire Extinguishing Systems	2015 Edition
• UL 300 Standard for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment	2005 (R2010)
• UL 464 Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories	2003 Edition
• UL 521 Standard for Heat Detectors for Fire Protective Signaling Systems	1999 Edition
• UL 1971 Standard for Signaling Devices for the Hearing Impaired	2002 Edition
• ICC 300 Standard for Bleachers, Folding and Telescopic Seating, and Grandstands	2012 Edition

NOTES

1. A COPY OF ALL PARTS 1, 2, 3, 4 & 5 TITLE 24 C.C.R. SHALL BE KEPT ON THE JOB SITE AT ALL TIMES.
2. ALL CHANGE ORDERS AND ADDENDA TO BE SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER AND APPROVED BY DSA. CHANGE ORDERS NOT VALID UNTIL APPROVED BY DSA PER SECTION 4-338, PART 1, TITLE 24.
3. ALL TESTS TO CONFORM TO THE REQUIREMENTS OF SECTION 4-335, PART 1, TITLE 24, AND APPROVED TESTING AND INSPECTION SHEET.
4. TESTS OF MATERIALS AND TESTING LAB SHALL BE IN ACCORDANCE WITH SECTION 4-335 OF PART 1, TITLE 24, AND THE DISTRICT SHALL EMPLOY AND PAY THE LABORATORY. COST OF RE-TEST MAY BE BACK-CHARGED TO THE CONTRACTOR.
5. DSA SHALL BE NOTIFIED AT THE START OF CONSTRUCTION AND PRIOR TO THE REPLACEMENT OF CONCRETE, PER SECTION 4-331, PART 1, TITLE 24.
6. INSPECTOR TO BE APPROVED BY THE ARCHITECT AND DSA AND TO BE EMPLOYED BY THE DISTRICT. INSPECTION TO BE IN ACCORDANCE WITH SECTION 4-333(B), THE DUTY OF THE INSPECTOR SHALL BE IN ACCORDANCE WITH SECTION 4-342, PART 1, TITLE 24.
7. SUPERVISION OF CONSTRUCTION BY DSA IN ACCORDANCE WITH SECTION 4-334, PART 1, TITLE 24.
8. CONTRACTOR, INSPECTOR, ARCHITECT, AND ENGINEERS SHALL SUBMIT VERIFIED REPORTS (SSS-6) IN ACCORDANCE WITH SECTIONS 4-336 AND 4-343, PART 1, TITLE 24.
9. THE ARCHITECT, STRUCTURAL ENGINEER, AND PROFESSIONAL ENGINEER SHALL PERFORM THEIR DUTIES IN ACCORDANCE WITH SECTIONS 4-333(a) AND 4-341, PART 1, TITLE 24.
10. THE CONTRACTOR SHALL PERFORM HIS DUTIES IN ACCORDANCE WITH SECTION 4-343, PART 1, TITLE 24.
11. DSA IS NOT SUBJECT TO ARBITRATION.
12. ALL BARRIER FREE ITEMS SHALL COMPLY WITH TITLE 21 AND 24 OF THE CALIFORNIA CODE OF REGULATIONS, 2016.
13. ALL WORK AND MATERIALS SHALL BE IN FULL ACCORDANCE WITH THE REQUIREMENTS OF THESE CODES AND ALL APPLICABLE LOCAL ORDINANCES. WHERE CODES CONFLICT, THE MORE STRINGENT SHALL APPLY.
14. NO CHANGES OR REVISIONS SHALL BE MADE FOLLOWING WRITTEN APPROVAL WHICH AFFECTS ACCESS COMPLIANCE ITEMS UNLESS SUCH CHANGES OR REVISIONS ARE SUBMITTED TO DSA FOR REVIEW AND APPROVAL.
15. SUBSTITUTIONS AFFECTING DSA REGULATED ITEMS SHALL BE SUBMITTED AS A CONSTRUCTION CHANGE DOCUMENT OR ADDENDA, AND SHALL BE APPROVED BY DSA PRIOR TO FABRICATION AND INSTALLATION.
16. MATERIALS AND THEIR INSTALLATION SHALL COMPLY WITH APPLICABLE CODES, STANDARDS AND MANUFACTURER RECOMMENDATIONS.
17. PER CBC 11B-104.1 "ALL DIMENSIONS ARE SUBJECT TO CONVENTIONAL INDUSTRY TOLERANCES, EXCEPT WHERE THE REQUIREMENT IS STATES AS A RANGE WITH A SPECIFIC MINIMUM AND MAXIMUM END POINTS."

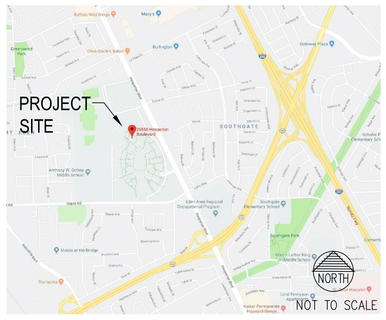
SUMMARY OF WORK

- CONVERT CLASSROOM SPACE IN BLDG 300 TO MINIMUM POINT OF ENTRY (MPOE) FOR TELECOMMUNICATION PROVIDERS.
- RENOVATE CUSTODIAL ROOM IN BLDG 100 TO A TESTING ROOM.

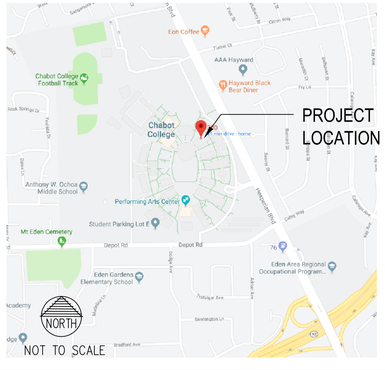
DEFERRED APPROVAL NOTE

- NONE

VICINITY MAP



CONTEXT MAP



PROJECT TEAM

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GENERAL CONFORMANCE STATEMENT

THE CIVIL, MECHANICAL, FIRE PROTECTION (SPRINKLER), ELECTRICAL, FIRE ALARM, TITLE 24 COMPLIANCE, AND TELECOMMUNICATION DRAWINGS LISTED ON THE COVER/SHEET INDEX HAVE BEEN PREPARED BY OTHER DESIGN PROFESSIONALS OR CONSULTANTS WHO ARE LICENSED AND/OR AUTHORIZED TO PREPARE SUCH DRAWINGS IN THIS STATE. THEY HAVE BEEN EXAMINED BY ME FOR:

1. DESIGN INTENT AND APPEAR TO MEET THE APPROPRIATE REQUIREMENTS OF TITLE 24, CALIFORNIA CODE OF REGULATIONS AND THE PROJECT SPECIFICATIONS PREPARED BY ME, AND;
2. COORDINATION WITH PLANS AND SPECIFICATIONS ARE ACCEPTABLE FOR INCORPORATION INTO THE CONSTRUCTION OF THIS PROJECT.

THE STATEMENT OF GENERAL CONFORMANCE SHALL NOT BE CONSTRUED AS RELIEVING ME OF MY RIGHTS, DUTIES, AND RESPONSIBILITIES UNDER SECTIONS 17302 AND 81138 OF THE EDUCATION CODE AND SECTIONS 4-336, 4-341 AND 4-344 OF TITLE 24, PART 1. (TITLE 24, PART 1, SECTION 4-317 (b))

SIGNATURE OF THE ARCHITECT/ENGINEER — 11/7/2019 DATE

LUKE SHIRAS RA, LEED AP

C-31985 — LICENSE NUMBER — 11/30/2021 EXPIRATION DATE

CODE ANALYSIS DATA

EXISTING BUILDING 300
BUSINESS EDUCATION

DSA APPLICATION NUMBERS:
#01-109151 & #01-101146

CONSTRUCTION TYPE:	V-N
OCCUPANCY CLASSIFICATION:	B2
NUMBER OF STORIES:	2
TOTAL (E) SQUARE FOOTAGE:	22,904
ALLOWABLE FLOOR AREA:	
AS PER TABLE 506.2 (36,000 x 2)	72,000

EXISTING BUILDING 100
LIBRARY

DSA APPLICATION NUMBERS:
#01-113847, #01-100862, #56068, #24326 #01-104993 CAMPUS FIRE ALARM #56581 CAMPUS BARRIER REMOVAL

CONSTRUCTION TYPE:	II-1HR
OCCUPANCY CLASSIFICATION:	A3/B2
NUMBER OF STORIES:	2
TOTAL (E) SQUARE FOOTAGE:	71,396
ALLOWABLE FLOOR AREA:	
AS PER TABLE 506.2 (150,000 x 2)	300,000

SHEET INDEX

SHEET TOTAL 83

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

LICENSED ARCHITECT LUKE SHIRAS C-31985 EXP. 11/30/2021 STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD HAYWARD, CA 94545

SHEET INDEX AND PROJECT NOTES

DRAWN BY: NF CHECKED BY: LS

DATE: 11/7/2019 PROJECT NO: C9506

SHEET NO:

G-000

11/19/2019 - 03:31:59 PM
P:\CIC\C9500 Chabot-Las Positas_CCC\C9506_Chabot_MPOE_R(dmm13_Dwgs\G-000\n-G-000-Cover.dwg - nfarahani

LEGEND

	EXISTING	PROPOSED
SAWCUT AND CONFORM LINE		
RETAINING WALL		
A.C. PAVEMENT		
CONC. VALLEY GUTTER		
CONC. SIDEWALK OR PAD		
6" CURB & GUTTER		
EDGE OF A.C. PAVEMENT	EP	
6" VERTICAL CURB		
CENTER LINE		
SANITARY SEWER MAIN	8" SS	8" SS
STORM DRAIN MAIN	12" SD	15" SD
PERFORATED PIPE		6" SD
WATER MAIN	6" W	6" W
FIRE WATER MAIN	6" FW	4" FW
DOMESTIC WATER MAIN	6" DW	4" DW
CHILLED WATER MAIN	6" CHW	4" CHW
IRRIGATION LINE	2" IRR	4" IRR
HOT WATER SUPPLY & RETURN	HWS HWR	HWS HWR
STEAM LINE	ST	ST
TRENCH DRAIN		
CONDENSATE RETURN	CR	CR
METAL BEAM GUARD RAIL		
SILT FENCE		
FLOW LINE		
CHAIN LINK FENCE	x x	x x
GAS MAIN	G	2" G
ELECTRIC AND SIGNAL DUCT BANK	E	E
OVERHEAD ELECTRIC LINE	OHE	OHE
UNDERGROUND ELECTRIC LINE	UGE	UGE
STREET LIGHT CONDUIT	SL	SL
CONTOUR ELEVATION LINE	85	90 89
SPOT ELEVATION	x 95.94	FG 95.94
DIRECTION OF SLOPE		2:1 1%
GAS METER		GM
GAS VALVE		GV
WATER METER		WM
WATER VALVE		WV
FIRE HYDRANT		
BACK FLOW PREVENTOR		
POST INDICATOR VALVE	PIV	PIV
FIRE DEPARTMENT CONNECTION		
WATER LINE TEE		
CAP AND PLUG END		
AIR RELEASE VALVE		ARV
SIGN		
ACCESSIBLE RAMP		
CONCRETE THRUST BLOCK		
REDUCER		
SANITARY SEWER MANHOLE		
SANITARY SEWER CLEANOUT	SSCO	SSCO
STORM DRAIN MANHOLE		
STORMCEPTOR		
STORM DRAIN AREA DRAIN		
STORM DRAIN CATCH BASIN	CB	
STORM DRAIN CURB INLET		
STORM DRAIN CLEANOUT	SDCO	SDCO
ELECTROLIER		
JOINT POLE		
OVERLAND RELEASE		
CONSTRUCTION DETAIL REFERENCE		2 / C-201 DETAIL REFERENCE SHEET REFERENCE

Construction contractor agrees that in accordance with generally accepted construction practices, construction contractor will be required to assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property; that this requirement shall be made to apply continuously and not be limited to normal working hours and construction contractor further agrees to defend, indemnify and hold design professional harmless from any and all liability, real or alleged in connection with the performance of work on this project, excepting liability arising from sole negligence of design professional.

ABBREVIATIONS

AB	–	AGGREGATE BASE
AC	–	ASPHALT CONCRETE
AD	–	AREA DRAIN
ADA	–	AMERICANS WITH DISABILITIES ACT
ASB	–	AGGREGATE SUBBASE
BC	–	BEGINNING OF CURVE
BFP	–	BACK FLOW PREVENTOR
BLDC	–	BUILDING CORNER
BLDG	–	BUILDING
BOD	–	BOTTOM OF DOCK
BOL	–	BOLLARD
BOS	–	BOTTOM OF STEP
BOW	–	FG @ BOTTOM OF WALL
BVC	–	BEGIN VERTICAL CURVE
BW	–	BACK OF WALK
C	–	CONCRETE OR CIVIL
C&G	–	CURB AND GUTTER
CB	–	CATCH BASIN
CI	–	CURB INLET
CIP	–	CAST IRON PIPE
CL	–	CENTER LINE OR CLASS
CMP	–	CORRUGATED METAL PIPE
CO	–	CLEANOUT
CONC	–	CONCRETE
CONST	–	CONSTRUCTION OR CONSTRUCT
CY	–	CUBIC YARD
DCDA	–	DOUBLE CHECK DETECTOR ASSEMBLY
DI	–	DROP INLET
DIP	–	DUCTILE IRON PIPE
DOM	–	DOMESTIC
DW	–	DOMESTIC WATER
DWG	–	DRAWING
E	–	EAST
EC	–	END OF CURVE
EP	–	EDGE OF PAVEMENT
ER	–	END OF RETURN
EVC	–	END VERTICAL CURVE
ELEV	–	ELEVATION
EX., EXIST.	–	EXISTING
FC	–	FACE OF CURB
FDC	–	FIRE DEPARTMENT CONNECTION
FF	–	FINISHED FLOOR
FG	–	FINISHED GRADE
FH	–	FIRE HYDRANT
FL	–	FLOW LINE
FOUND	–	FOUNDATION
FS	–	FINISHED SURFACE
FT	–	FOOT
FW	–	FIRE WATER
G	–	GROUND ELEVATION
GB	–	GRADE BREAK
GV	–	GATE VALVE
HCR	–	ACCESSIBLE RAMP
HP	–	HIGH POINT
INV	–	INVERT ELEVATION
JP	–	JOINT POLE
JT	–	JOINT TRENCH
LIP	–	LIP OF GUTTER
LP	–	LOW POINT
LSA	–	LANDSCAPE ARCHITECT
MAX	–	MAXIMUM
MEP	–	MECHANICAL/ELECTRICAL/PLUMBING
MH	–	MANHOLE
MIN	–	MINIMUM
MPVC	–	MIDPOINT OF VERTICAL CURVE
MON	–	MONUMENT
N	–	NORTH
N.I.C.	–	NOT IN CONTRACT
NO	–	NUMBER
NTS	–	NOT TO SCALE
P	–	PAVEMENT ELEVATION
PCC	–	PORTLAND CEMENT CONCRETE / POINT OF CONTINUOUS CURVATURE
PIV	–	POST INDICATOR VALVE
PL	–	PROPERTY LINE
PMH	–	POWER MANHOLE
POC	–	POINT ON CURVE
PP	–	POWER POLE
PRC	–	POINT OF REVERSE CURVATURE
PVC	–	POLYVINYL CHLORIDE PIPE
R	–	RADIUS
RC	–	RELATIVE COMPACTION
RCP	–	REINFORCED CONCRETE PIPE
RPPA	–	REDUCED PRESSURE PRINCIPLE ASSEMBLY
R/W	–	RIGHT OF WAY
S	–	SLOPE OR SOUTH
S.A.D.	–	SEE ARCHITECTURAL DRAWINGS
SB	–	SEDIMENT BASIN
SD	–	STORM DRAIN
S.E.D.	–	SEE ELECTRICAL DRAWINGS
SF	–	SILT FENCE
SG	–	SUBGRADE
S.L.D.	–	SEE LANDSCAPE DRAWINGS
S.M.D.	–	SEE MECHANICAL DRAWINGS
SMH	–	SIGNAL MANHOLE
S.P.D.	–	SEE PLUMBING DRAWINGS
SS	–	SANITARY SEWER
STA	–	STATION
STD	–	STANDARD
S/W	–	SIDEWALK
TC	–	TOP OF CURB
TD	–	TRENCH DRAIN
TOD	–	TOP OF DOCK
TOE	–	TOE OF SLOPE
TOS	–	TOP OF STAIR
TOW	–	FG @ TOP OF WALL
TS	–	TOP OF SLAB
TYP	–	TYPICAL
UON	–	UNLESS OTHERWISE NOTED
U/G	–	UNDERGROUND
VC	–	VERTICAL CURVE
WM	–	WATER METER
WV	–	WATER VALVE
W	–	WEST
WWF	–	WELDED WIRE FABRIC
W/	–	WITH

811 Know what's below. Call before you dig.

UNAUTHORIZED CHANGES AND USES

CAUTION: The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes to the plans must be in writing and must be approved by the preparer of the plans.

CONSTRUCTION NOTES

1. ALL OFF-SITE CONSTRUCTION MATERIAL AND METHODS SHALL COMPLY WITH THE LATEST EDITION OF THE CITY OF HAYWARD STANDARD PLANS & SPECIFICATIONS AND THE LATEST CALTRANS STANDARD SPECIFICATIONS.
2. CONTRACTOR SHALL LEAVE AN EMERGENCY PHONE NUMBER WITH THE POLICE AND FIRE DEPARTMENTS.
3. CONTRACTOR SHALL POST ON THE SITE, EMERGENCY TELEPHONE NUMBERS FOR PUBLIC WORKS, AMBULANCE, POLICE, AND FIRE DEPARTMENTS.
4. CONTRACTOR SHALL NOTIFY ALL PUBLIC OR PRIVATE UTILITY OWNERS 48 HOURS PRIOR TO COMMENCEMENT OF WORK ADJACENT TO THE UTILITY UNLESS AN EXCAVATION PERMIT SPECIFIES OTHERWISE.
5. UTILITIES AND UNDERGROUND FACILITIES INDICATED ARE FOR INFORMATION ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATION AND DEPTH WITH THE APPROPRIATE AGENCIES. NEITHER THE OWNER NOR THE CITY NOR THE DESIGN PROFESSIONAL ASSUMES RESPONSIBILITY THAT THE UTILITIES AND UNDERGROUND FACILITIES INDICATED WILL BE THE UTILITIES AND UNDERGROUND FACILITIES ENCOUNTERED.
6. CONTRACTOR TO CONTACT UNDERGROUND SERVICE ALERT U.S.A. 800-227-2600 FORTY-EIGHT (48) HOURS PRIOR TO BEGINNING WORK TO HAVE THE LOCATION OF EXISTING UNDERGROUND UTILITIES MARKED. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO IDENTIFY, LOCATE, AND PROTECT ALL UNDERGROUND FACILITIES.
7. THE CONTRACTOR SHALL HIRE A STREET CLEANING CONTRACTOR TO CLEAN UP DIRT AND DEBRIS FROM CITY STREETS THAT ARE ATTRIBUTABLE TO THE DEVELOPMENT'S CONSTRUCTION ACTIVITIES.
8. ALL GRADING SHALL BE PERFORMED IN SUCH A MANNER AS TO COMPLY WITH THE STANDARDS ESTABLISHED BY THE AIR QUALITY MAINTENANCE DISTRICT FOR AIRBORNE PARTICULATES (DUST).
9. ALL GRADING SHALL CONFORM TO APPROVED SPECIFICATIONS PRESENTED HEREON OR ATTACHED HERETO. ALL GRADING WORK SHALL BE OBSERVED AND APPROVED BY THE SOILS ENGINEER. THE SOILS ENGINEER SHALL BE NOTIFIED AT LEAST 48 HOURS BEFORE BEGINNING ANY GRADING. UNOBSERVED AND UNAPPROVED GRADING WORK SHALL BE REMOVED AND REDONE AT THE CONTRACTORS EXPENSE.
10. ALL MATERIALS, REQUIRED FOR THE COMPLETE EXECUTION OF THE PROJECT, SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR UNLESS OTHERWISE NOTED.
11. THE CONTRACTOR SHALL PROVIDE ALL LIGHTS, SIGNS, BARRICADES, FLAGMEN OR OTHER DEVICES NECESSARY TO PROVIDE FOR PUBLIC SAFETY DURING THE CONSTRUCTION PERIOD.
12. THE CONTRACTOR SHALL BE RESPONSIBLE TO REPAIR OR REPLACE ANY EXISTING IMPROVEMENTS OF UNDERGROUND FACILITIES DAMAGED DURING THE CONSTRUCTION PERIOD.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL ENCROACHMENT, EXCAVATION, CONCRETE, ELECTRICAL, PLUMBING, ETC. PERMITS NECESSARY PRIOR TO BEGINNING CONSTRUCTION FOR ANY WORK.
14. THE CONTRACTOR SHALL HAVE A SUPERINTENDENT OR REPRESENTATIVE ON SITE AT ALL TIMES DURING CONSTRUCTION.
15. STORAGE OF CONSTRUCTION MATERIAL AND EQUIPMENT ON CITY STREETS WILL NOT BE PERMITTED.
16. CONSTRUCTION EQUIPMENT SHALL BE PROPERLY MUFFLED. UNNECESSARY IDLING OF GRADING CONSTRUCTION EQUIPMENT IS PROHIBITED.
17. CONSTRUCTION EQUIPMENT, TOOLS, ETC. SHALL NOT BE CLEANED OR RINSED INTO A STREET, GUTTER OR STORM DRAIN.
18. A CONTAINED AND COVERED AREA ON-SITE SHALL BE USED FOR STORAGE OF CEMENT BAGS, PAINTS, FLAMMABLE, OILS, FERTILIZERS, PESTICIDES, OR ANY OTHER MATERIALS THAT HAVE POTENTIAL FOR BEING DISCHARGED TO THE STORM DRAIN SYSTEM BY WIND OR IN THE EVENT OF A MATERIAL SPILL.
19. ALL CONSTRUCTION DEBRIS SHALL BE GATHERED ON A REGULAR BASIS AND PLACED IN A DUMPSTER WHICH IS EMPTIED OR REMOVED WEEKLY. WHEN FEASIBLE, TARPS SHALL BE USED ON THE GROUND TO COLLECT FALLEN DEBRIS OR SPLATTERS THAT COULD CONTRIBUTE TO STORMWATER POLLUTION.
20. ANY TEMPORARY ON-SITE CONSTRUCTION PILES SHALL BE SECURELY COVERED WITH A TARP OR OTHER DEVICE TO CONTAIN DEBRIS.
21. CONCRETE TRUCKS AND CONCRETE FINISHING OPERATIONS SHALL NOT DISCHARGE WASH WATER INTO THE STREET GUTTERS OR DRAINS.

DISCREPANCIES

IF THERE ARE ANY DISCREPANCIES BETWEEN DIMENSIONS IN DRAWINGS AND EXISTING CONDITIONS WHICH WILL AFFECT THE WORK, THE CONTRACTOR SHALL BRING SUCH DISCREPANCIES TO THE ATTENTION OF THE ENGINEER FOR ADJUSTMENT BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER FITTING OF ALL WORK AND FOR THE COORDINATION OF ALL TRADES, SUBCONTRACTORS, AND PERSONS ENGAGED UPON THIS CONTRACT.

HAZARDOUS MATERIALS NOTE

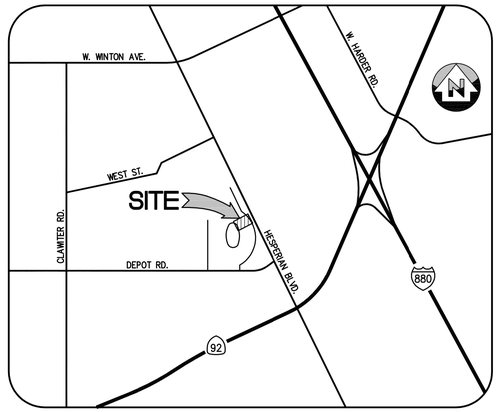
ASBESTOS CONTAINING PIPE AND PIPE INSULATION IS KNOWN TO EXIST WITHIN THE PROJECT AREA. THE CONTRACTOR WILL PROTECT ALL ASBESTOS CONTAINING ITEMS DURING THE EXECUTION OF THIS CONTRACT. ADDITIONALLY THE CONTRACTOR WILL COMPLY WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS REGARDING CONSTRUCTION ACTIVITIES NEAR ASBESTOS CONTAINING MATERIALS.

UTILITY/POTHOLE NOTE

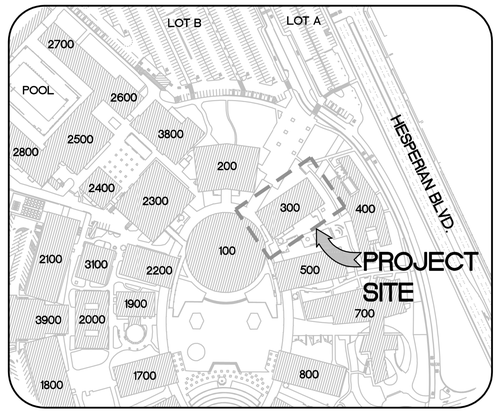
THE TYPES, LOCATIONS, SIZES AND /OR DEPTHS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ARE APPROXIMATE AND WERE OBTAINED FROM SOURCES OF VARYING RELIABILITY. ONLY ACTUAL EXCAVATION WILL REVEAL THE TYPES, EXTENT, SIZES, LOCATIONS AND DEPTHS OF SUCH UNDERGROUND UTILITIES. A REASONABLE EFFORT HAS BEEN MADE TO LOCATE AND DELINEATE ALL KNOWN UNDERGROUND UTILITIES. HOWEVER, THE ENGINEER CAN ASSUME NO RESPONSIBILITY FOR THE COMPLETENESS OR ACCURACY OF ITS DELINEATION OF SUCH UNDERGROUND UTILITIES WHICH MAY BE ENCOUNTERED, BUT WHICH ARE NOT SHOWN ON THESE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND FACILITIES AND UTILITIES BY POTHOLING PRIOR TO COMMENCING CONSTRUCTION.

ADA NOTES

1. ALL SITE WORK SHALL BE IN CONFORMANCE WITH TITLE 24 OF THE CALIFORNIA ADMINISTRATIVE CODE AND WITH THE AMERICANS WITH DISABILITIES ACT.
2. CURB RAMPS SHALL NOT EXCEED A SLOPE OF 1:12 (8.33%).
3. PATH OF TRAVEL TO BUILDINGS SHALL NOT EXCEED A SLOPE OF 1:20 (5%) UNLESS RAILINGS ARE SHOWN ON ARCHITECTURAL PLANS, IN WHICH CASE THE SLOPE SHALL NOT EXCEED 1:12 (8.33%).
4. A 2% MAXIMUM SLOPE LANDING SHALL BE PROVIDED AT PRIMARY ENTRANCES TO BUILDINGS, THE LANDINGS SHALL HAVE A MINIMUM WIDTH OF 60" AND A MINIMUM DEPTH OF 60" WHEN THE DOOR OPENS INTO THE BUILDING, AND 42" PLUS THE WIDTH OF THE DOOR WHEN THE DOOR OPEN ONTO THE LANDING.
5. RAMPS ARE DEFINED AS ANY WALKWAY BETWEEN SLOPES OF 1:20 (5%) AND 1:12 (8.33%), AND SHALL HAVE A MINIMUM WIDTH OF 48" AND A MAXIMUM CROSS-SLOPE OF 2%. RAMPS EXCEEDING 2'-6" VERTICAL SHALL HAVE INTERMEDIATE (2% MAXIMUM SLOPE) LANDINGS HAVING A MINIMUM LENGTH IN THE DIRECTION OF TRAVEL OF 60". BOTTOM LANDINGS AT CHANGES IN RAMP DIRECTION SHALL HAVE A MINIMUM LENGTH OF 72".
6. MAXIMUM CROSS SLOPE ON ANY SIDEWALK OR RAMP SHALL BE 2% MAXIMUM. MAXIMUM SLOPE WITHIN PARKING STALLS DESIGNATED AS ACCESSIBLE PARKING SHALL BE 2% IN ANY DIRECTION.
7. ALL SIDEWALK SHALL HAVE A 4' MINIMUM CLEAR WIDTH FOR ACCESSIBLE CONFORMANCE.



VICINITY MAP
N.T.S.



LOCATION MAP
SCALE: 1"=200'

PROJECT DESCRIPTION

NEW MPOE ROOM WITHIN EXISTING BUILDING ON CHABOT COLLEGE CAMPUS. THE NEW MPOE WILL REQUIRE NEW ELECTRICAL AND TELECOMMUNICATIONS SERVICE CONNECTIONS. CONSTRUCTION SHALL CONSIST OF UTILITY INSTALLATION AND SURFACE RESTORATION.

BOUNDARY NOTE

THE CHABOT BOUNDARY IS BASED ON LEGAL DESCRIPTION PER BOOK 1126 O.R. PAGE 821, ALAMEDA COUNTY RECORDS.
MONUMENTS WERE FOUND LOCATING CL OF HESPERIAN BOULEVARD ON OUR EASTERLY BOUNDARY, AND THE SOUTHERLY LINE OF TRACT 1407, WHICH IS OUR NORTHERLY BOUNDARY. THE WESTERLY BOUNDARY WAS ESTABLISHED BY FINDING PROPERTY PIPES ON BOTH SIDES OF THE COURSE SHOWN ON TRACT 6713 AS "N78-02-25E 221.80"" THE METES AND BOUNDS DESCRIPTION PER DEED CONNECTED CENTERLINE MONUMENTS ON HESPERIAN BOULEVARD ON OUR EASTERLY LINE, AND THE EXTERIOR BOUNDARY OF TRACT 6713 ON OUR WESTERLY LINE, TO THE ORIGINAL CENTERLINE OF DEPOT ROAD, WHEN IT WAS A 50' RIGHT-OF-WAY. (DATA TAKEN FROM TITLE REPORT SUPPLIED BY OWNER, DATED APRIL 27, 1964.)
UTILITIES

BENCHMARK NOTE

THE BASIS OF ELEVATION FOR THIS SURVEY IS A CITY OF HAYWARD BENCHMARK LOCATED AT THE INTERSECTION OF HESPERIAN BOULEVARD AND CATHY WAY.
ELEVATION = 39.40 FEET

CIVIL SHEET INDEX

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3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:
DATE 12 / 06 , 2019
REGISTERED PROFESSIONAL ENGINEER MICHAEL A. KUYKENDALL No. 70870 Exp. 6/30/21 Civil STATE OF CALIFORNIA
MICHAEL A. KUYKENDALL
R.C.E. NO. 70870
EXPIRES 6-30-21

CONSULTANT:
SANDIS
CIVIL ENGINEERS
SURVEYORS
PLANNERS
636 Ninth Street
Oakland, CA 94607
P. 510.873.8866
F. 510.873.8868
www.sandis.net

SILICON VALLEY TRI-VALLEY
CENTRAL VALLEY EAST BAY/SF

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CIVIL NOTES, LEGEND, AND ABBREVIATIONS

DRAWN BY: GL CHECKED BY: MAK
DATE: 11-07-2019 PROJECT NO: 618201
SHEET NO:

C-001

SCALE: 1"=20'

EAST BAY/SF

200
FF=42.81±

300
FF=42.9±

HESPERIAN BOULEVARD

PUBLIC STREET & HIGHWAY EASEMENT
BK 1192 OR PG 223-230
PARCEL 1

DOC #AW-69808

N26°02'35"W 2257.61'

N26°07'35"W 2286.20'

N26°07'35"W 2154.16'

GENERAL NOTE

CONTRACTOR SHALL CONDUCT FIELD INVESTIGATIONS, AS REQUIRED, TO VERIFY THE LOCATION AND ELEVATION OF EXISTING SUBSURFACE IMPROVEMENTS AND UTILITIES (WHETHER SHOWN ON THE PLANS OR NOT) PRIOR TO THE COMMENCEMENT OF WORK. CONTRACTOR SHALL NOTIFY THE CIVIL DESIGN ENGINEER IMMEDIATELY UPON DISCOVERY OF ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS IN THE FIELD AND INFORMATION SHOWN ON THESE PLANS.

SURVEY NOTE

ADDITIONAL BACKGROUND INFORMATION IS SHOWN ON THIS SHEET FROM A VARIETY OF SOURCES INCLUDING A TOPOGRAPHIC SURVEY PERFORMED BY SANDIS IN 2005, DESIGN LINEWORK FROM RECORD DRAWINGS DATED MAY 2010, AND A COMPOSITE UTILITY SURVEY PERFORMED BY SANDIS IN 2012.

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PROFESSIONAL STAMP:
DATE _____, 2019

MICHAEL A. KUYKENDALL
R.C.E. NO. 70870
EXPIRES 6-30-21

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SILICON VALLEY TRI-VALLEY
CENTRAL VALLEY EAST BAY/SF

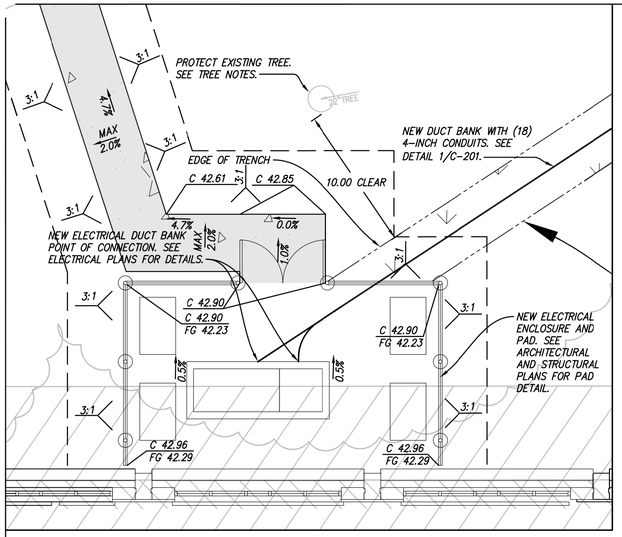
ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

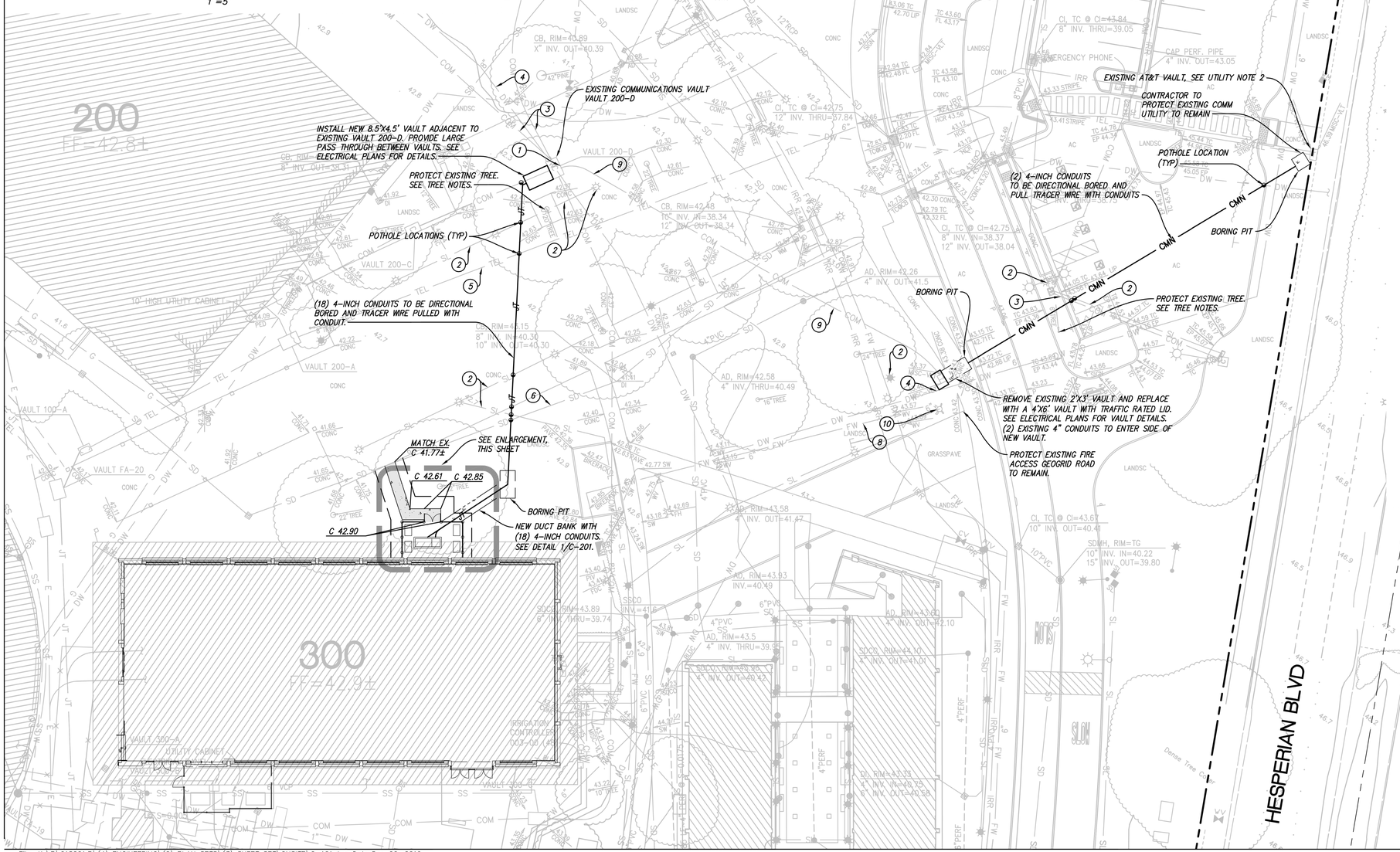
TOPOGRAPHIC SURVEY
(FOR REFERENCE ONLY)

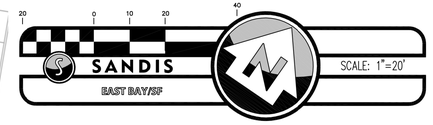
DRAWN BY: GL	CHECKED BY: MAK
DATE: 11-07-2019	PROJECT NO: 618201
SHEET NO:	

C-002



ENLARGEMENT
1"=5'





LEGEND

- PROPERTY LINE
- SAWCUT LINE
- LIMIT OF TRENCH
- CMN — COMM LINE
- JT — JOINT TRENCH
- UTILITY BOX
- CONCRETE SIDEWALK (2 / C-201)
- CONCRETE TRENCH SURFACE RESTORATION (3 / C-201)
- LANDSCAPE SURFACE RESTORATION (4 / C-201)
- POTHOLE LOCATION, SEE UTILITY NOTES 3

UTILITY NOTES

1. SEE ELECTRICAL PLANS AND SPECIFICATIONS FOR DETAILS PERTAINING TO ELECTRICAL CONNECTIONS, CONDUITS, AND STRUCTURES.
2. CONNECT TO EXISTING AT&T VAULT. CHABOT–LAS POSITAS COMMUNITY COLLEGE DISTRICT INFORMATION TECHNOLOGY SERVICES (CLPCCD ITS) TO COORDINATE LAYOUT/CONSRUCTION WITH AT&T BEFORE DIRECTIONAL BORING AND CORE–DRILLING INTO AT&T VAULT CAN BE PERFORMED BY CONTRACTOR.
3. CONTRACTOR TO POTHOLE AND VERIFY LOCATION AND DEPTH EXISTING OF UTILITIES AT UTILITY CROSSINGS AND ADJUST DEPTH OF NEW CONDUITS AS NECESSARY TO AVOID EXISTING UTILITIES.

TREE NOTES

1. CONTRACTOR SHALL PRESERVE AND PROTECT EXISTING TREES TO THE MAXIMUM EXTENT POSSIBLE.
2. WHERE TRENCHING FOR UTILITIES IS REQUIRED WITHIN DRIP LINES, TUNNELING UNDER AND AROUND ROOTS SHALL BE DONE BY HAND DIGGING TO MINIMIZE DAMAGE TO TREE ROOT SYSTEM.

UTILITY SHEET NOTES

1. SPECIFICALLY STATE COORDINATE LAYOUT/CONSTRUCTION WITH ITS PRIOR TO COREDRILLING INTO EXISTING VAULT. SEE ELECTRICAL PLANS AND SPECIFICATIONS FOR DETAILS.
2. PROTECT EXISTING STREET LIGHT SERVICE OR POLE TO REMAIN.
3. PROTECT EXISTING COMMUNICATION SERVICE TO REMAIN.
4. PROTECT EXISTING DOMESTIC WATER SERVICE TO REMAIN.
5. PROTECT EXISTING TELECOM SERVICE TO REMAIN.
6. PROTECT EXISTING STORM DRAIN LINE OR STRUCTURE TO REMAIN.
7. NOT USED.
8. PROTECT EXISTING FIRE WATER LINE TO REMAIN.
9. (2) 4" EXISTING EMPTY CONDUITS.
10. PROTECT EXISTING FIRE HYDRANT TO REMAIN.

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PROFESSIONAL STAMP:
DATE 12 / 06 , 2019
REGISTERED PROFESSIONAL ENGINEER MICHAEL A. KUYKENDALL No. 70870 Exp. 6/30/21 Civil STATE OF CALIFORNIA
MICHAEL A. KUYKENDALL
R.C.E. NO. 70870
EXPIRES 6-30-21

CONSULTANT:
SANDIS
CIVIL ENGINEERS
SURVEYORS
PLANNERS
636 Ninth Street
Oakland, CA 94607
P. 510.873.8866
F. 510.873.8868
www.sandis.net

SILICON VALLEY TRI-VALLEY
CENTRAL VALLEY EAST BAY/SF

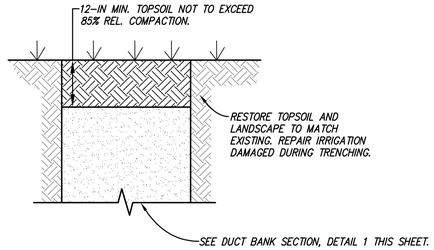
ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

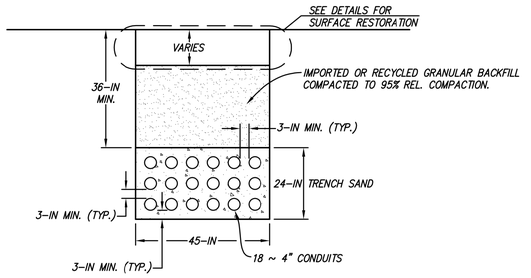
UTILITY PLAN

DRAWN BY: GL CHECKED BY: MAK
DATE: 11-07-2019 PROJECT NO: 618201
SHEET NO:

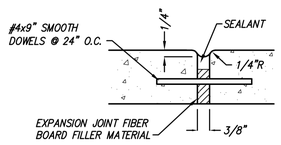
C-101



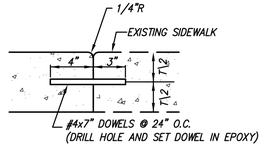
LANDSCAPE TRENCH REPAIR 4
N.T.S.



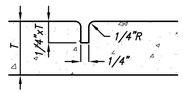
TYPICAL DUCT BANK TRENCH SECTION 1
SCALE: N.T.S.



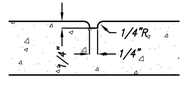
EXPANSION JOINT



SIDEWALK CONTACT JOINT



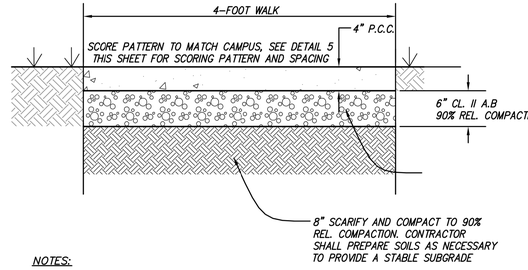
WEAKENED PLANE JOINT



SCORE MARK

NOTE: ALTERNATE BETWEEN EXPANSION AND WEAKENED PLANE JOINTS AT 5' O.C., TYPICAL ALONG SIDEWALKS

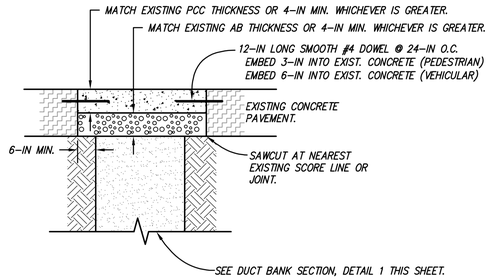
TYPICAL CONCRETE DETAILS 5
N.T.S.



NOTES:

1. CONCRETE SHALL BE MINOR CONCRETE CONFORMING TO SECTION 90 OF THE CALTRANS STANDARD SPECIFICATIONS WITH A 28–DAY MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI.
2. CEMENT SHALL BE TYPE II CEMENT CONFORMING TO ASTM C150 AS MODIFIED BY SECTION 90 OF THE CALTRANS STANDARD SPECIFICATIONS.
3. CONCRETE FINISH SHALL BE LIGHT BROOMED.

PEDESTRIAN CONCRETE SECTION 2
N.T.S.



CONCRETE PAVEMENT TRENCH REPAIR 3
N.T.S.

DSA:

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APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
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3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

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DATE 12 / 06 , 2019

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CIVIL
STATE OF CALIFORNIA

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SILICON VALLEY TRI-VALLEY
CENTRAL VALLEY EAST BAY/SF

ITEM:	REVISION / ISSUE:	DATE:

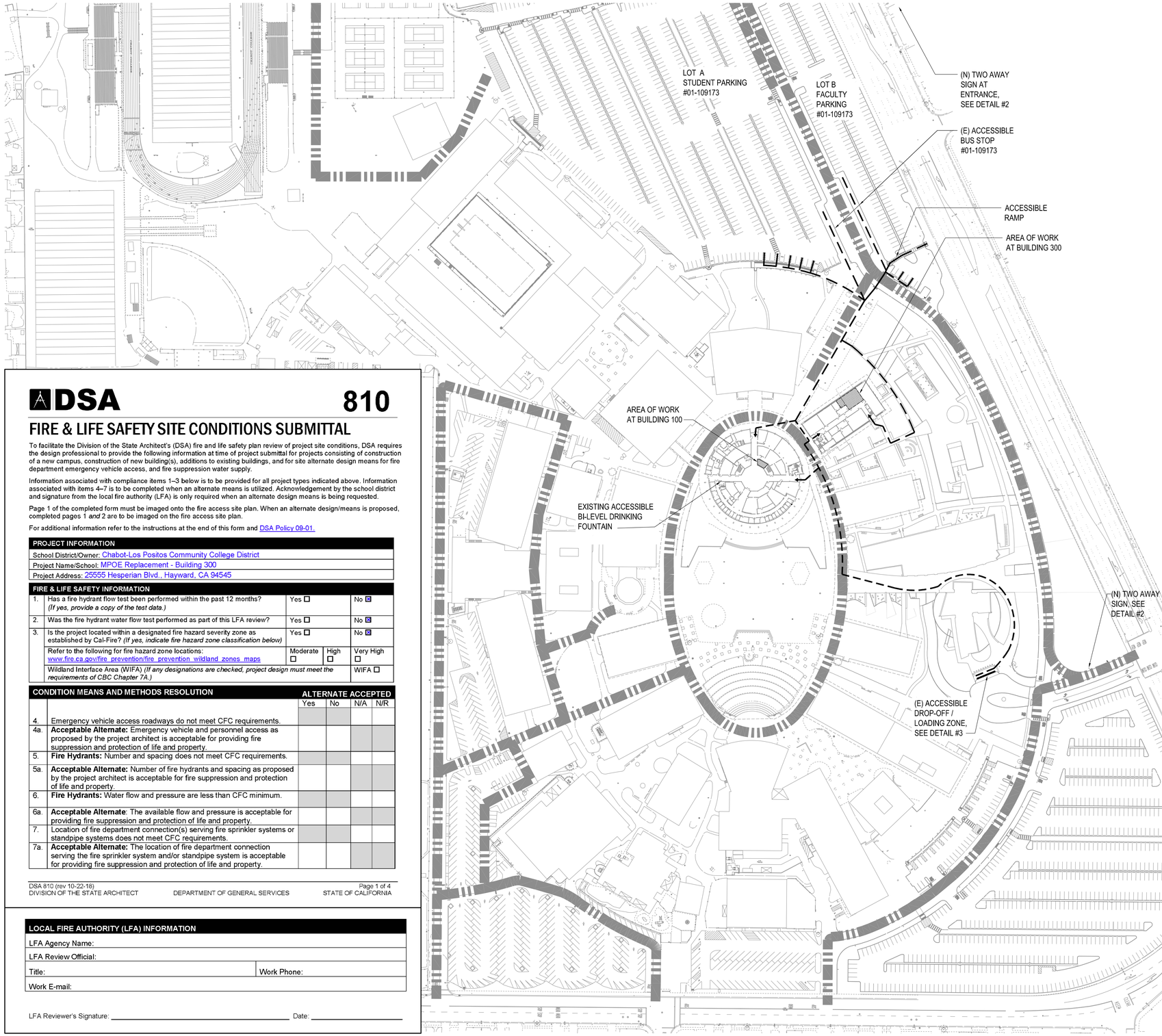
KEY PLAN:

SECTION AND CONSTRUCTION DETAILS

DRAWN BY: GL	CHECKED BY: MAK
DATE: 11-07-2019	PROJECT NO: 618201

SHEET NO:

C-201



DSA 810

FIRE & LIFE SAFETY SITE CONDITIONS SUBMITTAL

To facilitate the Division of the State Architect's (DSA) fire and life safety plan review of project site conditions, DSA requires the design professional to provide the following information at time of project submittal for projects consisting of construction of a new campus, construction of new building(s), additions to existing buildings, and for site alternate design means for fire department emergency vehicle access, and fire suppression water supply.

Information associated with compliance items 1–3 below is to be provided for all project types indicated above. Information associated with items 4–7 is to be completed when an alternate means is utilized. Acknowledgement by the school district and signature from the local fire authority (LFA) is only required when an alternate design means is being requested.

Page 1 of the completed form must be imaged onto the fire access site plan. When an alternate design/means is proposed, completed pages 1 *and* 2 are to be imaged on the fire access site plan.

For additional information refer to the instructions at the end of this form and DSA Policy 09-01.

PROJECT INFORMATION
School District/Owner: Chabot-Los Positos Community College District
Project Name/School: MPOE Replacement - Building 300
Project Address: 25555 Hesperian Blvd., Hayward, CA 94545

FIRE & LIFE SAFETY INFORMATION				
1.	Has a fire hydrant flow test been performed within the past 12 months? *(If yes, provide a copy of the test data.)*	Yes ☐		No ☒
2.	Was the fire hydrant water flow test performed as part of this LFA review?	Yes ☐		No ☒
3.	Is the project located within a designated fire hazard severity zone as established by Cal-Fire? *(If yes, indicate fire hazard zone classification below)*	Yes ☐		No ☒
	Refer to the following for fire hazard zone locations: www.fire.ca.gov/fire_prevention/fire_prevention_wildland_zones_maps	Moderate ☐	High ☐	Very High ☐
	Wildland Interface Area (WIFA) *(If any designations are checked, project design must meet the requirements of CBC Chapter 7A.)*			WIFA ☐

CONDITION MEANS AND METHODS RESOLUTION		ALTERNATE ACCEPTED			
		Yes	No	N/A	N/R
4.	Emergency vehicle access roadways do not meet CFC requirements.				
4a.	**Acceptable Alternate:** Emergency vehicle and personnel access as proposed by the project architect is acceptable for providing fire suppression and protection of life and property.				
5.	**Fire Hydrants:** Number and spacing does not meet CFC requirements.				
5a.	**Acceptable Alternate:** Number of fire hydrants and spacing as proposed by the project architect is acceptable for fire suppression and protection of life and property.				
6.	**Fire Hydrants:** Water flow and pressure are less than CFC minimum.				
6a.	**Acceptable Alternate**: The available flow and pressure is acceptable for providing fire suppression and protection of life and property.				
7.	Location of fire department connection(s) serving fire sprinkler systems or standpipe systems does not meet CFC requirements.				
7a.	**Acceptable Alternate:** The location of fire department connection serving the fire sprinkler system and/or standpipe system is acceptable for providing fire suppression and protection of life and property.				

LOCAL FIRE AUTHORITY (LFA) INFORMATION	
LFA Agency Name:	
LFA Review Official:	
Title:	Work Phone:
Work E-mail:	

LFA Reviewer's Signature: _____ Date: _____

LEGEND

EXISTING FIRE HYDRANT

FIRE ACCESS LINE

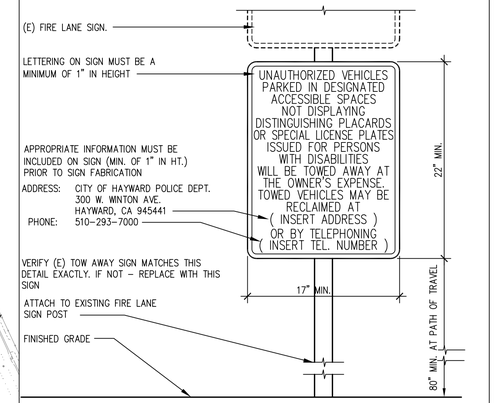
THE PATH OF TRAVEL (POT) IDENTIFIED IN THESE CONSTRUCTION DOCUMENTS IS COMPLIANT WITH THE CURRENT APPLICABLE CALIFORNIA BUILDING CODE ACCESSIBILITY PROVISIONS FOR PATH OF TRAVEL REQUIREMENTS FOR ALTERATIONS, ADDITIONS AND STRUCTURAL REPAIRS. AS PART OF THE DESIGN OF THIS PROJECT, THE POT WAS EXAMINED AND ANY ELEMENTS, COMPONENTS OR PORTIONS OF THE POT THAT WERE DETERMINED TO BE NONCOMPLIANT 1) HAVE BEEN IDENTIFIED AND 2) THE CORRECTIVE WORK NECESSARY TO BRING THEM INTO COMPLIANCE HAS BEEN INCLUDED WITHIN THE SCOPE OF THIS PROJECT'S WORK THROUGH DETAILS, DRAWINGS AND SPECIFICATIONS INCORPORATED INTO THESE CONSTRUCTION DOCUMENTS. ANY NONCOMPLIANT ELEMENTS, COMPONENTS OR PORTIONS OF THE POT THAT WILL NOT BE CORRECTED BY THIS PROJECT BASED ON VALUATION THRESHOLD LIMITATIONS OR A FINDING OF UNREASONABLE HARDSHIP ARE SO INDICATED IN THESE CONSTRUCTION DOCUMENTS. DURING CONSTRUCTION, IF POT ITEMS WITHIN THE SCOPE OF THE PROJECT REPRESENTED AS CODE COMPLIANT ARE FOUND TO BE NONCONFORMING BEYOND REASONABLE CONSTRUCTION TOLERANCES, THEY SHALL BE BROUGHT INTO COMPLIANCE WITH THE CBC AS A PART OF THIS PROJECT BY MEANS OF A CONSTRUCTION CHANGE DOCUMENT.

ACCESSIBLE ROUTE COMPONENTS INCLUDE BUT ARE NOT LIMITED TO:

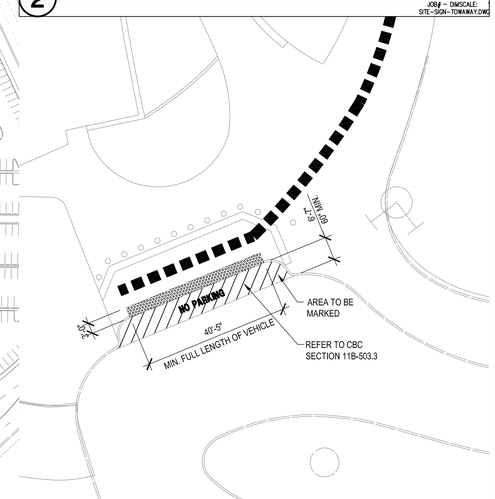
- AT LEAST 48" IN WIDTH: OR AS APPROVED BY CODE;
- WITHOUT ABRUPT LEVEL CHANGES EXCEEDING 1/2" IF BEVELED AT 1:2 MAXIMUM SLOPE, OR VERTICAL LEVEL CHANGES EXCEEDING 1/4";
- WITH A FIRM, STABLE, AND SLIP RESISTANT WALKING SURFACE;
- WITH A RUNNING SLOPE OF 1:20 OR LESS;
- WITH A RUNNING SLOPE OF CODE COMPLIANT RAMPS, NOT EXCEEDING 8.33% (1:12), (RAMPS COMPLY WITH 11B-405);
- WITH REQUIRED LANDINGS AND LEVEL AREAS WITH A SLOPE OF 1:48 (1/4"/FT.) OR LESS;
- WITH A CROSS SLOPE OF 1:48 (1/4"/FT.) OR LESS;
- WITH OPENINGS IN DRAINS AND GRATINGS NOT TO EXCEED 1/2" IN PREDOMINANT DIRECTION OF TRAVEL;
- IS FREE OF OVERHEAD OBSTRUCTION WITHIN 80" ABOVE THE WALKING SURFACE; AND
- IS FREE OF OBJECTS WHICH PROTRUDE MORE THAN 4" BETWEEN THE HEIGHTS OF 27" AND 80" ABOVE THE WALKING SURFACE.

EXISTING PARKING COUNT:

PARKING LOT A: STUDENT	772 PARKING SPACES TOTAL (12 ACCESSIBLE, 4 VAN)
PARKING LOT B: FACULTY	155 PARKING SPACES TOTAL (4 ACCESSIBLE)



2 SIGN - TOW AWAY — SCALE: 1'-0"=1'-0"



1 SITE PLAN — SCALE : 1" = 100'-0"

NORTH

3 ENLARGED SITE PLAN — SCALE : 1" = 20'-0"

DSA:

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APP. 01-118445 INC:
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DATE: 12/19/2019

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3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

LICENSED ARCHITECT LUKE SHIRAS C-31985 NOV. 2021 RENEWAL STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

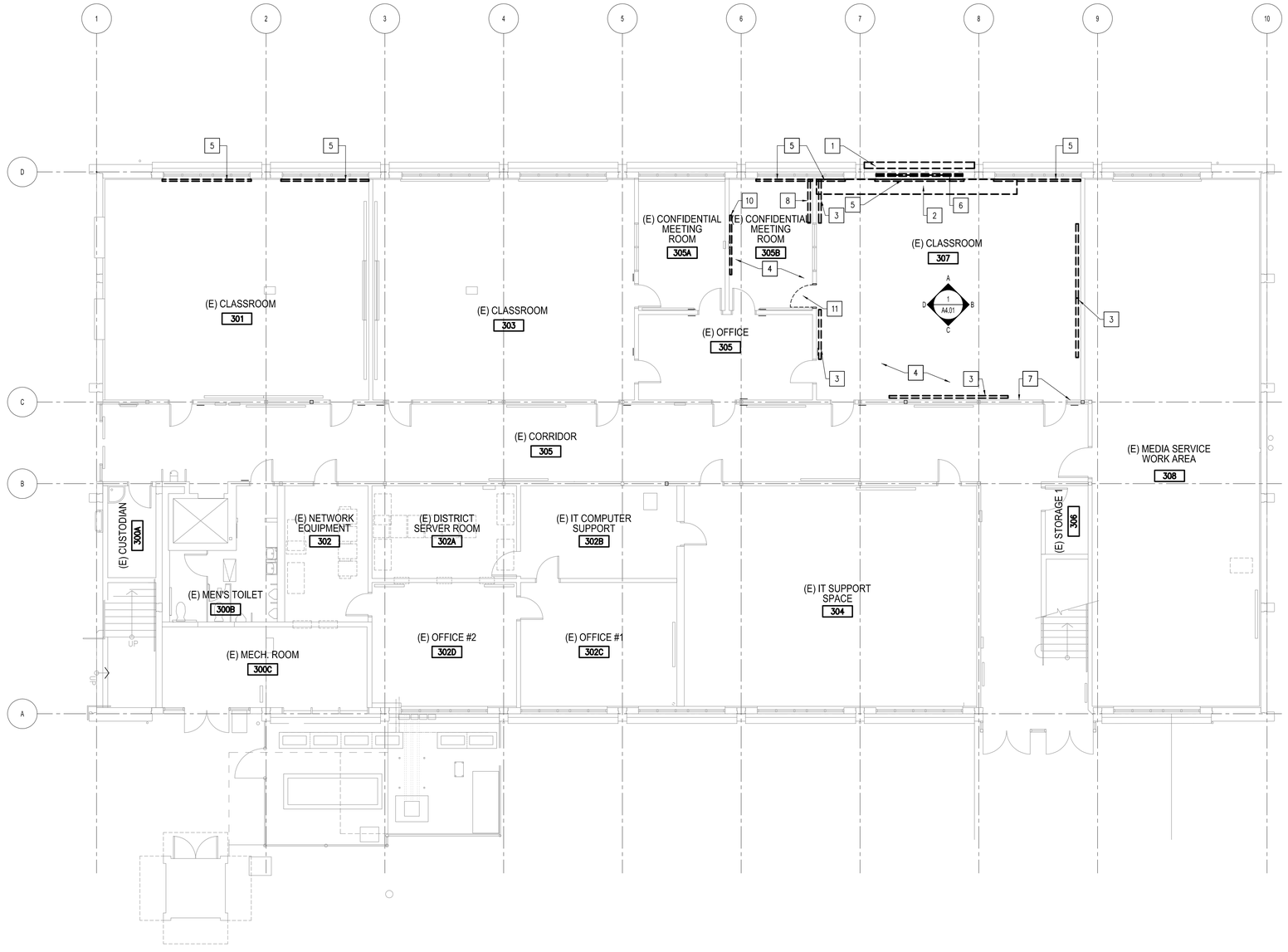
25555 HESPERIAN BLVD
HAYWARD, CA 94545

OVERALL SITE PLAN FIRE ACCESS & SITE ACCESSIBILTY PLAN

DRAWN BY: NF	CHECKED BY: AW
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

A-100

12/05/2019 - 01:18:17 PM
P:\C\C9500 Chabot-Las Positas_CO\C9506_Chabot_MPOE_Rplcmnt\3_Dwgs\A-100 - Site Plan\A-100- Site Plan.dwg - nfarahani



1 DEMOLITION FLOOR PLAN

SCALE : 1/8" = 1'-0"

NORTH

GENERAL NOTES

1. BUILDING SECURITY, FIRE ALARM, AND FIRE PROTECTION SYSTEMS ARE TO REMAIN FUNCTIONAL AT ALL TIMES.
2. DEMOLITION WORK INCLUDES, BUT IS NOT LIMITED TO EXTERIOR WINDOW, CEILING MATERIALS AND EQUIPMENTS, LIGHT FIXTURES, INTERIOR FINISHES, FLOOR FINISHES TO STRUCTURAL SLAB, BUILT-IN CASEWORK, ELECTRICAL FIXTURES AND ASSOCIATED WIRING, MECHANICAL DUCTS AND REGISTERS, AND ALL OTHER UTILITIES THAT ARE NOT SERVICING THE REMAINDER OF THE BUILDING NOT REQUIRED TO REMAIN FUNCTIONAL.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY AND PROTECTION OF THE EXISTING STRUCTURAL, ARCHITECTURAL, MECHANICAL AND ELECTRICAL ITEMS DURING DEMOLITION AND SHALL TAKE ADEQUATE PRECAUTIONS TO PREVENT DAMAGE TO ANY PART OF THE EXISTING STRUCTURE TO REMAIN OR ANY COMPONENTS THAT ARE TO BE SALVAGED FOR LATER REUSE. ANY DAMAGE, IF INCURRED, SHALL BE RECTIFIED TO THE ENTIRE SATISFACTION OF THE OWNER.
4. REMOVED MATERIALS SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN ACCORDANCE WITH ALL APPLICABLE LAWS, ORDINANCES, CODES AND REGULATIONS.
5. ALL UTILITY SHUTDOWNS TO BE COORDINATED WITH DISTRICT MAINTENANCE AND OPERATIONS STAFF.
6. SUBMIT A DEMOLITION SCHEDULE TO BUILDING OWNER TO COORDINATE THE DEMOLITION AND REMOVAL OPERATIONS WITH THE BUILDING MANAGER'S REQUIREMENTS FOR USING AND PROTECTING BUILDING ELEVATORS, STAIRS, WALKWAYS, BUILDING ENTRIES AND OTHER BUILDING FACILITIES DURING DEMOLITION OPERATIONS.
7. ERECT AND MAINTAIN TEMPORARY PROTECTIONS, AS REQUIRED, INCLUDING BRACING, BARRICADES, SIGNS AND OTHER MEASURES AS REQUIRED BY CODES AND REGULATIONS.
8. CONDUCT DEMOLITION SO THAT OCCUPANTS' OPERATIONS WILL NOT BE DISRUPTED. PROVIDE NOT LESS THAN 72 HOURS NOTICE TO BUILDING OWNER OF ACTIVITIES THAT WILL AFFECT OCCUPANTS' OPERATIONS. MAINTAIN ACCESS TO EXISTING WALKWAYS, CORRIDORS AND OTHER ADJACENT OCCUPIED OR USED FACILITIES.
9. DO NOT CLOSE OR OBSTRUCT WALKWAYS, CORRIDORS, OR OTHER OCCUPIED OR USED FACILITIES WITHOUT WRITTEN PERMISSION FROM AUTHORITIES HAVING JURISDICTION. MAINTAIN FIRE-PROTECTION, LIFE SAFETY, AND BUILDING SECURITY SYSTEM IN SERVICE DURING DEMOLITION OPERATIONS.
10. MAINTAIN (E) UTILITIES THAT SERVICE OTHER AREAS OF THE BUILDING THAT ARE TO REMAIN FUNCTIONAL. PROTECT (E) UTILITIES AGAINST DAMAGE AND DO NOT REMOVE UTILITIES LINES SERVING OTHER PARTS OF THE BUILDING UNTIL NEW REPLACEMENT LINES ARE INSTALLED. REMOVE AND CAP (E) UTILITIES WHERE FIXTURES ARE DEMOLISHED.
11. REPAIR DAMAGE CAUSED BY SELECTIVE DEMOLITION TO ADJACENT CONSTRUCTION AND (E) COLUMNS AND RESTORE.
12. DO NOT ALLOW DEMOLISHED MATERIALS TO ACCUMULATE ON-SITE. STORAGE OR SALE OF REMOVED ITEMS ON SITE IS NOT PERMITTED. DO NOT SOIL ADJACENT SURFACES OR OTHER BUILDING AREAS. LEGALLY DISPOSE OF REMOVED MATERIALS.
13. RETAIN ALL (E) FIRE RATED ASSEMBLIES. IF ANY (E) FIRE RATED MATERIAL IS DAMAGED, MATERIALS MUST BE REPLACED TO MATCH (E).
14. IF MATERIALS SUSPECTED OF CONTAINING HAZARDOUS MATERIALS ARE ENCOUNTERED, REFER TO THE APPENDIX TO THE SPECIFICATION PREPARED BY THE HAZARDOUS MATERIALS CONSULTANT.

KEYNOTES

1. (E) WINDOW SCREEN TO BE REMOVED
2. (E) CASEWORK TO BE REMOVED
3. (E) MARKER BOARDS & TACK BOARDS TO BE REMOVED
4. (E) FLOORING TO BE REMOVED THROUGHOUT.
5. REMOVE (E) WINDOW BLINDS AND VALANCE AND PREPARE WINDOW FOR INFILL.
6. (E) WINDOW TO BE REMOVED.
7. REMOVE MISCELLANEOUS ITEMS ON WALL SUCH AS PENCIL SHARPER, HAND SANITIZER.
8. REMOVE TACK BOARD, SALVAGE TO OWNER.
9. REMOVE TACK BOARD AND REINSTALL AT BUILDING 100, ROOM 138, SEE SHEET A-221.
10. REMOVE WHITE BOARD AND REINSTALL AT BUILDING 100, ROOM 138, SEE SHEET A-221.
11. (E) DOOR TO BE REMOVED

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LICENSED ARCHITECT
LUKE SHIRAS
C-31985
30TH NOV. 2021
RENEWAL
STATE OF CALIFORNIA

CONSULTANT:

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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

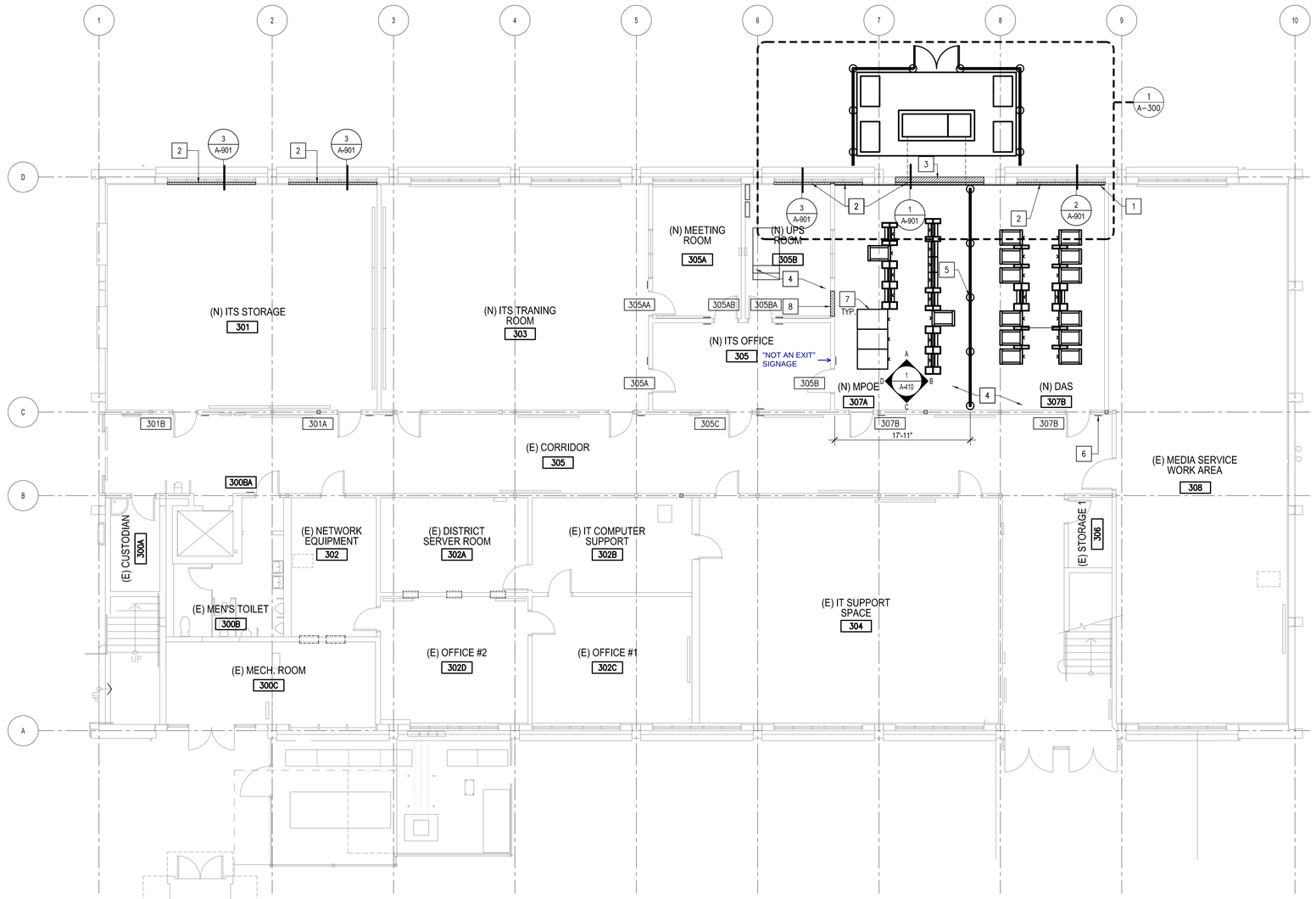
25555 HESPERIAN BLVD
HAYWARD, CA 94545

BUILDING 300 DEMOLITION FLOOR PLAN

DRAWN BY: NF	CHECKED BY: AW
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

A-120

11/19/2019 - 03:22:15 PM
P:\C\C9500 Chabot-Las Positas_CCC\C9506_Chabot_MPOE_Rplcmnt\3_Dwgs\A-120 - Demo Floor Plan\A-120 - Demo Floor Plan.dwg - nfarahani



1 NEW FLOOR PLAN

SCALE : 1/8" = 1'-0"

NORTH

DOOR SCHEDULE - BUILDING 300

DOOR NO.	(E) DOOR NOMINAL SIZE WIDTH x HEIGHT	THICK.	TYPE	MAT.	FINISH	GLASS	(E) FRAME TYPE	MAT.	FINISH	DETAILS HEAD	DETAILS JAMB HINGE	DETAILS SILL	(E) HARDWARE GROUP	(E) HARDWARE EXIT DEVICE	SIGN DETAIL	FIRE RATING	REMARKS
FIRST FLOOR																	
301A	3'-0" x 7'-0"	1.75	C	SC	BV	CW	A	HM	MP	(E)	(E)	(E)	04A	PH	B	--	
301B	3'-0" x 7'-0"	1.75	C	SC	BV	CW	A	HM	MP	(E)	(E)	(E)	04A	PH	B	--	
305A	3'-0" x 7'-0"	1.75	B	SC	BV	--	A	HM	MP	(E)	(E)	(E)	03	--	B	--	
305B	3'-0" x 7'-0"	1.75	B	SC	BV	--	A	HM	MP	(E)	(E)	(E)	03	--	B	--	
305C	3'-0" x 7'-0"	1.75	B	SC	BV	--	A	HM	MP	(E)	(E)	(E)	17	--	A & B	--	
305AA	3'-0" x 7'-0"	1.75	B	SC	BV	--	A	HM	MP	(E)	(E)	(E)	26	--	B	--	
305AB	3'-0" x 7'-0"	1.75	B	SC	BV	--	A	HM	MP	(E)	(E)	(E)	26	--	A & B	--	
305BA	3'-0" x 7'-0"	1.75	B	SC	BV	--	A	HM	MP	(E)	(E)	(E)	26	--	A & B	--	
307A	3'-0" x 7'-0"	1.75	C	SC	BV	CW	A	HM	MP	(E)	(E)	(E)	26	PH	B	--	
307B	3'-0" x 7'-0"	1.75	C	SC	BV	CW	A	HM	MP	(E)	(E)	(E)	4D	PH	B	--	
300BA	3'-0" x 7'-0"	1.75	B	SC	BV	--	A	HM	MP	(E)	(E)	(E)	31	--	D & G	--	
SECOND FLOOR																	
305A	3'-0" x 7'-0"	1.75	B	SC	BV	--	A	HM	MP	(E)	(E)	(E)	31	--	C & F	--	

2 DOOR SCHEDULE

SCALE: 1/4"=1'-0"

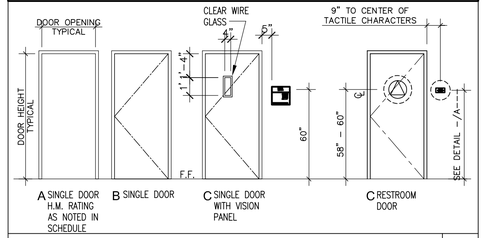
JOB# - DWGSCALE: 48
A-121_DOOR SCHADULE.DWG

GENERAL FLOOR PLAN NOTES

1. PATCH AND REPAIR DRYWALL WHERE WALL MOUNTED DEVICES AND EQUIPMENTS HAVE BEEN REMOVED.
2. PAINT PATCHED AREAS TO MATCH EXISTING SURFACE TO NEAREST NATURAL BREAK. U.O.N..

KEYNOTES

1. PROVIDE BACKBOARDS ON NORTH WALL OF ROOM, STARTING AT 6" A.F.F. TO 8'-6" A.F.F. USE FLUSH FASTENERS FOR MOUNTING PLYWOOD.
2. INFILL INTERIOR SIDE OF WINDOW OPENING. NEW WINDOW FILM AT INTERIOR SIDE OF WINDOW. SEE DETAILS 2/A-901 & 3/A-901. (BASIS OF DESIGN: 3M NIGHT VISION NV15; 24% VISIBLE LIGHT TRANSMISSION, 0.39 SHGC, U-VALUE=1, 72% TOTAL SOLAR ENERGY REJECTION)
3. INFILL DEMO'D WINDOW OPENING. SEE DETAIL 1/A-901.
4. PROVIDE ANTI STATIC VCT FLOORING THIS ROOM.
5. (N) CHAIN LINK FENCE, S.S.D.
6. (N) DOOR SIGNAGE FOR ROOMS, SEE DETAIL #3.
7. (N) TELECOMMUNICATION EQUIPMENTS, SEE TELECOMMUNICATION DRAWINGS.
8. INFILL REMOVED (E) DOOR OPENING.

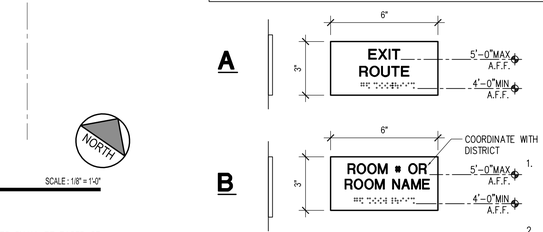


FRAME & DOOR TYPES 3

DOOR SCHEDULE/LEGEND

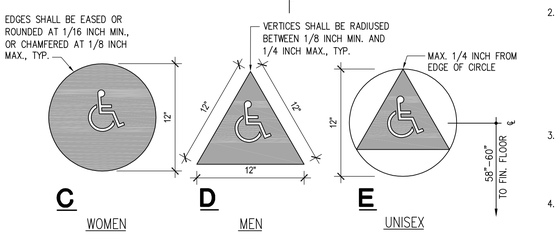
BV	BIRCH VENEER
CW	CLEAR WIRE GLASS
HM	HOLLOW METAL
IP	INFILL PANEL
LE	LOW – EMMISION GLAZING
MDH	MAGNETIC DOOR HOLDER
MP	METAL PAINTED
NA	NOT APPLICABLE
NR	NOT RATED
PH	PANIC HARDWARE
PR	PAIR/DOORS AND HARDWARE
SC	SOLID CORE WOOD
SGL	SINGLE DOOR
TG	TEMPERED GLASS

LEGEND 4

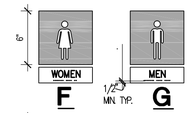


-1/16" FACE
-1/16" SPACERS
-1/8" BACKER
-TO HOLD 3-1/8"x8-1/2" PAPER INSERT LOADED EITHER SIDE WITH RAISED WHITE LETTERS AND BRAILLE 3/4" FRUTIGER 65 BOLD
-BACKGROUND: BROWN TO MATCH SAMPLE
-COPY: WHITE

1. IN ADDITION TO 12" DOOR MOUNTED RESTROOM PLAQUE, PROVIDE WALL MOUNTED ACCESSIBLE RESTROOM PLAQUE PER ELEVATION F, G, H, I, & J. SIGNS CONTAINING TACTILE CHARACTERS SHALL BE LOCATED SO THAT A CLEAR FLOOR SPACE OF 18 INCHES MIN. BY 18 INCHES MIN., CENTERED ON THE TACTILE CHARACTERS, IS PROVIDED BEYOND THE ARC OF ANY DOOR SWING BETWEEN THE CLOSED POSITION AND 45 DEGREE OPEN POSITION.
2. GEOMETRIC RESTROOM SIGNS FOR CALIFORNIA: USE INTERNATIONAL SYMBOL OF ACCESSIBILITY (ISA) TO IDENTIFY ACCESSIBLE SANITARY FACILITY. COLOR OF GEOMETRIC SIGN MUST CONTRAST WITH DOOR. INSTALL SIGN CENTERED LEFT TO RIGHT ON DOOR. CIRCLE & TRIANGLE ARE TO BE 1/4 INCH THICK. FOR UNISEX RESTROOM, PLACE 1/4 INCH THICK TRIANGLE ON TOP OF & WITHIN BORDER OF 1/4 INCH THICK CIRCLE. CIRCLE AND TRIANGLE TO CONTRAST.
3. FOR LETTERS AND NUMERALS, TEXT PLACEMENT AND SPACING AND CALIFORNIA CONTRACTED GRADE 2 BRAILLE: SEE SIGNAGE GENERAL NOTES, DETAIL 20/-
4. FOR SIGNAGE LOCATIONS SEE SIGNAGE PLANS.



RESTROOM DOOR SIGNS

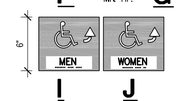


UNISEX RESTROOM

H

BRAILLE & RAISED CHARACTER RESTROOM SIGNS

GENDER PICTOGRAM IS OPTIONAL BUT IS RECOMMENDED. IF USED, PICTOGRAM MUST BE IN SIX INCH HIGH CLEAR SPACE.



RESTROOM WALL SIGNS

SIGNAGE MUST BE FIELD INSPECTED PER 2016 CBC 11B-703.1.1

5 TACTILE SIGN TYPES

SCALE: 3"=1'-0"

JOB# - DWGSCALE: 4
DRAWING2.DWG

DSA:

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DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

LICENSED ARCHITECT LUKE SHIRAS C-31985 NOV. 2021 RENEWAL STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

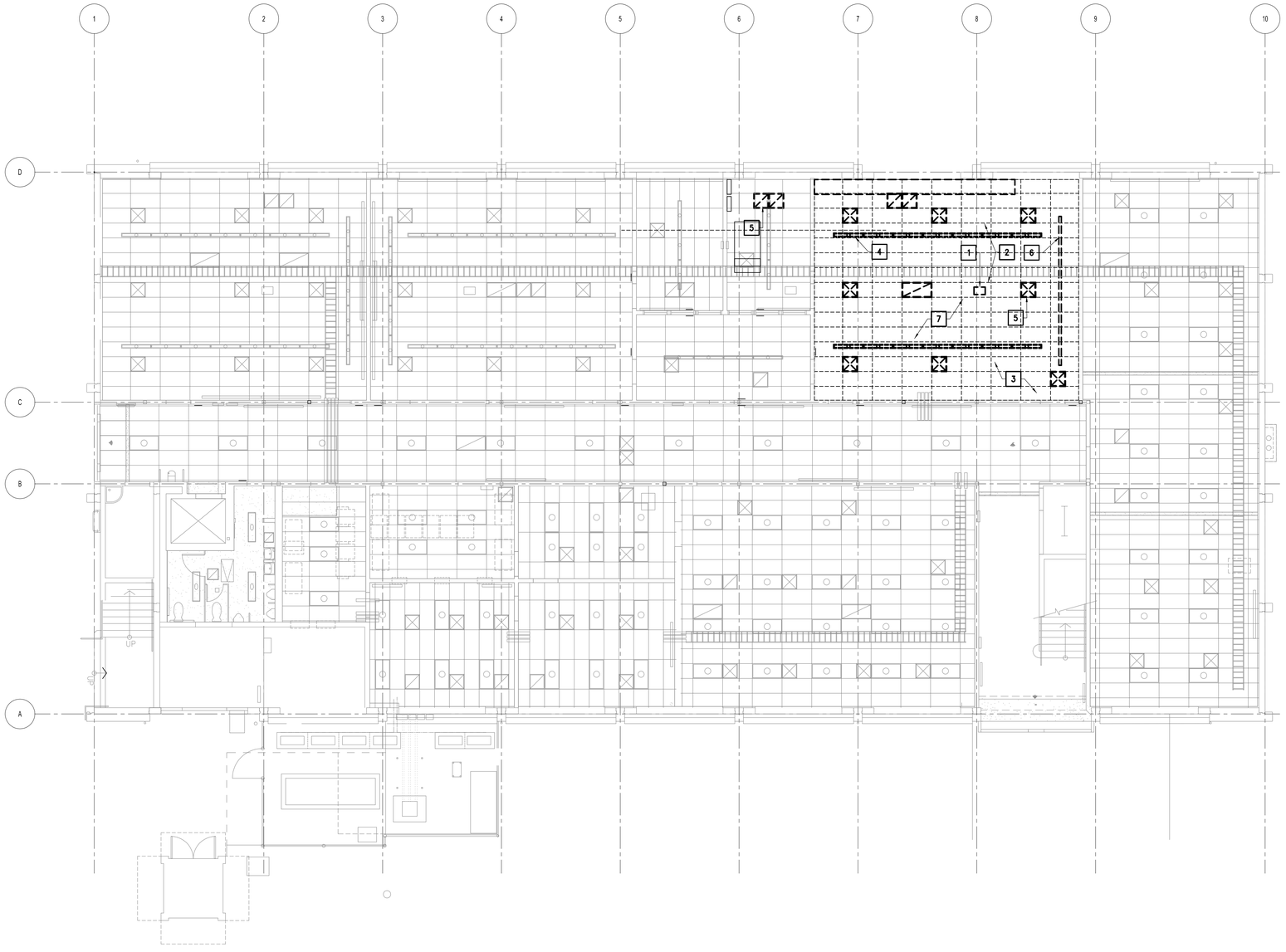
25555 HESPERIAN BLVD
HAYWARD, CA 94545

BUILDING 300 NEW FLOOR PLAN

DRAWN BY: NF	CHECKED BY: AW
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

A-121

11/19/2019 - 03:19:50 PM
P:\C\C9500 Chabot\Las Positas_CC\C9506_Chabot_MPOE_Rplcmnt\3_Dwgs\A-121 - New Floor Plan\A-121 - New Floor Plan.dwg - nfarahani



1 DEMOLITION RCP

SCALE : 1/8" = 1'-0"

NORTH

GENERAL NOTES

1. BUILDING SECURITY, FIRE ALARM, AND FIRE PROTECTION SYSTEMS ARE TO REMAIN FUNCTIONAL AT ALL TIMES.
2. DEMOLITION WORK INCLUDES, BUT IS NOT LIMITED TO EXTERIOR WINDOW, CEILING MATERIALS AND EQUIPMENTS, LIGHT FIXTURES, INTERIOR FINISHES, FLOOR FINISHES TO STRUCTURAL SLAB, BUILT-IN CASEWORK, ELECTRICAL FIXTURES AND ASSOCIATED WIRING, MECHANICAL DUCTS AND REGISTERS, AND ALL OTHER UTILITIES THAT ARE NOT SERVICING THE REMAINDER OF THE BUILDING NOT REQUIRED TO REMAIN FUNCTIONAL.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY AND PROTECTION OF THE EXISTING STRUCTURAL, ARCHITECTURAL, MECHANICAL AND ELECTRICAL ITEMS DURING DEMOLITION AND SHALL TAKE ADEQUATE PRECAUTIONS TO PREVENT DAMAGE TO ANY PART OF THE EXISTING STRUCTURE TO REMAIN OR ANY COMPONENTS THAT ARE TO BE SALVAGED FOR LATER REUSE. ANY DAMAGE, IF INCURRED, SHALL BE RECTIFIED TO THE ENTIRE SATISFACTION OF THE OWNER.
4. REMOVED MATERIALS SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN ACCORDANCE WITH ALL APPLICABLE LAWS, ORDINANCES, CODES AND REGULATIONS.
5. ALL UTILITY SHUTDOWNS TO BE COORDINATED WITH DISTRICT MAINTENANCE AND OPERATIONS STAFF.
6. SUBMIT A DEMOLITION SCHEDULE TO BUILDING OWNER TO COORDINATE THE DEMOLITION AND REMOVAL OPERATIONS WITH THE BUILDING MANAGER'S REQUIREMENTS FOR USING AND PROTECTING BUILDING ELEVATORS, STAIRS, WALKWAYS, BUILDING ENTRIES AND OTHER BUILDING FACILITIES DURING DEMOLITION OPERATIONS.
7. ERECT AND MAINTAIN TEMPORARY PROTECTIONS, AS REQUIRED, INCLUDING BRACING, BARRICADES, SIGNS AND OTHER MEASURES AS REQUIRED BY CODES AND REGULATIONS.
8. CONDUCT DEMOLITION SO THAT OCCUPANTS' OPERATIONS WILL NOT BE DISRUPTED. PROVIDE NOT LESS THAN 72 HOURS NOTICE TO BUILDING OWNER OF ACTIVITIES THAT WILL AFFECT OCCUPANTS' OPERATIONS. MAINTAIN ACCESS TO EXISTING WALKWAYS, CORRIDORS AND OTHER ADJACENT OCCUPIED OR USED FACILITIES.
9. DO NOT CLOSE OR OBSTRUCT WALKWAYS, CORRIDORS, OR OTHER OCCUPIED OR USED FACILITIES WITHOUT WRITTEN PERMISSION FROM AUTHORITIES HAVING JURISDICTION. MAINTAIN FIRE-PROTECTION, LIFE SAFETY, AND BUILDING SECURITY SYSTEM IN SERVICE DURING DEMOLITION OPERATIONS.
10. MAINTAIN (E) UTILITIES THAT SERVICE OTHER AREAS OF THE BUILDING THAT ARE TO REMAIN FUNCTIONAL. PROTECT (E) UTILITIES AGAINST DAMAGE AND DO NOT REMOVE UTILITIES LINES SERVING OTHER PARTS OF THE BUILDING UNTIL NEW REPLACEMENT LINES ARE INSTALLED. REMOVE AND CAP (E) UTILITIES WHERE FIXTURES ARE DEMOLISHED.
11. REPAIR DAMAGE CAUSED BY SELECTIVE DEMOLITION TO ADJACENT CONSTRUCTION AND (E) COLUMNS AND RESTORE.
12. DO NOT ALLOW DEMOLISHED MATERIALS TO ACCUMULATE ON-SITE. STORAGE OR SALE OR REMOVED ITEMS ON SITE IS NOT PERMITTED. DO NOT SOIL ADJACENT SURFACES OR OTHER BUILDING AREAS. LEGALLY DISPOSE OF REMOVED MATERIALS.
13. RETAIN ALL (E) FIRE RATED ASSEMBLIES. IF ANY (E) FIRE RATED MATERIAL IS DAMAGED, MATERIALS MUST BE REPLACED TO MATCH (E).
14. IF MATERIALS SUSPECTED OF CONTAINING HAZARDOUS MATERIALS ARE ENCOUNTERED, REFER TO THE APPENDIX TO THE SPECIFICATION PREPARED BY THE HAZARDOUS MATERIALS CONSULTANT.

KEYNOTES

1. (E) CEILING MOUNTED PROJECTOR AND MOUNT SALVAGED BY COLLEGE AVS.
2. SALVAGE CEILING TILE TO PATCH CEILING TILE IN ROOM 301.
3. (E) CEILING & ALL CEILING MOUNTED DEVICES TO BE REMOVED.
4. SALVAGE (E) PENDANT LIGHTS AND RETURN TO COLLEGE.
5. REMOVE MECHANICAL SUPPLY AND RETURN CEILING REGISTERS PER MECHANICAL, TYP.
6. (E) PROJECTOR SCREEN (RECESSED ABOVE T-BAR) SALVAGED BY CONTRACTOR AND TURNED OVER TO DISTRICT AVS.

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3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

LICENSED ARCHITECT
LUKE SHIRAS
C-31985
REN: 2021
STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

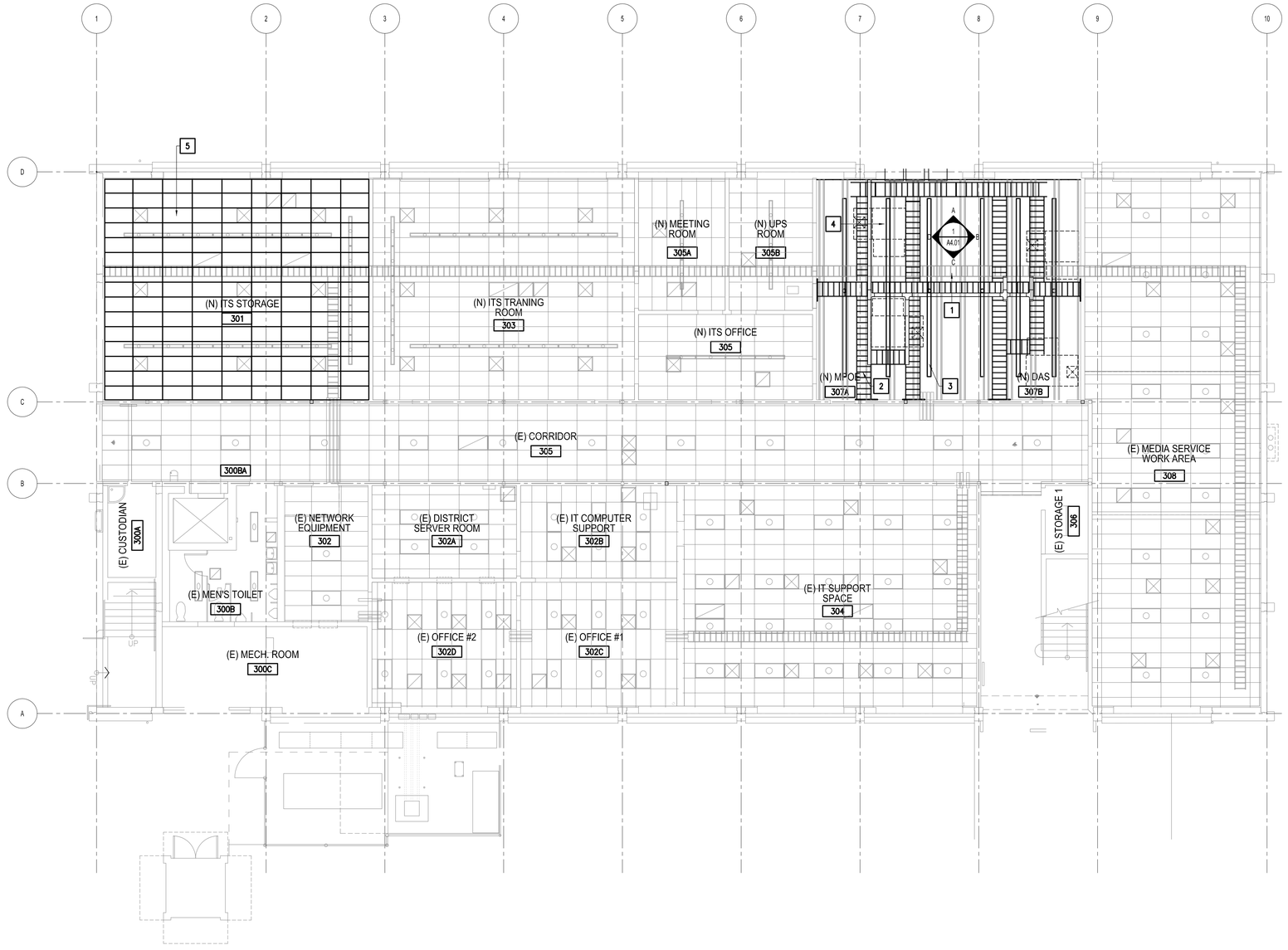
25555 HESPERIAN BLVD
HAYWARD, CA 94545

BUILDING 300
RCP
DEMOLITION

DRAWN BY: NF	CHECKED BY: AW
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

A-150

11/19/2019 - 03:04:02 PM
P:\C\C9500 Chabot-Las Positas_CCC\C9506_Chabot_MPOE_Rplcmnt\3_Dwgs\A-150 - Demo RCP\A-150 - Demo RCP.dwg - nfarahani



2 NEW PARTIAL RCP

SCALE : 1/8" = 1'-0"

NORTH

GENERAL REFLECTED CEILING PLANNOTES

1. PATCH AND REPAIR DRYWALL WHERE WALL MOUNTED DEVICES AND EQUIPMENTS HAVE BEEN REMOVED, PAINT PATCH TO MATCH EXISTING WALL TO NEAREST B=NATURAL BREAK, U.O.N.

KEYNOTES

1. (E) CABLE TRAY TO REMAIN.
2. (N) CABLE TRAY, REFER TO TELECOM DRAWINGS.
3. (N) CEILING MOUNTED LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS.
4. (N) FAN COIL, TYPICAL OF (4) AT UNDER SIDE OF SECOND FLOOR, S.M.D. & S.S.D.
5. REPLACED DAMAGED CEILING TILES WITH THOSE SALVAGED FROM ROOM 307

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LUKE SHIRAS
C-31985
NOV. 2021
RENEWAL
STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

BUILDING 300
NEW
RCP

DRAWN BY: NF	CHECKED BY: AW
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

A-151

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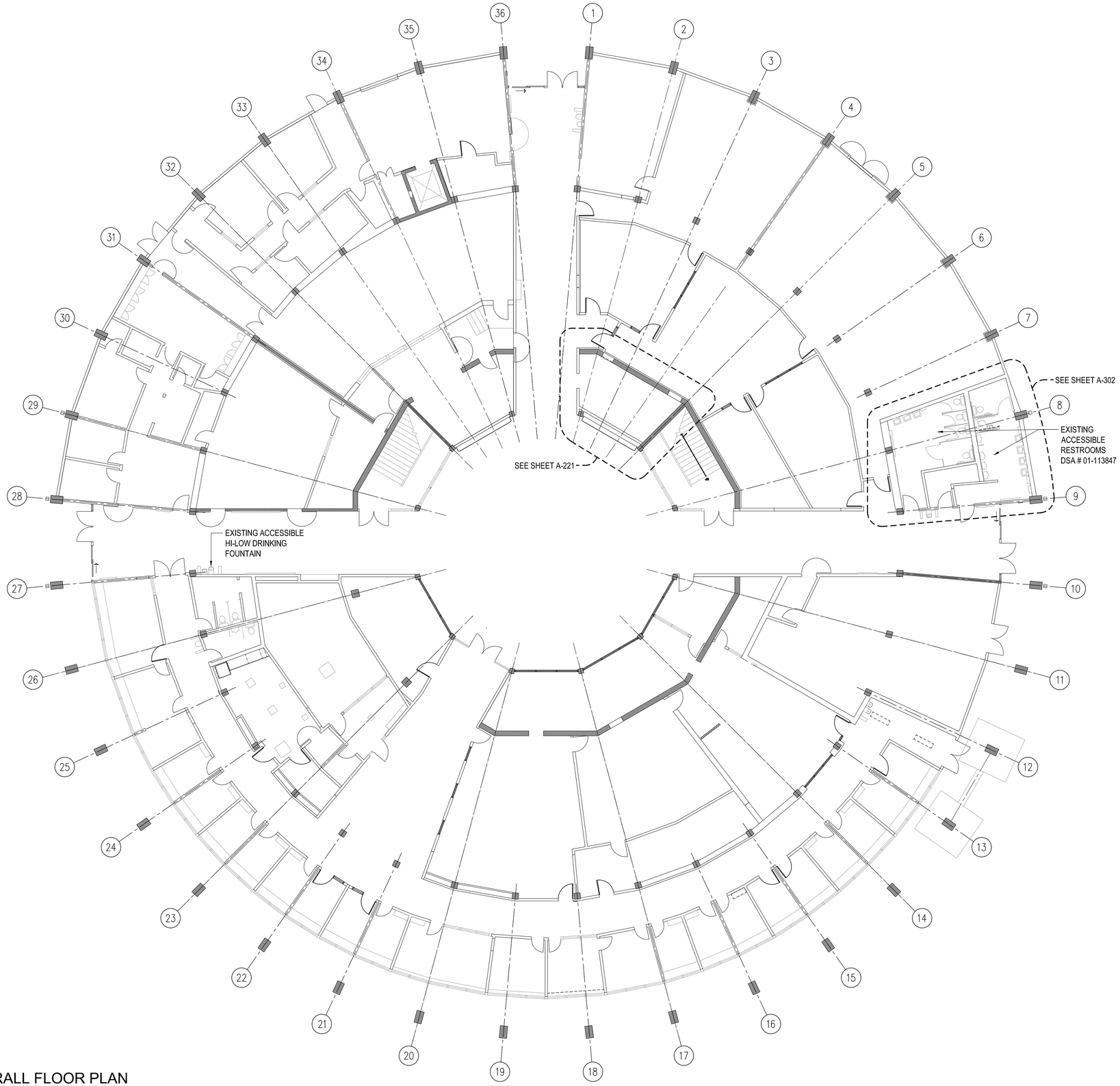

1 BUILDING 100 - OVERALL FLOOR PLAN

SCALE : 1" = 10'-0"

NORTH

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APP. 01-118445 INC:
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LUKE SHIRAS
C-31985
30TH NOV. 2021
RENEWAL
STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

BUILDING 100 OVERALL FLOOR PLAN

DRAWN BY: NF CHECKED BY: AW
DATE: 11/7/2019 PROJECT NO: C9506
SHEET NO:

A-220

11/19/2019 - 02:51:02 PM
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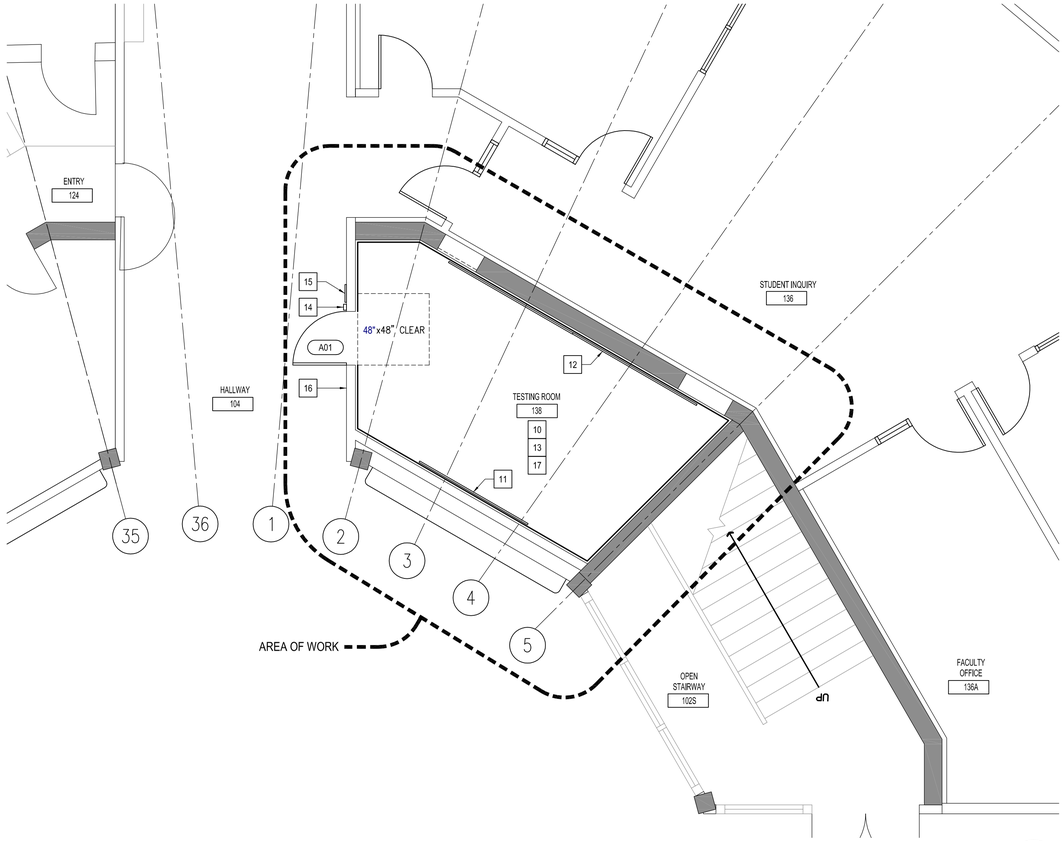
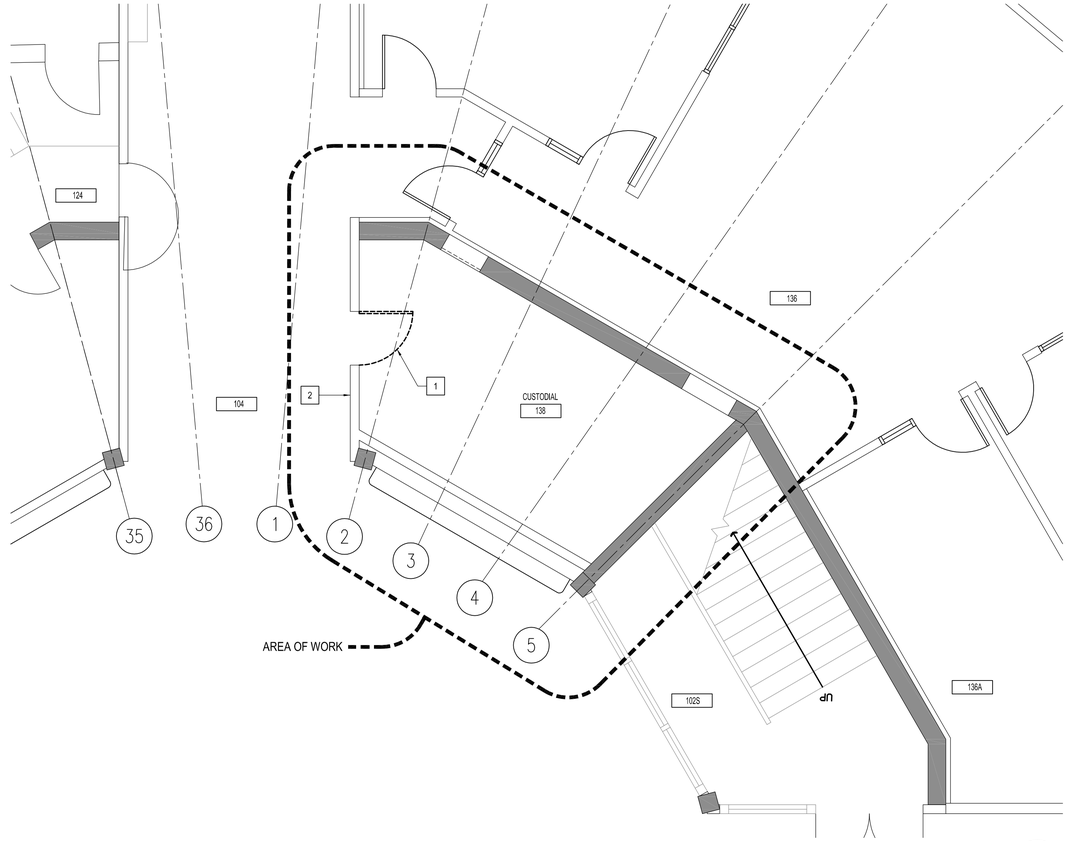


2 NEW FLOOR PLAN

SCALE : 1/4" = 1'-0"

NORTH

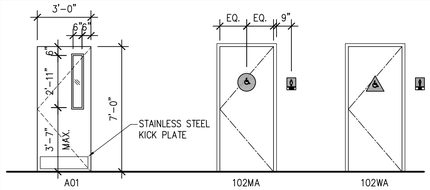


1 DEMOLITION FLOOR PLAN

SCALE : 1/4" = 1'-0"

NORTH

TOILETS & INTERIOR DOORS



INTERIOR DOOR — TOILET DOORS

DOOR MATERIAL:	SOLID CORE WOOD, FINISH TO MATCH ADJACENT (E)
FRAME MATERIAL:	HOLLOW METAL PAINTED TO MATCH ADJACENT (E)
GLAZING TYPE:	CLEARED TEMPERED GLAZING
FIRE RATING:	NON-RATED
HARDWARE GROUP:	GROUP 001
DOOR "A01":	4/A901
HEAD, JAMB, AND SILL DETAIL:	

1. CARD READER MOUNT WITHIN REACH RANGE 15"–48" ABOVE FINISH FLOOR AND WITH 30"x48" CLEAR FLOOR SPACE APPROACH.
2. VERIFY IN FIELD DOORS OPENINGS PRIOR TO FABRICATION.
3. EGRESS DOORS SHALL BE READILY OPEN ABLE FROM THE EGRESS SIDE WITH LATCHING HARDWARE THAT DOES NOT REQUIRE THE USE OF A KEY OR SPECIAL KNOWLEDGE OR EFFORT (INCLUDING ANY ELECTRICAL CARD KEY ACCESS IF APPLICABLE)
4. SEE SPECIFICATIONS FOR HARDWARE GROUPS.
5. ALL SOLID CORE WOOD DOORS TO BE FLUSH WITH WOOD VENEER
6. PROVIDE ROOM NAME SIGNAGE, MATCH EXISTING.
7. PROVIDE STAINLESS STEEL KICK PLATE ON PUSH SIDE OF THE DOOR.

NOTE

REFER TO DETAIL 5/A–121 & 6/A–901 FOR TOILET ROOMS SIGNAGE.

SHEET KEYNOTES

10 FULL HEIGHT VINYL TACK BOARD PANEL, MOUNT BOTTOM EDGE OF PANEL ABOVE TOP EDGE OF RUBBER BASE.

11 INSTALL SALVAGED BULLETIN BOARD FROM ROOM 305B BUILDING #300, MOUNT CENTERED TO WALL, TOP EDGE AT 7'–0" ABOVE FINISH FLOOR, SEE DETAIL 8/A–901.

12 INSTALL SALVAGED WHITE BOARD FROM ROOM 305B BUILDING #300, MOUNT CENTERED TO WALL, TOP EDGE AT 7'–0" ABOVE FINISH FLOOR, SEE DETAIL 8/A–901.

13 PATCH WALL AT RELOCATED OUTLETS WITHIN ROOM.

14 CARD READER, SEE DOOR NOTE. LOCATE CENTERED UNDER ROOM SIGN.

15 INSTALL SALVAGED ROOM PLAQUE, SEE DETAIL 5/A–901.

16 PATCH WALL AT REMOVED ROOM PLAQUE, PAINT TO MATCH ADJACENT SURFACE.

17 CLEAN (E) FLOOR AND PROVIDE (N) FINISH COAT PER MANUFACTURER'S RECOMMENDATION.

DEMOLITION KEYNOTES

1 REMOVE DOOR, FRAME, AND RELATED HARDWARE, SALVAGE TO OWNER.

2 REMOVE ROOM PLAQUE SALVAGE FOR RELOCATION.

GENERAL NOTES

1. DISTRICT TO REMOVE EXISTING FIXTURES, FURNISHINGS, EQUIPMENT, ETC. PRIOR TO START OF WORK. SALVAGE TO OWNER U.O.N.
2. DIMENSIONS ARE TO FACE OF STUD.
3. RETAIN ALL (E) FIRE RATED ASSEMBLIES. IF ANY (E) FIRE RATED MATERIAL IS DAMAGED, MATERIALS MUST BE REPLACED TO MATCH (E).
4. BUILDING SECURITY, FIRE ALARM, AND FIRE PROTECTION SYSTEMS ARE TO REMAIN FUNCTIONAL AT ALL TIMES.
5. DEMOLITION WORK INCLUDES, BUT IS NOT LIMITED TO INTERIOR STUD WALLS, INTERIOR DOORS, LIGHT FIXTURES, BUILT–IN CASEWORK, PLUMBING FIXTURES AND ASSOCIATED PIPING AND ALL OTHER UTILITIES THAT ARE NOT SERVICING THE REMAINDER OF THE BUILDING NOT REQUIRED TO REMAIN FUNCTIONAL.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF THE EXISTING STRUCTURAL, ARCHITECTURAL, MECHANICAL AND ELECTRICAL ITEMS DURING DEMOLITION AND SHALL TAKE ADEQUATE PRECAUTIONS TO PREVENT DAMAGE TO ANY PART OF THE EXISTING STRUCTURE TO REMAIN OR ANY COMPONENTS THAT ARE TO BE SALVAGED FOR LATER REUSE. ANY DAMAGE, IF INCURRED, SHALL BE RECTIFIED TO THE ENTIRE SATISFACTION OF THE OWNER.
7. REMOVED MATERIALS SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN ACCORDANCE WITH ALL APPLICABLE LAWS, ORDINANCES, CODES AND REGULATIONS.
8. ALL UTILITY SHUTDOWNS TO BE COORDINATED WITH DISTRICT MAINTENANCE AND OPERATIONS STAFF.
9. IF MATERIALS SUSPECTED OF CONTAINING HAZARDOUS MATERIALS ARE ENCOUNTERED, REFER TO THE APPENDIX TO THE SPECIFICATION PREPARED BY THE HAZARDOUS MATERIALS CONSULTANT.
10. SUBMIT A DEMOLITION SCHEDULE TO BUILDING OWNER TO COORDINATE THE DEMOLITION AND REMOVAL OPERATIONS WITH THE BUILDING MANAGER'S REQUIREMENTS FOR USING AND PROTECTING BUILDING ELEVATORS, STAIRS, WALKWAYS, BUILDING ENTRIES AND OTHER BUILDING FACILITIES DURING DEMOLITION OPERATIONS.
11. ERECT AND MAINTAIN TEMPORARY PROTECTIONS, AS REQUIRED, INCLUDING BRACING, BARRICADES, SIGNS AND OTHER MEASURES AS REQUIRED BY CODES AND REGULATIONS.
12. CONDUCT DEMOLITION SO THAT OCCUPANTS' OPERATIONS WILL NOT BE DISRUPTED. PROVIDE NOT LESS THAN 72 HOURS NOTICE TO BUILDING OWNER OF ACTIVITIES THAT WILL AFFECT OCCUPANTS' OPERATIONS. MAINTAIN ACCESS TO EXISTING WALKWAYS, CORRIDORS AND OTHER ADJACENT OCCUPIED OR USED FACILITIES.
13. DO NOT CLOSE OR OBSTRUCT WALKWAYS, CORRIDORS, OR OTHER OCCUPIED OR USED FACILITIES WITHOUT WRITTEN PERMISSION FROM AUTHORITIES HAVING JURISDICTION. MAINTAIN FIRE–PROTECTION, LIFE SAFETY, AND BUILDING SECURITY SYSTEM IN SERVICE DURING DEMOLITION OPERATIONS.
14. MAINTAIN (E) UTILITIES THAT SERVICE OTHER AREAS OF THE BUILDING THAT ARE TO REMAIN FUNCTIONAL. THIS INCLUDES, BUT IS NOT LIMITED TO THE TELEVISION STUDIO, RADIO STUDIO, HEALTH CENTER AND THE LIBRARY. PROTECT (E) UTILITIES AGAINST DAMAGE AND DO NOT REMOVE UTILITIES LINES SERVING OTHER PARTS OF THE BUILDING UNTIL NEW REPLACEMENT LINES ARE INSTALLED. REMOVE AND CAP (E) UTILITIES WHERE FIXTURES ARE DEMOLISHED.
15. REPAIR DAMAGE CAUSED BY SELECTIVE DEMOLITION TO ADJACENT CONSTRUCTION AND (E) COLUMNS AND RESTORE.
16. DO NOT ALLOW DEMOLISHED MATERIALS TO ACCUMULATE ON–SITE. STORAGE OR SALE OR REMOVED ITEMS ON SITE IS NOT PERMITTED. DO NOT SOIL ADJACENT SURFACES OR OTHER BUILDING AREAS. LEGALLY DISPOSE OF REMOVED MATERIALS.

LEGEND

- - - - - - - - - -	TO BE DEMOLISH
————	EXISTING TO REMAIN
	EXISTING CONCRETE STRUCTURE

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LUKE SHIRAS
C-31985
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STATE OF CALIFORNIA

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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

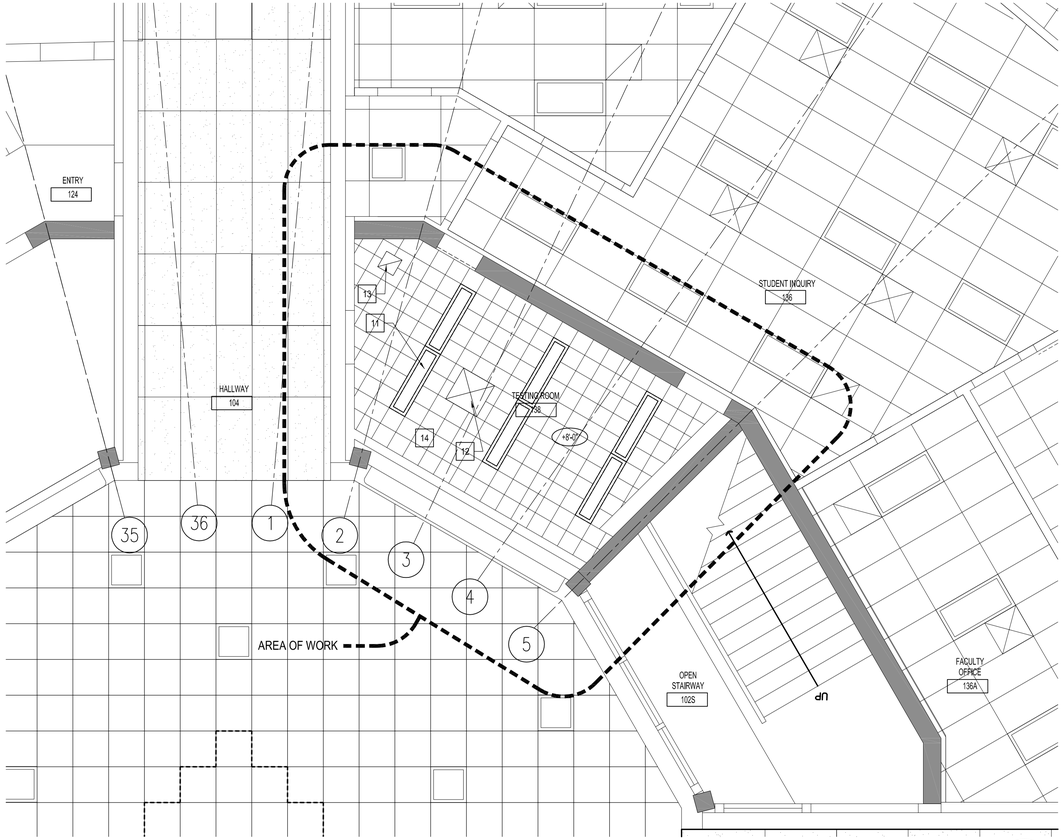
25555 HESPERIAN BLVD
HAYWARD, CA 94545

BUILDING 100 DEMOLITION AND NEW FLOOR PLANS

DRAWN BY: NF	CHECKED BY: AW
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

A-221

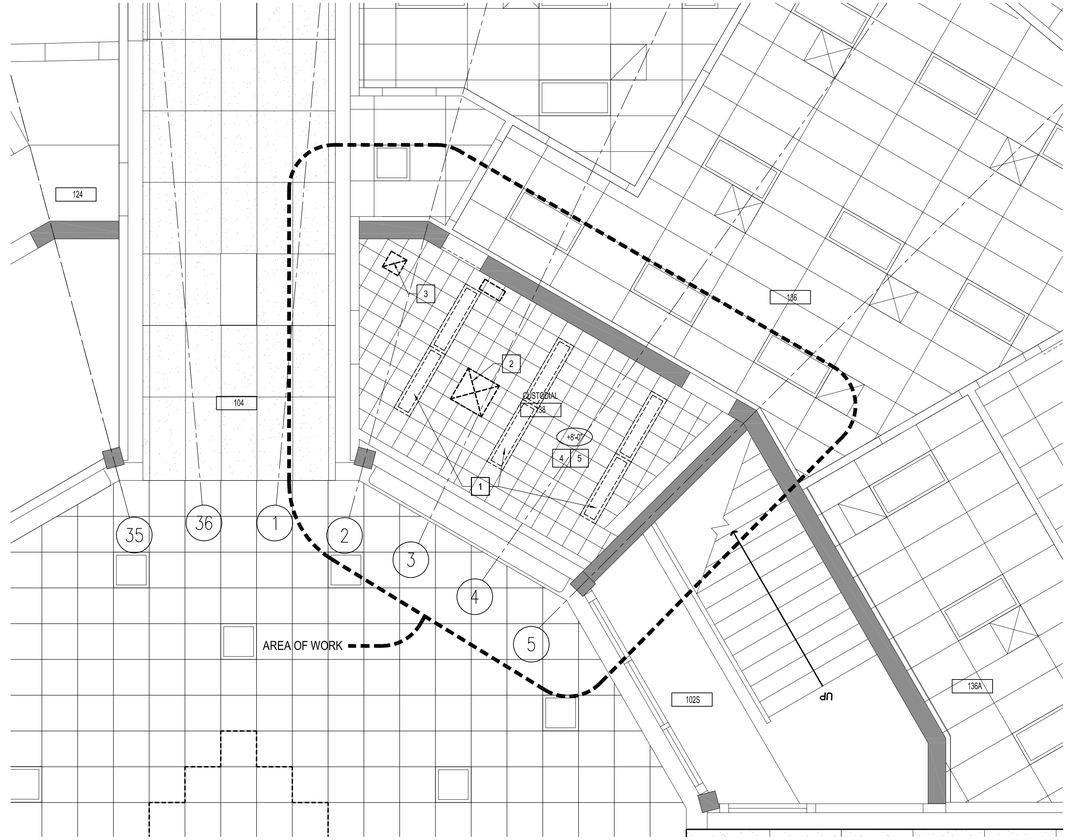
11/19/2019 - 02:20:43 PM
P:\C\C9500 Chabot\Las Positas_CC\C9506_Chabot_MPOE_Bolcmnt3_Dwgs\A-221 - BLDG 100\A-221 - Demo+New Floor Plans.dwg - nfarahani



2 NEW REFLECTED CEILING PLAN

SCALE : 1/4" = 1'-0"

NORTH



1 DEMOLITION REFLECTED CEILING PLAN

SCALE : 1/4" = 1'-0"

NORTH

NEW KEYNOTES

11 (N) LIGHT FIXTURE, TYP. SEE ELECTRICAL DRAWINGS.

12 (N) SUPPLY AIR DIFFUSER, SEE MECHANICAL DRAWINGS.

13 (N) RETURN AIR GRILLE, SEE MECHANICAL DRAWINGS.

14 PAINT EXISTING CEILING TILES WITH P-3, NON-BRIDGING PAINT FINISH AS SPECIFIED.

DEMOLITION KEYNOTES

1 REMOVE LIGHT FIXTURES, SALVAGE TO OWNER.

2 REMOVE SUPPLY AIR GRILLE, SEE MECHANICAL DRAWINGS.

3 REMOVE RETURN AIR GRILLE, SEE MECHANICAL DRAWINGS.

4 REMOVE DAMAGED CEILING TILES AND REPLACE WITH NEW TO MATCH EXISTING. REFER TO HAZMAT REPORT IN SPECIFICATION FOR ADDITIONAL INFORMATION PRIOR TO REMOVAL ACTIVITY.

5 CLEAN SURFACE OF (E) ACOUSTIC CEILING TILES AND PREPARE TO RECEIVE NEW FINISH AS INDICATED.

GENERAL NOTES

1. BUILDING SECURITY, FIRE ALARM, AND FIRE PROTECTION SYSTEMS ARE TO REMAIN FUNCTIONAL AT ALL TIMES.
2. DEMOLITION WORK INCLUDES, BUT IS NOT LIMITED TO LIGHT FIXTURES AND ASSOCIATED CONDUITS AND WIRING.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF THE EXISTING STRUCTURAL, ARCHITECTURAL, MECHANICAL AND ELECTRICAL ITEMS DURING DEMOLITION AND SHALL TAKE ADEQUATE PRECAUTIONS TO PREVENT DAMAGE TO ANY PART OF THE EXISTING STRUCTURE TO REMAIN OR ANY COMPONENTS THAT ARE TO BE SALVAGED FOR LATER REUSE. ANY DAMAGE, IF INCURRED, SHALL BE RECTIFIED TO THE ENTIRE SATISFACTION OF THE OWNER.
4. REMOVED MATERIALS SHALL BE SALVAGE TO OWNER OR REMOVE FROM THE SITE AND DISPOSE OF IN ACCORDANCE WITH ALL APPLICABLE LAWS, ORDINANCES, CODES AND REGULATIONS.
5. ALL UTILITY SHUTDOWNS TO BE COORDINATED WITH DISTRICT MAINTENANCE AND OPERATIONS STAFF.
6. IF MATERIALS SUSPECTED OF CONTAINING HAZARDOUS MATERIALS ARE ENCOUNTERED, REFER TO THE APPENDIX TO THE SPECIFICATION PREPARED BY THE HAZARDOUS MATERIALS CONSULTANT.
7. SUBMIT A DEMOLITION SCHEDULE TO BUILDING OWNER TO COORDINATE THE DEMOLITION AND REMOVAL OPERATIONS WITH THE BUILDING MANAGER'S REQUIREMENTS FOR USING AND PROTECTING BUILDING ELEVATORS, STAIRS, WALKWAYS, BUILDING ENTRIES AND OTHER BUILDING FACILITIES DURING DEMOLITION OPERATIONS.
8. ERECT AND MAINTAIN TEMPORARY PROTECTIONS, AS REQUIRED, INCLUDING BRACING, BARRICADES, SIGNS AND OTHER MEASURES AS REQUIRED BY CODES AND REGULATIONS.
9. CONDUCT DEMOLITION SO THAT OCCUPANTS' OPERATIONS WILL NOT BE DISRUPTED. PROVIDE NOT LESS THAN 72 HOURS NOTICE TO BUILDING OWNER OF ACTIVITIES THAT WILL AFFECT OCCUPANTS' OPERATIONS. MAINTAIN ACCESS TO EXISTING WALKWAYS, CORRIDORS AND OTHER ADJACENT OCCUPIED OR USED FACILITIES.
10. DO NOT CLOSE OR OBSTRUCT WALKWAYS, CORRIDORS, OR OTHER OCCUPIED OR USED FACILITIES WITHOUT WRITTEN PERMISSION FROM AUTHORITIES HAVING JURISDICTION. MAINTAIN FIRE-PROTECTION, LIFE SAFETY, AND BUILDING SECURITY SYSTEM IN SERVICE DURING DEMOLITION OPERATIONS.
11. MAINTAIN (E) UTILITIES THAT SERVICE OTHER AREAS OF THE BUILDING THAT ARE TO REMAIN FUNCTIONAL. THIS INCLUDES, BUT IS NOT LIMITED TO THE TELEVISION STUDIO, RADIO STUDIO, HEALTH CENTER AND THE LIBRARY. PROTECT (E) UTILITIES AGAINST DAMAGE AND DO NOT REMOVE UTILITIES LINES SERVING OTHER PARTS OF THE BUILDING UNTIL NEW REPLACEMENT LINES ARE INSTALLED. REMOVE AND CAP (E) UTILITIES WHERE FIXTURES ARE DEMOLISHED.
12. REPAIR DAMAGE CAUSED BY SELECTIVE DEMOLITION TO ADJACENT CONSTRUCTION AND (E) COLUMNS AND RESTORE.
13. DO NOT ALLOW DEMOLISHED MATERIALS TO ACCUMULATE ON-SITE. STORAGE OR SALE OR REMOVED ITEMS ON SITE IS NOT PERMITTED. DO NOT SOIL ADJACENT SURFACES OR OTHER BUILDING AREAS. LEGALLY DISPOSE OF REMOVED MATERIALS.
14. RETAIN ALL (E) FIRE RATED ASSEMBLIES. IF ANY (E) FIRE RATED MATERIAL IS DAMAGED, MATERIALS MUST BE REPLACED TO MATCH (E).

LEGEND

- TO BE DEMOLISHED
- +8'-0" CEILING HEIGHT
- ACOUSTIC CEILING TILE
- RETURN AIR
- SUPPLY AIR
- SURFACE MOUNTED LIGHT, SEE ELECTRICAL DRAWINGS.

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3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

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LUKE SHIRAS
C-31985
NOV. 2021
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STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

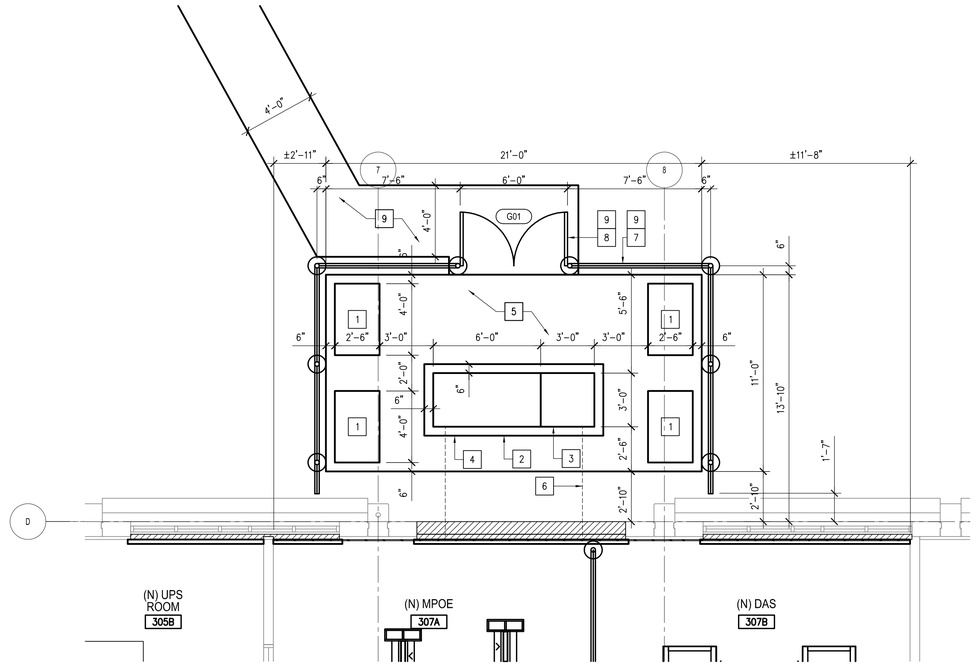
25555 HESPERIAN BLVD
HAYWARD, CA 94545

BUILDING 100 DEMOLITION AND NEW RCP

DRAWN BY: NF	CHECKED BY: AW
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

A-251

11/19/2019 - 02:17:29 PM
P:\C\C9500 Chabot\Las Positas_CC\C9506_Chabot_MPOE_Bldgs\mt3_Dwgs\A-251 - BLDG 100\r4-A-251 - Demo-New RC Plans.dwg - rifarihani



1 UTILITY ENCLOSURE ENLARGED PLAN

SCALE : 1/4" = 1'-0"

NORTH

GENERAL NOTES

1. FOR FENCE & GATE PANELS, SUBMIT MANUFACTURERS STANDARD COLOR CHART FOR OWNER SELECTION AND PROVIDE FINISH SAMPLE OF PREFERRED COLOR(S) FOR APPROVAL.

KEYNOTES

1. AREA FOR CONDENSING UNITS, SEE MECHANICAL DRAWINGS.
2. RAISED CONCRETE PAD FOR OUTSIDE PLANTS, SEE TELECOMMUNICATION DRAWINGS.
3. 36"W X36"D X 90"H OSP CAN, SEE TELECOMMUNICATION DRAWINGS.
4. 72"W X36"D X 90"H OSP CAN, SEE TELECOMMUNICATION DRAWINGS.
5. CONCRETE PAD, SEE STRUCTURAL DRAWINGS.
6. OUTLINE OF CABLE TROUGH ABOVE.
7. 8'-0" HIGH FENCE; BASIS OF DESIGN: AMTECO POLARIS PANEL SYSTEM, SEE STRUCTURAL DRAWINGS.
8. 6'-0" WIDE X 8'-0" HIGH GATE; BASIS OF DESIGN: AMTECO POLARIS PANEL SYSTEM, SEE DETAILS 9/A-901, 10/A-901, AND STRUCTURAL DRAWINGS.
9. WALKWAY PER CIVIL.

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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

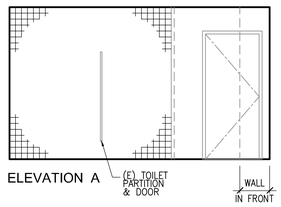
BUILDING 300
ROOM 307
ENLARGED
FLOOR PLAN

DRAWN BY: NF	CHECKED BY: AW
DATE: 11/7/2019	PROJECT NO: C9506

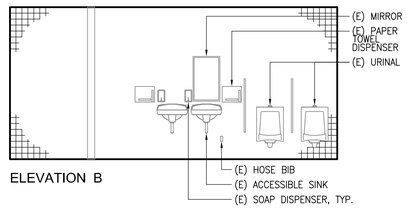
SHEET NO:

A-300

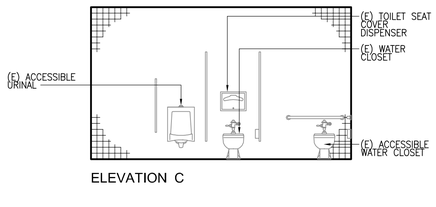
11/19/2019 - 02:12:22 PM
P:\C\C9500 Chabot\Las Positas_CC\C9506_Chabot_MPOE_Rplcmnt3_Dwgs\A-300 - Enlarged Plans\+A-300 - Enlarged Plans.dwg - nfarahani



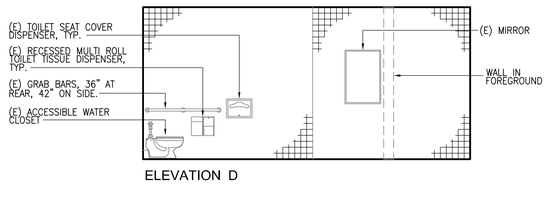
ELEVATION A



ELEVATION B

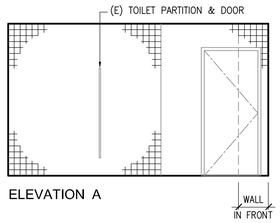


ELEVATION C

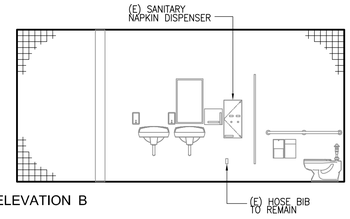


ELEVATION D

INTERIOR ELEVATIONS OF MENS TOILET (304)



ELEVATION A



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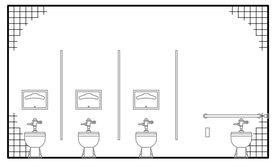
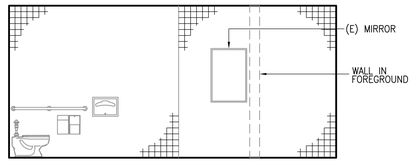


ELEVATION C

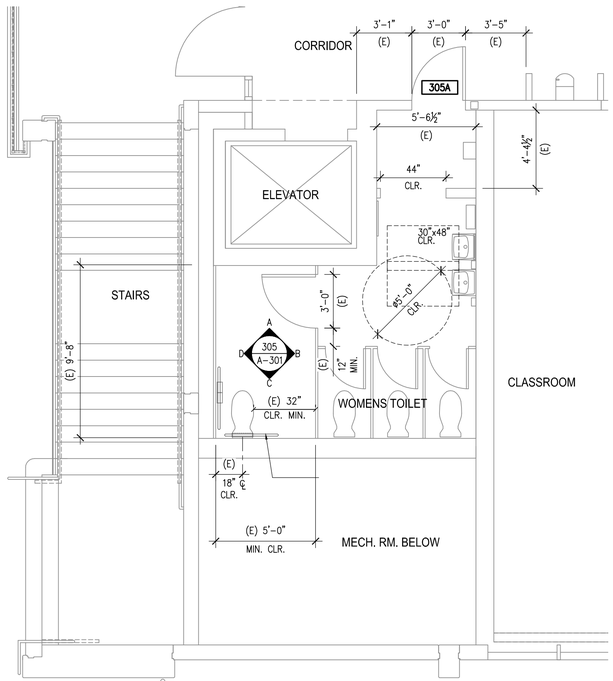


ELEVATION D

INTERIOR ELEVATIONS OF WOMENS TOILET (305)

3 INTERIOR ELEVATIONS OF WOMENS & MENS TOILETS

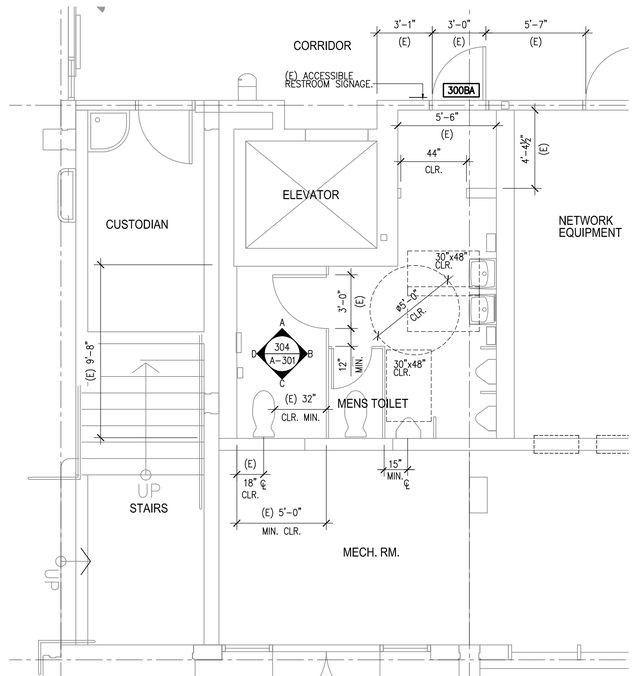
SCALE : 1/4" = 1'-0"



SEE DETAIL 3/A-302 FOR ACCESSIBLE PLUMBING FIXTURE & TOILET ACCESSORIES HEIGHT, U.O.N.

2 ENLARGED FLOOR PLAN - (E) WOMENS TOILET (305)

SCALE : 1/4" = 1'-0"



SEE DETAIL 3/A-302 FOR ACCESSIBLE PLUMBING FIXTURE & TOILET ACCESSORIES HEIGHT, U.O.N.

1 ENLARGED FLOOR PLAN - (E) MENS TOILET (300B)

SCALE : 1/4" = 1'-0"

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ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

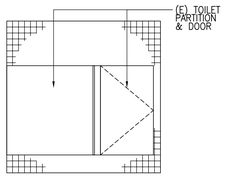
25555 HESPERIAN BLVD
HAYWARD, CA 94545

BUILDING 300 ROOM 307 ENLARGED PLANS AND ELEVATIONS

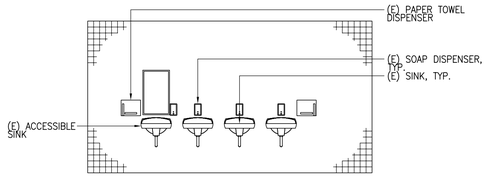
DRAWN BY: NF	CHECKED BY: AW
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

A-301

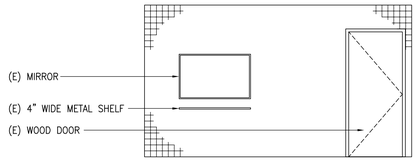
11/19/2019 - 02:20:21 PM
P:\CIC\3500 Chabot\Las Positas_CC\C3506_Chabot_MPOE_Bolcmnt3_Dwgs\A-301 - Enlarged Bathrooms Plans\+A-301 - Enlarged Plans.dwg - nfarahani



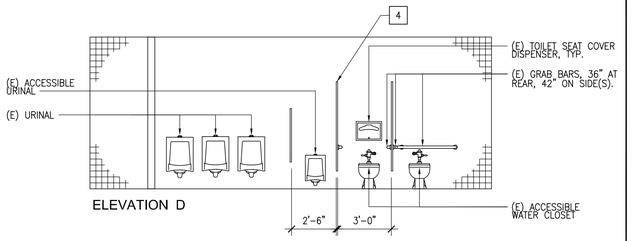
ELEVATION A



ELEVATION B

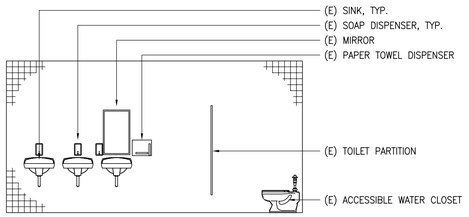


ELEVATION C

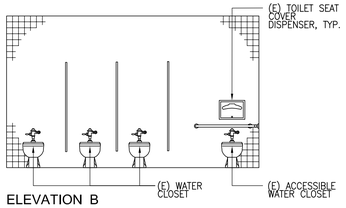


ELEVATION D

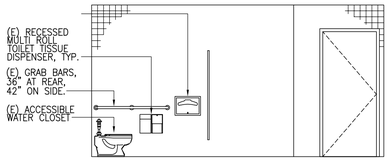
INTERIOR ELEVATIONS OF MENS TOILET (102M)



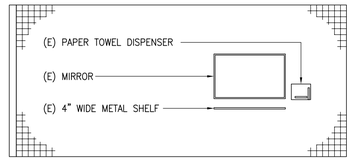
ELEVATION A



ELEVATION B



ELEVATION C

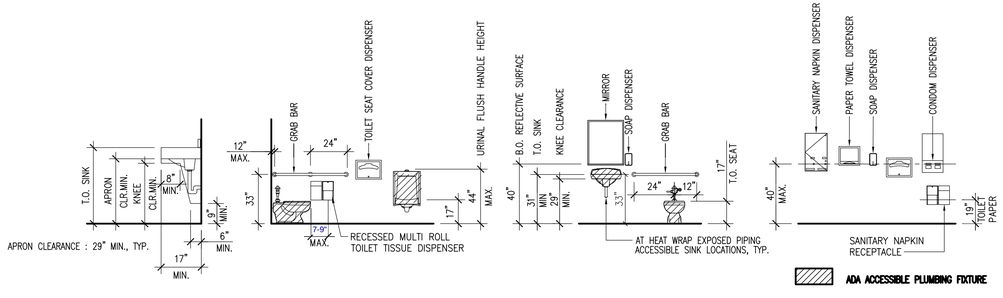


ELEVATION D

INTERIOR ELEVATIONS OF WOMENS TOILET (102W)

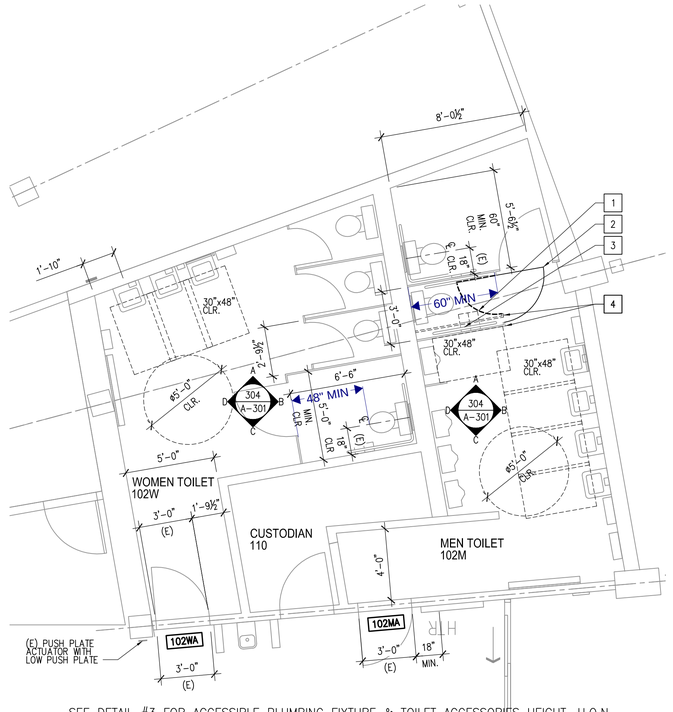
2 INTERIOR ELEVATIONS OF WOMENS & MENS TOILETS

SCALE : 1/4" = 1'-0"



3 ACCESSIBLE PLUMBING FIXTURE & TOILET ACCESSORIES HEIGHT, U.O.N.

SCALE : 1/4" = 1'-0"



SEE DETAIL #3 FOR ACCESSIBLE PLUMBING FIXTURE & TOILET ACCESSORIES HEIGHT, U.O.N.

1 ENLARGED FLOOR PLAN - (E) MENS & WOMENS TOILET

SCALE : 1/4" = 1'-0"

NORTH

KEYNOTES

1. (E) PARTITION DOOR TO BE REMOVED
2. (N) 32" MIN. WIDE PARTITION DOOR, V.I.F.
3. (N) 48" LONG GRAB BAR.
4. RELOCATE (E) PARTITION TOWARD URINAL BY 6" TO HAVE 36" CLEAR WIDE TOILET AREA.

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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

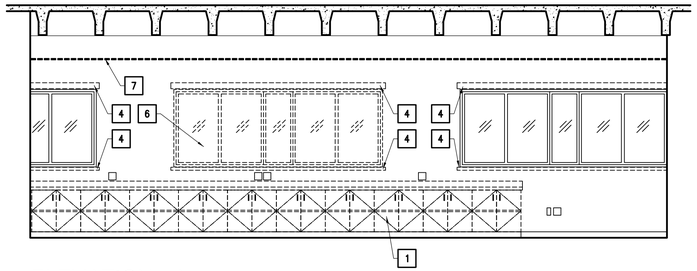
25555 HESPERIAN BLVD
HAYWARD, CA 94545

BUILDING 100
MEN & WOMEN TOILETS
ENLARGED PLANS
AND ELEVATIONS

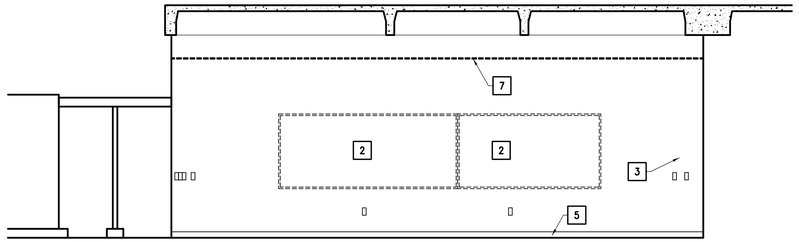
DRAWN BY: NF | CHECKED BY: AW
DATE: 11/7/2019 | PROJECT NO: C9506
SHEET NO:

A-302

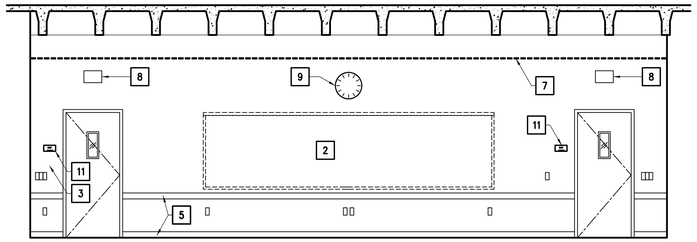
11/19/2019 - 01:58:50 PM
P:\OC\C9500 Chabot-Las Positas_CCC\C9506_Chabot_MPOE_Rplcmnt\3_Dwgs\A-302 - Enlarged Bathroom Plan - BLDG 100\+A-302 - Enlarged Plans.dwg - nfarahani



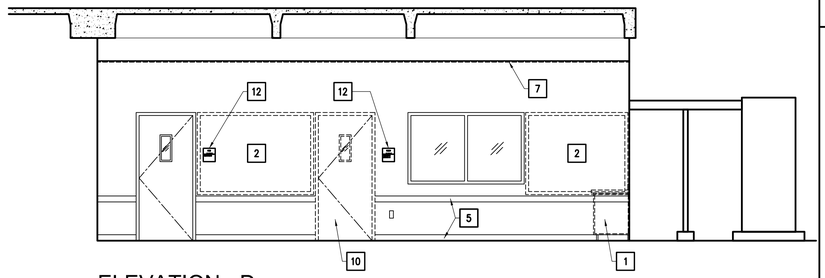
ELEVATION - A



ELEVATION - B



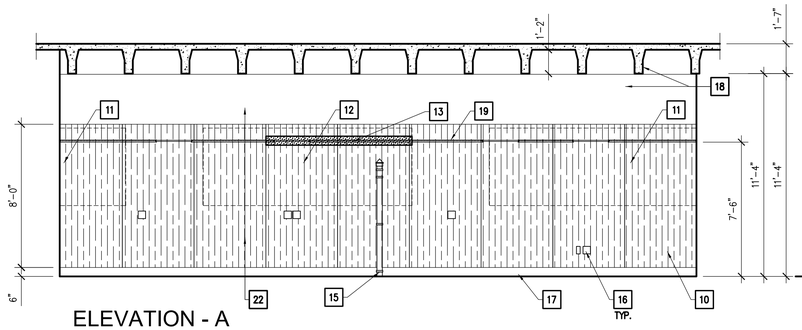
ELEVATION - C



ELEVATION - D

2 DEMOLITION INTERIOR ELEVATIONS

SCALE : 1/4" = 1'-0"



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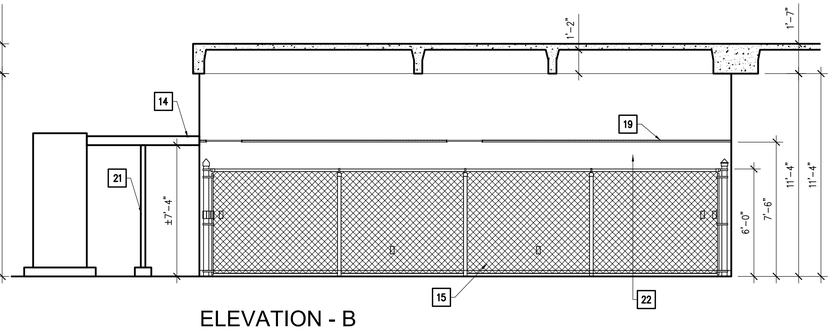
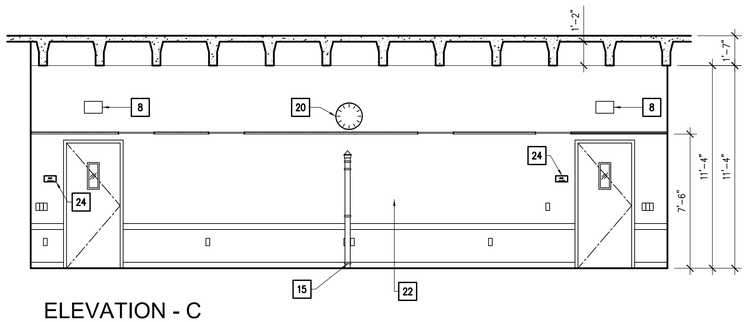
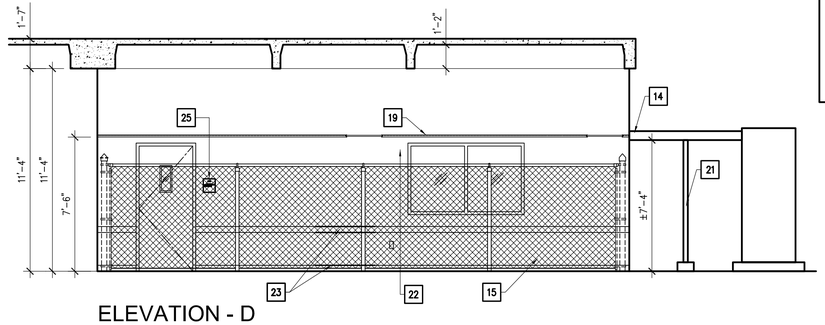


ELEVATION - B



ELEVATION - C



ELEVATION - D

1 NEW INTERIOR ELEVATIONS

SCALE : 1/4" = 1'-0"

GENERAL NOTES

1. ALL ITEMS INDICATED TO BE REMOVED MUST BE VERIFIED AND REVIEWED ON SITE BY THE CONTRACTOR PRIOR TO BIDDING.
2. REFER TO MECHANICAL, PLUMBING, ELECTRICAL, AND STRUCTURAL DRAWINGS FOR ADDITIONAL INFORMATION.
3. MOUNTING HEIGHTS FOR ALL FIXTURES: REFER TO "MOUNTING HEIGHTS SCHEDULE" ON 4/A-301 & 3/A-302.
4. PAINT ALL (E) SURFACES AND WOOD TRIM, TYP.
5. PROVIDE REQUIRED BLOCKING FOR ALL WALL HUNG ITEMS.
6. PATCH, REPAIR, AND PAINT ALL WALL SURFACES WHERE DEMOLITION WORK NECESSITATES.
7. NOTES AND SYMBOLS ARE TO APPLY AT ALL AREAS OF SIMILAR GRAPHIC REPRESENTATION, U.O.N.
8. REFER TO MECHANICAL DRAWINGS FOR REGISTERS AND VENTS NOT OTHERWISE SHOWN.
9. REFER TO ELECTRICAL DRAWINGS FOR HORNS, SPEAKERS, PULL STATIONS, AND OTHER ELECTRICAL AND FIRE ALARM FEATURES NOT OTHERWISE SHOWN.
10. PROVIDE BLOCKING FOR CABINETS, ACCESSORY, OR EQUIPMENT MOUNTING, SEE 7 & 8 /A-901
11. MOUNTING HEIGHTS FOR ALL SIGNAGE: REFER TO SHEET A-121

DEMOLITION KEYNOTES

1. REMOVE (E) CASEWORK.
2. REMOVE AND SALVAGE (E) MARKER BOARDS.
3. REMOVE MISCELLANEOUS APPURTENANCES ON WALL SUCH AS PENCIL SHARPENER, HAND SANITIZER.
4. ALL (E) WINDOW SHADES AND VALANCE TO BE REMOVED.
5. (E) WALL BASEBOARD AND CHAIR RAIL TO REMAIN.
6. (E) WINDOW TO BE REMOVED.
7. (E) CEILING & ALL CEILING MOUNTED DEVICES TO BE REMOVED.
8. (E) EXIT SIGNS TO REMAIN.
9. (E) WALL CLOCK TO REMAIN.
10. (E) DOOR TO BE REMOVED.
11. (E) EXIT SIGN AT DOOR TO REMAIN.
12. (E) ROOM NUMBER AND NAME AT DOOR TO BE REMOVED.

NEW KEYNOTES

10. PROVIDE TELECOM BACKBOARDS ON WALLS OF ROOM AS SHOWN, STARTING AT 6" A.F.F. TO 8'-6" A.F.F., MASK FIRE RATING STAMP PRIOR TO PAINTING. USE FLUSH FASTENERS FOR MOUNTING PLYWOOD.
11. INFILL THE WINDOWS INTERIOR OPENING FLUSH WITH THE EXISTING WALL COVERING ALL AROUND. SEE DETAILS 2/A-901 & 3/A-901.
12. INFILL THE WINDOW EXTERIOR OPENING, MATCH WITH EXISTING CONCRETE WALL AROUND THE OPENING. SEE DETAIL 1/A-901.
13. BLOCK OUT FOR CONDUIT ENTRY, SEE ELECTRICAL DETAILS.
14. WIRE WAY TROUGH, S.E.D.
15. 6'-0" HIGH CHAIN LINK FENCE TO DIVIDE (E) ROOM 307 TO (N) MOPE (307A) AND (N) DAS (307B) ROOMS.
16. CUT OUT BACKBOARD AND ALIGN FACE OF THE OUTLETS WITH FACE OF BACKBOARD.
17. NEW RUBBER BASE AT REMOVED CASEWORK.
18. CLEAN AND PAINT UNDER SIDE OF SECOND FLOOR AND WALL ABOVE 8'-6" BLACK.
19. OVERHEAD CABLE RUNWAY, SEE TELECOMMUNICATION DRAWINGS.
20. (E) WALL CLOCK TO REMAIN.
21. TROUGH SUPPORT, S.S.D.
22. PAINT THE WALLS AND TELECOM BACKBOARDS UP TO 8'-6" WHITE.
23. CONNECT (E) WALL BASEBOARD AND CHAIR RAIL TO EACH SIDE OF THE REMOVED (E) DOOR.
24. (E) EXIT SIGN AT DOOR TO REMAIN.
25. (N) ROOM NUMBER AND NAME.

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DATE: 12/19/2019

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C-31985
NOV. 2021
RENEWAL
STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

BUILDING 300
ROOM 307
INTERIOR ELEVATIONS

DRAWN BY: NF	CHECKED BY: AW
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

A-410

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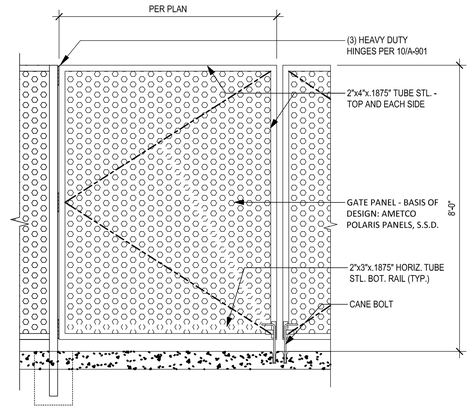
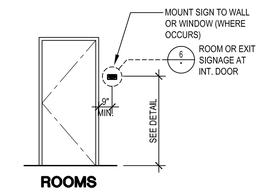


9 GATE DETAIL

SCALE: 1/2"=1'-0"

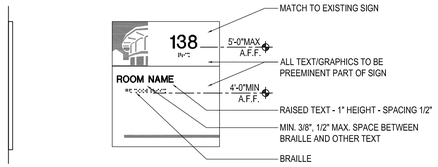
JOB# - DWGSCALE: 24
DRAWING2.DWG



5 IDENTIFICATION SIGNAGE

SCALE: 1/4"=1'-0"

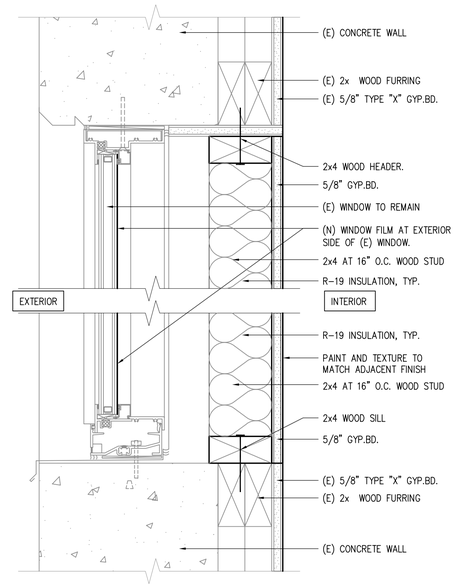
JOB# - DWGSCALE: 48
DRAWING8.DWG



6 TACTILE SIGN TYPES

SCALE: 3"=1'-0"

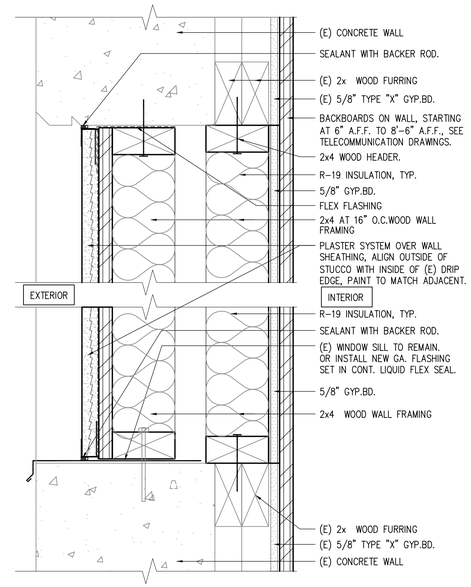
JOB# - DWGSCALE: 4
DRAWING9.DWG



3 INT. INFILL WINDOW OPENING-2

SCALE: 3"=1'-0"

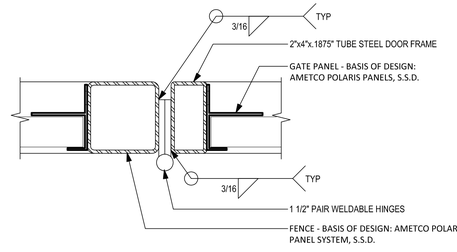
D506 - DWGSCALE: 4
A-901 - ENT INFILL OPENING-2.DWG



1 INFILL WINDOW OPENING @ INSIDE

SCALE: 3"=1'-0"

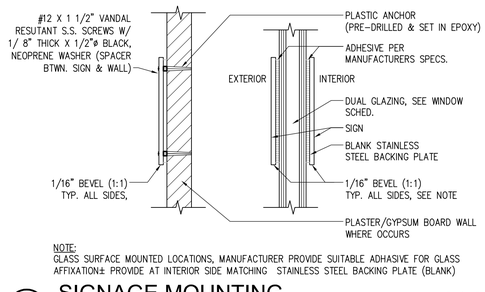
D506 - DWGSCALE: 4
A-901 - INFILL WINDOW OPENING.DWG



10 GATE HINGE DETAIL

SCALE: 3"=1'-0"

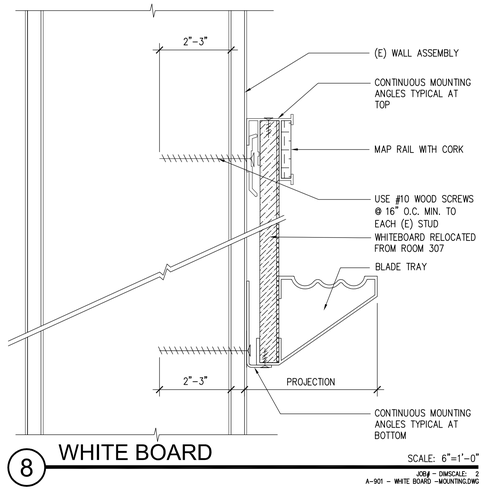
JOB# - DWGSCALE: 4
DRAWING3.DWG



7 SIGNAGE MOUNTING AT FINISHED WALL

SCALE: 3"=1'-0"

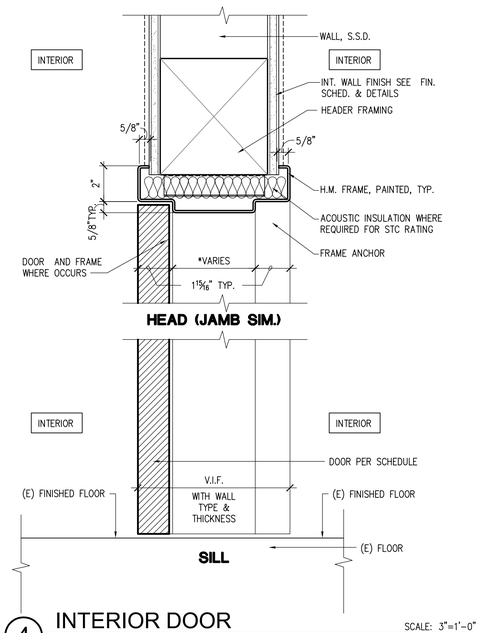
JOB# - DWGSCALE: 4
A-901 - SIGNMOUNTING.DWG



8 WHITE BOARD

SCALE: 6"=1'-0"

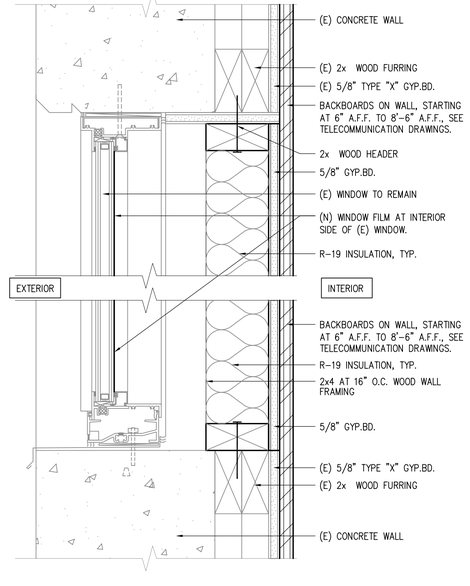
JOB# - DWGSCALE: 2
A-901 - WHITE BOARD -MOUNTING.DWG



4 INTERIOR DOOR

SCALE: 3"=1'-0"

JOB# - DWGSCALE: 4
A-901 - INT.DOOR HEAD JAMB SILL.DWG



2 INT. INFILL WINDOW OPENING-1

SCALE: 3"=1'-0"

D506 - DWGSCALE: 4
A-901 - ENT INFILL OPENING-1.DWG

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C-31985
30TH NOV. 2021
RENEWAL
STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

DETAILS

DRAWN BY: NF	CHECKED BY: AW
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

A-901

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GENERAL NOTES:

1. ALL MATERIAL AND WORKMANSHIP SHALL CONFORM TO THE 2016 CALIFORNIA BUILDING CODE (CBC). TITLE 24, AND ALL APPLICABLE LOCAL CODES AND ORDINANCES.
2. WHERE A CONFLICT BETWEEN THE DRAWINGS AND THE SPECIFICATIONS OCCUR, THE MORE STRINGENT REQUIREMENT SHALL GOVERN.
3. THE CONTRACTOR SHALL NOT SCALE DRAWINGS FOR SIZES, LENGTHS, CLEARANCES, ETC. THE CONTRACTOR SHALL CHECK ALL DRAWINGS IMMEDIATELY UPON THEIR RECEIPT AND SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, PROPERTY LINES AND SITE CONDITIONS BEFORE STARTING WORK. ATI ENGINEERING SERVICES, INC. SHALL BE NOTIFIED OF ANY DISCREPANCIES.
4. UNLESS SPECIFICALLY SHOWN ON THESE PLANS NO STRUCTURAL MEMBER SHALL BE CUT, NEITHER DRILLED NOR NOTCHED WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE STRUCTURAL ENGINEER AND THE DIVISION OF THE STATE ARCHITECT.
5. SEE ARCHITECTURAL DRAWINGS FOR SIZES AND LOCATIONS OF ALL OPENINGS (EXCEPT AS NOTED), INTERIOR NON-BEARING PARTITIONS, CONCRETE CURBS, FLOOR DRAINS, SLOPES, DEPRESSIONS, CHANGES IN LEVEL, CHAMFERS, GROOVES, INSERTS, FINISHES, STAIR FRAMING AND DETAILS (EXCEPT AS SHOWN), AND FOR DIMENSIONS NOT SHOWN ON THE STRUCTURAL DRAWINGS, ETC..
6. CONNECTIONS AND IMPLIED CONSTRUCTION ASSEMBLIES THAT ARE NOT SPECIFICALLY DESCRIBED OR DETAILED SHALL BE CONSTRUCTED USING STANDARD CONSTRUCTION PRACTICES IN COMPLIANCE WITH THE GOVERNING CODES AND ORDINANCES.
7. WHEN DETAILS LABELED "TYPICAL" OR "SIMILAR" ARE GIVEN ON DRAWINGS, THE CONTRACTOR SHALL APPLY THE INTENT OF THE DETAIL TO THAT SPECIFIC CONDITION.
8. WRITTEN INFORMATION AND DIMENSIONS SHALL TAKE PRECEDENCE OVER GRAPHIC INFORMATION. DO NOT SCALE DRAWINGS. RESOLVE ANY CONFLICTS ON THE PLANS WITH THE ARCHITECT/ENGINEER BEFORE PROCEEDING WITH CONSTRUCTION.
9. STRUCTURAL DRAWINGS AND SPECIFICATIONS FOR THIS WORK HAVE BEEN PREPARED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING STANDARDS OF PRACTICE TO MEET THE MINIMUM REQUIREMENTS OF THE 2016 EDITION OF THE CBC. ANY OMISSIONS OR DISCREPANCIES ON THE PLANS OR ANY DEVIATIONS FROM THE PLANS WHICH ARE NECESSITATED BY FIELD CONDITIONS OR ANY CONDITION DIFFERENT FROM THOSE INDICATED ON THE PLANS SHOULD BE BROUGHT TO THE ATTENTION OF ATI PRIOR TO CONTINUING CONSTRUCTION. ALL WORK IS TO BE COORDINATED SO THAT COOPERATION BETWEEN THE TRADES WHERE REQUIRED IS ACCOMPLISHED.
10. CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY BRACING AND SHORING DURING CONSTRUCTION.
11. TRADE NAMES AND MANUFACTURERS REFERRED TO ARE FOR QUALITY STANDARDS ONLY, EQUIVALENT SUBSTITUTIONS ARE PERMITTED WITH ATI & DSA APPROVAL.
12. THE STRUCTURAL SYSTEMS HAVE BEEN DESIGNED TO CARRY THE SUPERIMPOSED LIVE LOADS AS PRESCRIBED BY THE CALIFORNIA BUILDING CODE AND IN ACCORDANCE WITH STANDARD ENGINEERING PRACTICES, WITH NO SPECIAL PROVISIONS TO CARRY CONCENTRATED LOADS FROM STORAGE AND HANDLING OF CONSTRUCTION MATERIALS OR FROM OPERATION OF CONSTRUCTION EQUIPMENT.
13. THE STRUCTURAL DRAWINGS SHOW ONLY THE BASIC STRUCTURAL FRAME. REFER TO ARCHITECTURAL, CIVIL, MECHANICAL AND ELECTRICAL DRAWINGS FOR NON-STRUCTURAL ITEMS WHICH REQUIRE SPECIAL PROVISIONS DURING THE CONSTRUCTION OF THE STRUCTURAL FRAME.
14. ALL SIMPSON & UNISTRUT HARDWARE SHALL BE INSTALLED PER MANUFACTURER. RECOMMENDATIONS.

CONCRETE SLAB ON GRADE NOTES:

1. SUBGRADE:
   - ALL ARTIFICIAL FILL SOILS AND ANY LOOSE OR DISTURBED NATIVE SOILS SHALL BE REMOVED FROM THE BUILDING AND FOUNDATION AREAS. AS A MINIMUM, BUILDING AREAS SHOULD BE OVEREXCAVATED TO COMPETENT NATIVE SOILS OR IN ACCORDANCE WITH THE SOIL REPORT RECOMMENDATIONS FOR INFILL.
   - ONCE CLEANED OF UNACCEPTABLE MATERIAL AND MOISTURE CONDITIONED, THE EXCAVATED MATERIAL MAY BE REPLACED AS CONTROLLED COMPACTED FILL. FILL MATERIALS CONSISTING OF ON-SITE SOILS OR APPROVED IMPORTED GRANULAR SOILS SHOULD BE SPREAD IN THIN LIFTS AND COMPACTED AT NEAR OPTIMUM MOISTURE CONTENT TO A MINIMUM OF 90 PERCENT RELATIVE COMPACTION.
   - FINISH SUBGRADE PAD ELEVATION BEFORE CONCRETE POUR TO BE WITHIN ¼ INCH ABOVE OR ½ INCH BELOW REQUIRED ELEVATION.
   - PAD MUST BE MOIST PRIOR TO CONCRETE POUR AND BE FREE OF DEBRIS.
2. CONCRETE MIX AND MATERIALS:
   - MIX DESIGNS FOR SLAB CONCRETE SHOULD BE PREPARED BY REGISTERED ENGINEER AND MUST BE APPROVED BY THE ARCHITECT/ENGINEER. MIX DESIGN SHOULD INCLUDE PROPORTIONS FOR EACH MATERIAL.
   - CEMENT SHALL BE TYPE II U.O.N. AND TESTED PER ASTM STANDARDS. TEST RESULTS SHALL BE SUBMITTED TO THE ENGINEER/ARCHITECT ALONG WITH MIX DESIGN.
   - CONCRETE MUST BE BATCHED FROM THE SAME CONCRETE BATCHING PLANT AND FROM THE SAME AGGREGATE STROKE FOR ALL SLAB CONCRETE.
   - SLUMP SHALL NOT VARY MORE THAN ½" FROM TRUCK TO TRUCK.
   - MAXIMUM SIZE AGGREGATE FOR SLAB ON GRADE TO BE ¾".
4. CONCRETE CURING:
   - ALL CURING TO BE DONE SHALL BE WET CURING BY USING BURLINE FOR A MINIMUM OF 7 DAYS FROM THE TIME CONCRETE IS POURED.

SUBMITTALS:

1. PRIOR TO PROCEEDING WITH THE WORK, THE CONTRACTOR SHALL SUBMIT THE FOLLOWING TO THE STRUCTURAL ENGINEER FOR REVIEW:
   - MIX DESIGN FOR ALL GRADES AND APPLICATIONS OF CONCRETE, INCLUDING CERTIFIED TEST DATA ON THE STRENGTH OF SAMPLE BATCHES.
   - PLACEMENT AND SHOP DRAWINGS FOR ALL REINFORCING STEEL.
   - MANUFACTURER'S CATALOG DATA AND ICC-ES TEST REPORT FOR ANY PROPRIETARY PRODUCT PROPOSED AS A SUBSTITUTE FOR SPECIFIED MATERIALS.
   - WRITTEN WELDING PROCEDURES FOR EACH CLASS OF WELD.
2. THE CONTRACTOR IS TO SUBMIT THE FOLLOWING IN A TIMELY MANNER TO THE STRUCTURAL ENGINEER FOR RECORD PURPOSES:
   - MILL CERTIFICATES AND TEST REPORTS FOR REINFORCING STEEL.
   - MILL CERTIFICATES AND TEST REPORTS FOR STRUCTURAL STEEL.
   - RESULTS OF CONCRETE COMPRESSIVE STRENGTH TESTS.
3. THE INSPECTION AGENCY SELECTED BY THE OWNER SHALL SUBMIT WRITTEN DRILLED EPOXY DOWEL INSPECTION REPORT TO THE STRUCTURAL ENGINEER FOR REVIEW PER ACI 318 SECTION 17.8.2.4.
4. SUBMIT SHOP DRAWINGS UNDER PROVISIONS OF SECTION 01300. ALLOW 14 DAYS FOR STRUCTURAL ENGINEER'S REVIEW, AS PER AISC - CODE OF STANDARD PRACTICE. REVIEW OF SUBMITTALS BY THE STRUCTURAL ENGINEER IS ONLY FOR GENERAL CONFORMANCE WITH DESIGN INTENT. REVIEW OF THE DRAWINGS DOES NOT RELIEVE THE CONTRACTOR OF RESPONSIBILITY FOR COMPLETING THE WORK IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS.
5. INDICATE PROFILES, SIZES, SPACING AND LOCATIONS OF STRUCTURAL MEMBERS, CONNECTIONS, ATTACHMENTS, FASTENERS, CAMBERS, HOLES AS PER CONSTRUCTION DRAWINGS.
6. INDICATE WELDED CONNECTIONS USING STANDARD AWS WELDING SYMBOLS. INDICATE WELD SIZES, EFFECTIVE SIZES AND NET LENGTHS.
7. SHOP DRAWING SHALL SHOW CONNECTIONS AS INDICATED ON CONSTRUCTION DRAWINGS. WHERE ALTERNATIVE CONNECTIONS ARE SUBSTITUTED FOR THOSE INDICATED ON THE CONSTRUCTION DRAWINGS, SUBMIT DATA (CALCULATIONS OR TEST) DEMONSTRATING THAT THEY ARE EQUIVALENT OR SUPERIOR STRENGTH, STIFFNESS AND DUCTILITY TO THOSE SHOWN ON THE CONSTRUCTION DRAWINGS FOR STRUCTURAL ENGINEER'S APPROVAL. CLEARLY INDICATE ALL ALTERNATIVELY DETAILED CONNECTIONS ON SHOP DRAWINGS.

ADDITIONAL SAFETY NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR JOB SITE SAFETY. THE FOLLOWING REQUIREMENTS ARE NOT INTENDED TO BE A COMPLETE LIST, BUT ARE ADDITIONAL SAFETY REQUIREMENTS FOR THE CONTRACTOR.
2. THE STRUCTURE SHOWN IN THESE DRAWINGS IS STRUCTURALLY SOUND ONLY IN ITS COMPLETE FORM. THE DESIGN, ADEQUACY, AND SAFETY OF ERECTION BRACING, SHORING, TEMPORARY SUPPORTS, ETC IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR, AND HAS NOT BEEN CONSIDERED BY THE ENGINEER. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE AT ALL TIMES DURING CONSTRUCTION.
3. CONTRACTOR SHALL DETERMINE IF CONFINED SPACE ENTRY IS REQUIRED AND SHALL BE CERTIFIED IN ALL APPROPRIATE PRECAUTIONS WHEN WORKING IN A CONFINED SPACE.
4. CONTRACTOR SHALL DETERMINE IF A SAFETY PERMIT IS REQUIRED, IF SO, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN SUCH PERMIT.

STRUCTURAL SITE OBSERVATION

FOR STRUCTURES INCLUDED IN SEISMIC DESIGN CATEGORIES D, E AND F (CBC 1613A.3.5), THE STRUCTURAL ENGINEER SHALL PERFORM STRUCTURAL OBSERVATIONS OF STRUCTURAL SYSTEMS FOR GENERAL CONFORMANCE TO THE APPROVED CONSTRUCTION DOCUMENTS (CBC 1704A.6). THE FOLLOWING CONSTRUCTION STAGES REQUIRE STRUCTURAL OBSERVATION:

- FOUNDATION REINFORCEMENT, RETAINING WALL REINFORCEMENT AND HARDWARE PLACEMENT
- WOOD FRAMING
- MASONRY WALL CONSTRUCTION/REINFORCEMENT
- LATERAL SHEAR ELEMENTS (SHEAR WALLS, DIAPHRAGM, ALTERNATIVE LATERAL SYSTEMS)

STRUCTURAL ENGINEER OF RECORD (S.E.O.R.) OR HIS/HER DESIGNATED ENGINEER SHALL BE CALLED BY CONTRACTOR 48 HOURS PRIOR TO SITE OBSERVATION. S.E.O.R. OR HIS/HER DESIGNATED ENGINEER SHALL OBSERVE CONSTRUCTION OF EACH BUILDING.

DESIGN CRITERIA

GRAVITY LOAD: N/A

WIND DESIGN DATA:
- ULTIMATE DESIGN WIND SPEED V_{ULT} = 110 MPH
- RISK CATEGORY: III
- WIND EXPOSURE CATEGORY: C
- ANALYTICAL PROCEDURE USED: SIMPLIFIED PROCEDURE (METHOD 1)
- INTERNAL PRESSURE COEFFICIENT: N/A FOR METHOD 1
- TOPOGRAPHIC FACTOR: K_{ZT} = 1.0

EARTHQUAKE DESIGN DATA:
- RISK CATEGORY: III
- COMPONENT IMPORTANCE FACTOR: I_P = 1.0
- MAPPED SPECTRAL RESPONSE ACCELERATIONS: S_S = 1.887; S_1 = 0.76
- SITE CLASS: D (SEE SOIL CRITERIA)
- ALLOWABLE SOIL BEARING = 1500PSF
- SPECTRAL RESPONSE COEFFICIENTS: S_{DS} =1.258; S_{D1} = 0.76.
- SEISMIC DESIGN CATEGORY: E

FLOOD DESIGN DATA: N/A

SOIL NOTES

1. PRESUMPTIVE SOIL LOAD BEARING VALUES, CLASS 5 PER CBC 2016, TABLE 1806.2
2. SOIL CRITERIA:
   - DL+LL = 1500 PSF
   - DL+LL+WIND OR SEISMIC = 2000 PSF
   - PASSIVE EARTH PRESSURE = 100 PCF
   - COHESION = 130 PSF
4. FOUNDATION CRITERIA:
   - MINIMUM FOOTING DEPTH = 18 INCHES
   - MINIMUM SLAB THICKNESS = 5 INCHES

CONCRETE NOTES:

1. ALL CONCRETE WORK SHALL CONFORM TO THE REQUIREMENTS OF THE 2014 EDITION OF THE ACI BUILDING CODE (ACI-318-14) AND THE CBC, TITLE 24. DETAILING, FABRICATION, AND ERECTION OF REINFORCING BARS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE MANUAL OF STANDARD PRACTICE (ACI-315).
2. CONCRETE SHALL CONFORM TO A.S.T.M. C-94.
3. MIXING WATER SHALL BE CLEAN AND FREE FROM INJURIOUS AMOUNTS OF OIL, ACIDS, ALKALIES, ORGANIC MATERIALS OR OTHER DELETERIOUS SUBSTANCES.
4. COURSE AGGREGATE SHALL BE HARD, DURABLE CRUSHED STONE OR GRAVEL GRADED PER A.S.T.M. C33. MAXIMUM SIZE AGGREGATE SHALL BE 1".
5. SAND SHALL BE CLEAN, HARD, DURABLE, WASHED FREE FROM SILT, LOAM OR CLAY.
6. CONCRETE QUALITY SHALL CONFORM TO PROVISIONS OF ACI 318, CHAPTER 26.
7. CEMENT SHALL CONFORM TO A.S.T.M. C150, TYPE I OR II, U.O.N.
8. ALL REINFORCING BARS, ANCHOR BOLTS AND OTHER CONCRETE INSERTS SHALL BE WELL SECURED IN POSITION PRIOR TO PLACING CONCRETE.
9. EXCEPT WHERE DETAILED ON STRUCTURAL DRAWINGS, REINFORCEMENT SHALL NOT BE DISPLACED OR CUT TO PROVIDE CLEARANCE FOR PENETRATIONS, INSERTS, OR EMBEDMENTS.
10. ALL CONCRETE SHALL BE THOROUGHLY CONSOLIDATED DURING PLACEMENT USING A MECHANICAL VIBRATOR. CONCRETE FORMS FOR FOUNDATION SLABS SHALL REMAIN IN PLACE FOR 2 DAYS MINIMUM OR UNTIL THEY CAN BE REMOVED WITHOUT DAMAGING THE CONCRETE SURFACES.
11. LOOSE SOIL, SAWDUST, AND OTHER DEBRIS SHALL BE REMOVED FROM THE FORMS PRIOR TO PLACING CONCRETE.
12. PROVIDE NORMAL WEIGHT CONCRETE (145 PCF) WITH PROVEN SHRINKAGE CHARACTERISTICS OF LESS THAN 0.04%, ATTAINING MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS (f'c') AS FOLLOWS, UNLESS NOTED OTHERWISE:

USE	DESIGN	SLUMP	INSPECTION
CONCRETE PAD	4000 PSI	4" ±1 MAX.	YES
PIER FOOTING	4000 PSI	4" ±1 MAX.	YES
SLAB ON GRADE	4000 PSI	4" ±1 MAX.	YES
MISC.	3000 PSI	4" ±1 MAX.	YES

13. DO NOT EMBED CONDUITS, PIPES OR SLEEVES OTHER THAN ELECTRICAL CONDUITS 1" DIAMETER AND SMALLER IN STRUCTURAL CONCRETE EXCEPT WHERE SPECIFICALLY DETAILED OR ACCEPTED BY ARCHITECT (STRUCTURAL ENGINEER). CONDUITS SHALL BE LOCATED, MINIMUM 3" CLEAR APART AND WITHIN MIDDLE THIRD OF MEMBER.

CONCRETE REINFORCEMENT NOTES:

1. REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO A.S.T.M. DESIGNATION A615, U.O.N. WITH A SPECIFIED YIELD STRENGTH f_y = 60,000 PSI.
2. WIRE FABRIC SHALL BE ELECTRICALLY WELDED STEEL, A.S.T.M. A185. LAP 6" AT EDGES.
3. DETAILING, FABRICATION AND PLACING OF REINFORCING STEEL SHALL CONFORM TO OR EQUAL THAT SET FORTH IN THE MANUAL OF STANDARD PRACTICE (ACI-315) FOR DETAILING REINFORCED CONCRETE STRUCTURES, AND BETTER WHERE REQUIRED BY THE DRAWINGS.
4. STANDARD HOOKS SHALL COMPLY WITH RECOMMENDED SIZES AS SHOWN IN ABOVE MANUAL, UNLESS OTHERWISE NOTED.
5. LAP ALL BAR SPLICES PER TABLE SHOWN BELOW FOR RE-BAR IN CONCRETE OR CONCRETE BLOCK. SPLICES SHALL BE STAGGERED WHERE APPLICABLE. BARS SHALL BE CONTINUOUS IN LENGTH AS LONG AS POSSIBLE.
6. ALL DOWELS, ANCHOR BOLTS AND OTHER INSERTS SHALL BE WELL SECURED IN PLACE PRIOR TO CONCRETE PLACEMENT.
7. ALL PIPES AND DUCTS THROUGH CONCRETE SHALL BE SLEEVED. VERIFY OPENINGS WITH PLUMBER AND ELECTRICIAN.
8. ALL WELDED WIRE FABRIC SHALL BE 6x6-W2xW2 U.O.N. WELDED WIRE FABRIC SHALL BE TIED AT THREE PLACES TO REINFORCING DOWELS (WHERE OCCUR) EXCEPT LOCATIONS WHERE SLAB IS DESIGNED AS AN INDEPENDENT SLAB.
9. CONCRETE PROTECTION FOR REINFORCEMENT SHALL BE AS FOLLOWS:

TABLE 20.6.1.3.1 - SPECIFIED CONCRETE COVER FOR CAST-IN-PLACE NONPRESTRESSED CONCRETE MEMBERS

CONCRETE EXPOSURE	MEMBER	REINFORCEMENT	SPECIFIED COVER, IN.
CAST AGAINST AND PERMANENTLY IN CONTACT WITH GROUND	ALL	ALL	3
EXPOSED TO WEATHER OR IN CONTACT WITH GROUND	ALL	NO. 6 THROUGH NO. 18	2
		NO. 5 BAR, W31 OR D31 WIRE, AND SMALLER	1-1/2
NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND	SLABS, JOISTS, AND WALLS	NO. 14 AND NO. 18 BARS	1-1/2
		NO. 11 BAR AND SMALLER	¾
	BEAMS, COLUMNS, PEDESTALS, AND TENSION TIES	PRIMARY REINFORCEMENT, STIRRUPS, TIES, SPIRALS, AND HOOPS	1-1/2

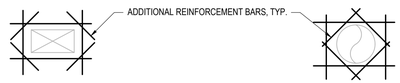
10. SUITABLE DEVICES SHALL BE USED TO HOLD THE REINFORCING IN ITS TRUE HORIZONTAL AND VERTICAL POSITIONS. THESE DEVICES SHALL BE SUFFICIENTLY RIGID AND NUMEROUS TO PREVENT DISPLACEMENT OF THE REINFORCING DURING THE PLACING OF THE CONCRETE.
11. CHAIRS OR SPACES FOR REINFORCING SHALL BE PLASTIC OR PLASTIC COATED WHEN RESTING ON EXPOSED SURFACES.
12. PROVIDE DOWELS FOR WALLS AND COLUMNS MATCHING VERTICAL REINFORCING SIZE AND SPACING UNLESS OTHERWISE NOTED.
13. WELD REINFORCING STEEL COMPLYING WITH AWS D1.4, EXCEPT AS MODIFIED BY CBC STANDARD 19-2. WELDING OF ASTM A706 STEEL IS PERMITTED. IF WELDING OF REINFORCING STEEL OTHER THAN A706 IS DESIRED, SUBMIT PROPOSED PROCEDURE, INDICATING CONFORMANCE TO CODE AND REQUIREMENTS OF GOVERNING CODE AUTHORITY, TO BUILDING DEPARTMENT FOR APPROVAL AND ARCHITECT (STRUCTURAL ENGINEER) FOR REVIEW, PRIOR TO EXECUTION. WELDERS SHALL BE CERTIFIED AS REQUIRED BY GOVERNING CODE AUTHORITY.
14. BEND REINFORCING STEEL COLD UNLESS AUTHORIZED BY ARCHITECT (STRUCTURAL ENGINEER). REINFORCING BARS SHALL NOT BE RE-BENT WITHOUT PRIOR APPROVAL OF ARCHITECT (STRUCTURAL ENGINEER).
15. REINFORCING STEEL SHALL BE CLEAN OF MUD, OIL OR OTHER COATING AFFECTING BONDING WITH CONCRETE.
16. SECURE ALL REINFORCING STEEL, ANCHOR BOLTS, INSERTS, ETC. IN PLACE PRIOR TO PLACING CONCRETE.
17. SUBMIT REINFORCING STEEL SHOP DRAWINGS INDICATING REINFORCING PLACEMENT, INCLUDING SPLICE LOCATION AND LENGTHS TO ARCHITECT (STRUCTURAL ENGINEER) FOR REVIEW. PROMPTLY NOTIFY ARCHITECT (STRUCTURAL ENGINEER) PRIOR TO DEVELOPING REINFORCING STEEL SHOP DRAWING IF INSUFFICIENT CLEAR DISTANCES BETWEEN REINFORCING STEEL OR REBAR CONGESTION IS ENCOUNTERED. REBAR SHOP DRAWING SHALL BE IN COMPLIANCE WITH ACI 315, PART "B".
18. FOLLOWING TABLE SHALL BE USED FOR ALL RE-BAR LAPS AND SPLICES.

REINFORCING BAR LAP SPLICE (INCHES)

BAR SIZE	F_c = 2500 psi		F_c = 3000 psi		F_c = 4000 psi	
	TOP	OTHER	TOP	OTHER	TOP	OTHER
#3	28	22	31	24	25	19
#4	37	29	41	32	33	25
#5	47	36	51	39	41	31
#6	56	43	61	47	49	37
#7	81	63	89	69	71	54
#8	93	72	102	78	81	62
#9	105	81	115	88	91	70

1. LAP SPLICE LENGTHS ARE FOR NORMAL WEIGHT CONCRETE (WEIGHT > 145 PCF), U.O.N.
2. CALC. BASED ON CLEAR COVER = d_b (BAR DIA.) AND CLEAR SPACING = $2d_b$.
3. STAGGER ALL SPLICES EXCEPT FOR LAP SPLICES OF DOWELS FROM FOOTINGS, WALLS OR SLABS.
4. LAP SPLICE TABLE IS FOR GR.60 REINF.
5. TOP BARS ARE HORIZONTAL BARS W/ 12" OR MORE OF CONCRETE PLACED BELOW.
6. SPLICE SHALL BE CONTACT LAP SPLICES, EXCEPT WHERE NON-CONTACT SPLICES ARE NOTED ON DRAWINGS. AT NON-CONTACT LAP SPLICES, PROVIDE BARS SPACE MAXIMUM ¼ OF LAP LENGTH, 6" O.C., MAX.

19. TEST VALUES FOR EMBEDDED REINFORCEMENT RODS SHALL BE SAME AS SAME DIAMETER EPOXY ANCHORS.
20. ADDITIONAL DIAGONAL REINFORCEMENT BARS ARE REQUIRED AT OPENINGS.



DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI
ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. RUGE
SE 2677
12/31/2020
RENEWAL DATE
STRUCTURAL
STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

STRUCTURAL GENERAL NOTES

DRAWN BY: m.arquines	CHECKED BY: g.ng
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

S-001

11/13/2019 - 09:01:57 AM
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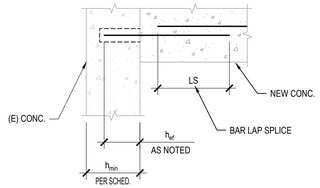
POST-INSTALLED ANCHORS

1. EPOXY ADHESIVE ANCHORS SHALL BE SIMPSON SET-XP FOR CRACKED CONCRETE AND SEISMIC APPLICATIONS (ESR-2508) OR APPROVED EQUAL.
2. EXPANSION ANCHORS SHALL BE SIMPSON STRONG-BOLT 2 FOR CRACKED CONCRETE (ESR-3037) OR APPROVED EQUAL.
3. CONTINUOUS SPECIAL INSPECTION IS REQUIRED. VERIFICATION OF THE FOLLOWING IS REQUIRED DURING SPECIAL INSPECTION:
   - A. ANCHOR TYPE AND DIMENSIONS.
   - B. CONCRETE TYPE AND COMPRESSIVE STRENGTH.
   - C. HOLE DIMENSIONS AND HOLE CLEANING PROCEDURES.
   - D. ANCHOR SPACING, EDGE DISTANCES, CONCRETE/MASONRY THICKNESS, AND ANCHOR EMBEDMENT DEPTH.
   - E. TIGHTENING TORQUE
   - F. COMPLIANCE WITH MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS.
4. FOR INSTALLATION PROCEDURES SEE CORRESPONDING ICC/ESR REPORTS.
5. USE CARE AND CAUTION TO AVOID CUTTING OR DAMAGING (E) REINFORCING BARS. MAINTAIN A MIN. CLEARANCE OF 1" BETWEEN REINFORCEMENT AND THE DRILLED-IN ANCHOR.
6. FOR TESTING REQUIREMENTS SEE TITLE 24, 1910A.5, CBC; AND TABLES BELOW.
7. CONCRETE ADHESIVE ANCHOR RODS SHALL BE ASTM A615 OR ASTM F1554 GR 36 U.O.N AND SHALL BE INSTALLED USING SIMPSON SET-XP EPOXY (AS SHOWN BELOW) PER ICC-ES ESR-2058.

SET-XP EPOXY ADHESIVE					
NOMINAL ROD/REBAR DIAMETER d_b (IN.)	DRILL BIT DIAMETER d_{hole} (IN.)	MAX TIGHTENING TORQUE (FT-LB)	EFFECTIVE EMBEDMENT DEPTH		MIN. CONC. THICKNESS h_{min} (IN.)
			MIN. h_{ef} (IN.)	Max. h_{ef} (IN.)	
⅜ OR #3	½	10	2⅜	7½	h_{ef} + 5d_b
½ OR #4	⅝	20	2¾	10	
⅝ OR #5	¾	30	3⅛	12½	
¾ OR #6	⅞	45	3½	15	
⅞ or #7	1	60	3½	17½	
1 or #8	1⅛	80	4	20	
1¼ or #10	1⅜	125	5	25	



- ALL CONCRETE ANCHORS AND DOWELS SHALL BE INSTALLED WITH PROPER TOOLS AND PROCEDURES IN STRICT ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS AND ICC-ES ESR REPORTS.
- NOTIFY ARCHITECT AND S.E.O.R. FOR CLARIFICATION WHERE CONCRETE THICKNESS DOES NOT ALLOW DESIGNATED EMBEDMENT.
- DO NOT DAMAGE OR CUT (E) REINFORCING BARS OR OTHER EMBEDDED ITEMS, RELOCATE DOWELS AS ACCEPTABLE BY ARCHITECT AND SEOR.
- PROVIDE EPOXIED DOWEL EMBEDMENT LENGTH AS NOTED ON DETAILS.

8. IF ANY ANCHOR FAILS TESTING, ALL ANCHORS OF THE SAME TYPE SHALL BE TESTED, WHICH ARE INSTALLED BY THE SAME TRADE, NOT PREVIOUSLY TESTED UNTIL TWENTY (20) CONSECUTIVE ANCHORS PASS, THEN RESUME THE INITIAL TEST FREQUENCY. WHEN POST-INSTALLED ANCHORS ARE USED FOR SILL PLATE BOLTING APPLICATIONS, 10 PERCENT OF THE ANCHORS SHALL BE TESTED. WHEN POST-INSTALLED ANCHORS ARE USED FOR OTHER STRUCTURAL APPLICATIONS, ALL SUCH ANCHORS SHALL BE TESTED. WHEN POST-INSTALLED ANCHORS ARE USED FOR NONSTRUCTURAL APPLICATIONS SUCH AS EQUIPMENT ANCHORAGE, 50 PERCENT OR ALTERNATE BOLTS IN A GROUP, INCLUDING AT LEAST ONE-HALF THE ANCHORS IN EACH GROUP, SHALL BE TESTED. UNDERCUT ANCHORS THAT ALLOW VISUAL CONFIRMATION OF FULL SET SHALL NOT REQUIRE TESTING. 10 PERCENT OF THOSE ANCHORS SPECIFIED ON THE CONSTRUCTION DOCUMENT SET SHALL BE TESTED. ADHESIVE ANCHORS USED TO INSTALL REINFORCING DOWEL BARS IN HARDENED CONCRETE, ONLY 25 PERCENT OF THE DOWELS SHALL BE TESTED IF INDICATED ON THE CONSTRUCTION DOCUMENT SET. ANCHORS TO BE TESTED SHALL BE SELECTED AT RANDOM BY THE SPECIAL INSPECTOR/INSPECTOR OF RECORD (IOR).
9. TEST EQUIPMENT (INCLUDING TORQUE WRENCHES IS TO BE CALIBRATED BY AN APPROVED TESTING LABORATORY IN ACCORDANCE WITH STANDARD RECOGNIZED PROCEDURES.
10. THE FOLLOWING CRITERIA APPLY FOR THE ACCEPTANCE OF INSTALLED ANCHORS:
    HYDRAULIC RAM METHOD: ANCHORS TESTED WITH A HYDRAULIC JACK OR SPRING LOADED APPARATUS SHALL MAINTAIN THE TEST LOAD FOR A MINIMUM OF 15 SECONDS AND SHALL EXHIBIT NO DISCERNIBLE MOVEMENT DURING THE TENSION TEST, E.G., AS EVIDENCED BY LOOSENING OF THE WASHER UNDER THE NUT. FOR ADHESIVE ANCHORS, WHERE OTHER THAN BOND IS BEING TESTED, THE TESTING APPARATUS SUPPORT SHALL NOT BE LOCATED WITHIN 1.5 TIMES THE ANCHOR'S EMBEDMENT DEPTH TO AVOID RESTRICTING THE CONCRETE SHEAR CONE TYPE FAILURE MECHANISM FROM OCCURRING.
    TORQUE WRENCH METHOD: TORQUE-CONTROLLED POST-INSTALLED ANCHORS TESTED WITH A CALIBRATED TORQUE WRENCH SHALL ATTAIN THE SPECIFIED TORQUE WITHIN ½ TURN OF THE NUT; OR ONE-QUATER (¼) TURN OF THE NUT FOR A ⅜-INCH SLEEVE ANCHOR ONLY. SCREW TYPE ANCHORS TESTED WITH A CALIBRATED TORQUE WRENCH SHALL ATTAIN THE SPECIFIED TORQUE WITHIN ONE-QUATER (¼) TURN OF THE SCREW AFTER INITIAL SEATING OF THE SCREW HEAD.
11. IF THE MANUFACTURER'S RECOMMENDED INSTALLATION TORQUE IS LESS THAN THE TEST TORQUE NOTED IN THE TABLE, THE MANUFACTURER'S RECOMMENDED INSTALLATION TORQUE SHOULD BE USED IN LIEU OF THE TABULATED VALUES.
12. ANCHOR BOLTS AND AUXILIARY FRAMING MEMBERS WHEN USED IN A CORROSIVE ENVIRONMENT SHALL BE STAINLESS STEEL AND WHEN USED FOR EXTERIOR APPLICATIONS (I.E. OUTDOOR CONSTRUCTION) SHALL BE HOT DIPPED GALVANIZED OR STAINLESS STEEL.
13. WHEN FASTENING DISSIMILAR METALS CAREFULLY CONSIDER THE CORRECT COMBINATION OF FASTENER AND MATERIAL NECESSARY TO AVOID GALVANIC CORROSION. CONSIDER USING NEOPRENE OR OTHER INERT WASHER WHEN FASTENING DISSIMILAR METALS AND FASTENERS.

M.E.P. COMPONENT ANCHORAGE NOTES:

1. ALL MECHANICAL, PLUMBING, AND ELECTRICAL COMPONENTS SHALL BE ANCHORED AND INSTALLED PER THE DETAILS ON THE DSA APPROVED CONSTRUCTION DOCUMENTS. WHERE NO DETAIL IS INDICATED, THE FOLLOWING COMPONENTS SHALL BE ANCHORED OR BRACED TO MEET THE FORCE AND DISPLACEMENT REQUIREMENTS PRESCRIBED IN THE 2016 CBC, SECTIONS 1616A.1.18 THROUGH 1616A.1.26 AND ASCE 7-10 CHAPTER 13, 26 & 30.
   - A. ALL PERMANENT EQUIPMENT AND COMPONENTS.
   - B. TEMPORARY OR MOVABLE EQUIPMENT THAT IS PERMANENTLY ATTACHED (E.G. HARD WIRED) TO THE BUILDING UTILITY SERVICES SUCH AS ELECTRICITY, GAS OR WATER.
   - C. MOVABLE EQUIPMENT WHICH IS STATIONED IN ONE PLACE FOR MORE THAN 8 HOURS AND HEAVIER THAN 400 POUNDS OR HAS A CENTER OF MASS LOCATED 4 FEET OR MORE ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT ARE REQUIRED TO BE ANCHORED WITH TEMPORARY ATTACHMENTS.
2. THE FOLLOWING MECHANICAL AND ELECTRICAL COMPONENTS SHALL BE POSITIVELY ATTACHED TO THE STRUCTURE, BUT THE ATTACHMENT NEED NOT BE DETAILED ON THE PLANS. THESE COMPONENTS SHALL HAVE FLEXIBLE CONNECTIONS PROVIDED BETWEEN THE COMPONENT AND ASSOCIATED DUCTWORK, PIPING, AND CONDUIT.
   - A. COMPONENTS WEIGHING LESS THAN 400 POUNDS AND HAVE A CENTER OF MASS LOCATED 4 FEET OR LESS ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT.
   - B. COMPONENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, LESS THAN 5 POUNDS PER FOOT, WHICH ARE SUSPENDED FROM A ROOF OR FLOOR OR HUNG FROM A WALL.
3. FOR THOSE ELEMENTS THAT DO NOT REQUIRE DETAILS ON THE APPROVED DRAWINGS, THE INSTALLATION SHALL BE SUBJECT TO THE APPROVAL OF THE DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE OR STRUCTURAL ENGINEER DELEGATED RESPONSIBILITY AND THE DSA DISTRICT STRUCTURAL ENGINEER. THE PROJECT INSPECTOR WILL VERIFY THAT ALL COMPONENTS AND EQUIPMENT HAVE BEEN ANCHORED IN ACCORDANCE WITH ABOVE REQUIREMENTS.

STRUCTURAL STEEL NOTES:

1. THE FABRICATION AND ERECTION OF ALL STEEL WORK SHALL CONFORM TO THE CONTRACT DOCUMENTS, DRAWINGS AND LATEST EDITIONS OF THE FOLLOWING CODES AND SPECIFICATIONS:
   - A.I.S.C. SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS.
   - A.I.S.C. CODE OF STANDARD PRACTICE.
   - A.I.S.C. MANUAL OF STEEL CONSTRUCTION.
   - SPECIFICATIONS FOR STRUCTURAL JOINTS USING HIGH STRENGTH BOLTS.
   - SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS (A.I.S.I.)
   - STRUCTURAL WELDING CODE (AWS) D1.1.
   - STRUCTURAL WELDING CODE - SEISMIC SUPPLEMENT (AWS) D1.8.
   - STEEL JOIST DESIGN AND CONSTRUCTION SHALL CONFORM TO THE APPLICABLE STANDARDS OF THE STEEL JOIST INSTITUTE.
2. UNLESS OTHERWISE NOTED ON THE DESIGN DRAWINGS, MATERIALS SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS IDENTIFIED WITH MARK AND MILL CERTIFICATION:

PLATES AND BARS	ASTM A36 (36 KSI)
STRUCTURAL PIPES	ASTM A53, Gr. B
STRUCTURAL RECTANGULAR/SQUARE HOLLOW STRUCTURAL STEEL (HSS)	ASTM A500, Gr. B (46 KSI)
OTHER STRUCTURAL STEEL SHAPES	ASTM A36
WASHERS	ASTM F436
NUTS	ASTM A563
ALL THREADED RODS	ASTM A36
ANCHOR RODS	ASTM F1554 Gr. 36

3. ALL STEEL SHALL BE FREE OF MILL SCALE, RUST OR OTHER CONTAMINANTS THAT WOULD IMPAIR THE BONDING OF CONCRETE TO THE STEEL. STRUCTURAL COMPONENT SURFACES SHALL BE PREPARED IN ACCORDANCE WITH SSPC SP2.
4. EXPOSED EXTERIOR STEEL SHALL BE HOT DIP GALVANIZED, PER ASTM A123 U.O.N.
5. EXPOSED INTERIOR STEEL SHALL BE SHOP PRIMED AND FIELD (FINAL) COATED.
6. ALL WELDING SHALL CONFORM TO STANDARD CODE AND A.W.S. FOR ARC AND GAS WELDING. USE THE ELECTRIC ARC PROCESS E-70 ELECTRODES; LOW HYDROGEN ELECTRODES FOR WELDING BOLTS AND RE-BAR AS PER A.S.T.M. A233.
7. SUBMIT SHOP DRAWINGS TO ARCHITECT (STRUCTURAL ENGINEER) FOR REVIEW PRIOR TO FABRICATION.
8. LENGTH OF WELDS SHOWN ARE EFFECTIVE LENGTHS AS SPECIFIED IN THE 2013 CBC. WHERE LENGTH OF WELD IS NOT SHOWN, IT SHALL BE FULL LENGTH OF JOINT. ALL BUTT WELDS SHALL BE FULL PENETRATION UNLESS NOTED OTHERWISE.
9. WHERE MINIMUM AISC FILLET WELD THICKNESS REQUIREMENT EXCEEDS WELDS SHOWN ON DETAILS, PROVIDE MINIMUM AISC WELD PER TABLE J2.4. VERIFY MAXIMUM WELD THICKNESS WITH AISC 360 SECTION 32B.
10. WELD SHALL BE TERMINATED AT THE END OF A JOINT IN A MANNER THAT WILL ENSURE SOUND WELDS. WHENEVER NECESSARY THIS SHALL BE DONE BY USE OF EXTENSION BARS AND RUN OFF TABS.
11. ALL STRUCTURAL WELDING SHALL BE DONE IN AN APPROVED FABRICATING SHOP 1704A.2.5. IN ABSENCE OF AN APPROVED SHOP, STRUCTURAL WELDING SHALL BE DONE UNDER THE SUPERVISION OF A CERTIFIED SPECIAL INSPECTOR.
12. ALL WELDING SHALL BE PERFORMED BY CERTIFIED WELDERS. ALL WELDING SHALL BE DONE UNDER THE SUPERVISION OF A CERTIFIED SPECIAL INSPECTOR.
13.

STRUCTURAL TESTING AND INSPECTION PROGRAM:

1. ALL STRUCTURAL TESTS AND INSPECTIONS SHALL COMPLY WITH ALL REQUIREMENTS AS STATED IN THE 2016 CBC CHAPTER 17A.
2. ALL TESTS AND INSPECTIONS SHALL BE PERFORMED BY AN INDEPENDENT AGENCY EMPLOYED BY THE OWNER OR ARCHITECT OF RECORD ACTING AS THE OWNER'S AGENT, BUT NOT THE CONTRACTOR OR ANY OTHER PERSON RESPONSIBLE FOR THE WORK, PER CBC SECTION 1704A.
3. TESTING LABORATORY SHALL PROVIDE SPECIAL INSPECTION DURING CONSTRUCTION, COMPLYING WITH 2016 CBC SECTIONS 1701A.3 AND 1701A.5. TESTING LABORATORY SHALL FURNISH COPIES OF TEST RESULTS AND FINAL INSPECTION REPORTS TO THE STRUCTURAL ENGINEER OF RECORD IN ADDITION TO OTHER NORMAL DISTRIBUTION WITHIN ONE WEEK OF TEST AND INSPECTION.
4. FOUNDATION INSPECTIONS SHALL BE COORDINATED WITH PROJECT GEOTECHNICAL ENGINEER AND SHALL COMPLY WITH ALL REQUIREMENTS OF THE CALIFORNIA BUILDING CODE, INCLUDING BUT NOT LIMITED TO, CBC CHAPTER 18A.
5. REFER TO THE APPROVED DSA TEST & INSPECTION FORM (DSA-103) FOR REQUIRED INSPECTIONS. ALSO SEE CURRENT CBC SECTION 1704A.

SPECIAL INSPECTION:

1. REFER TO THE APPROVED DSA FORM 103 FOR REQUIRED SPECIAL INSPECTIONS. ALSO SEE 2016 CBC SECTION 1704A.

ABBREVIATIONS

∠	ANGLE
@	AT
℄	CENTERLINE
°	DEGREE
Ø	DIAMETER
"	INCH; DITTO (SAME AS ABOVE)
≥	GREATER THAN OR EQUAL TO
≤	LESS THAN OR EQUAL TO
≠	NOT EQUAL TO
±	PLUS/MINUS
#	POUND OR NUMBER
A.B.	ANCHOR BOLT
ABV.	ABOVE
A.C.	ASPHALTIC CONCRETE
ADD'L.	ADDITIONAL
ADJ.	ADJACENT
A.F.F.	ABOVE FINISHED FLOOR
AGG.	AGGREGATE
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
ALT.	ALTERNATE
APPROX.	APPROXIMATE
ARCH.	ARCHITECT OR ARCHITECTURAL
A.T.R.	ALL THREADED ROD
BEV.	BEVELED
B.F.F.	BELOW FINISHED FLOOR
BLDG.	BUILDING
BLK.	BLOCK
BLKG.	BLOCKING
BM.	BEAM
B.N.	BOUNDARY NAIL
BNDY.	BOUNDARY
B.O.	BOTTOM OF
BOT.	BOTTOM
BRG.	BEARING
BRKT.	BRACKET
BTWN.	BETWEEN
CALCS.	CALCULATIONS
CALIF.	CALIFORNIA
CBC	CALIFORNIA BUILDING CODE
C.I.P.	CAST IN PLACE
C.J.	CONSTRUCTION JOINT
CLNG.	CEILING
CLR.	CLEAR OR CLEARANCE
CMU	CONCRETE MASONRY UNIT(S)
CNTR.	CENTER
COL.	COLUMN
CONC.	CONCRETE
CONN.	CONNECTION
COND.	CONDITION
CONT.	CONTINUATION OR CONTINUOUS
CONTR.	CONTRACTOR
CTSK.	COUNTERSINK OR COUNTERSUNK
D.F.	DOUGLAS FIR
D.F.-L.	DOUGLAS FIR LARCH
DL	DEAD LOAD
DBL.	DOUBLE
DEMO.	DEMOLITION
DET.	DETAIL
DIA. OR Ø	DIAMETER
DIAG.	DIAGONAL
DIAPH.	DIAPHRAGM
DIM.	DIMENSION
DIST.	DISTANCE
DN.	DOWN
do	DITTO
DTL.	DETAIL
DWG.	DRAWING
DWL.	DOWEL
(E)	EXISTING
EA.	EACH
E.F.	EACH FACE
ELEC.	ELECTRICAL
ELEV.	ELEVATION
EMBED.	EMBEDMENT
E.N.	EDGE NAIL
E.O.S.	EDGE OF SLAB
EQ.	EQUAL
EQUIP.	EQUIPMENT
E.S.	EACH SIDE
ETC.	ET CETERA
E.W.	EACH WAY
EXP.	EXPANSION
EXT.	EXTERIOR
F.D.	FLOOR DRAIN
F.F.	FINISHED FLOOR
F.J.	FLOOR JOIST
FLR.	FLOOR
F.O.	FACE OF
F.S.	FAR SIDE
FOUND. OR FND.	FOUNDATION
FT.	FOOT OR FEET
FTG.	FOOTING
GA.	GAUGE OR GAGE
GALV.	GALVANIZED
GEOTECH.	GEOTECHNICAL
GLU-LAM OR GLB	GLUE LAMINATED BEAM
GRTG.	GRATING
G.S.M.	GALVANIZED SHEET METAL
GYP. BD.	GYPSUM BOARD
H.A.S.	HEADED ANCHOR STUD
HD	HOLDOWN
H.D.G.	HOT DIP GALVANIZED
HDR.	HEADER
HGR.	HANGER
HORIZ.	HORIZONTAL
H.P.	HIGH POINT
H.S.B.	HIGH STRENGTH BOLT
HSS	HOLLOW STRUCTURAL SECTION
HT.	HEIGHT
I.D.	INSIDE DIAMETER
INCL.	INCLUDING

ABBREVIATIONS

INFO.	INFORMATION
INSUL.	INSULATION OR INSULATED
INT.	INTERIOR
INV.	INVERT
INTER.	INTERSECTION
JNT.	JOINT
JST.	JOIST
LB.	POUND
LDGR.	LEDGER
LGMS	LIGHT GAUGE METAL STEEL
LL	LIVE LOAD
L.L.V.	LONG LEG VERTICAL
L.L.H.	LONG LEG HORIZONTAL
LNG.	LONG OR LENGTH
LONGIT.	LONGITUDINAL
L.P.	LOW POINT
LS	LAG SCREW
LSL	LAMINATED STRAND LUMBER
LTWT. OR LW.	LIGHTWEIGHT
LVL	LAMINATED VENEER LUMBER
MAX.	MAXIMUM
M.B.	MACHINE BOLT
M.E.P.	MECHANICAL, ELECTRICAL & PLUMBING
MECH.	MECHANICAL
MNFR. OR MANUF.	MANUFACTURER
MIN.	MINIMUM
MSTR.	MASTER
MTL.	METAL
(N)	NEW
N.A. OR N/A	NOT APPLICABLE
N.I.C.	NOT IN CONTRACT
NOM.	NOMINAL
N.S.	NEAR SIDE
N.S.G.	NON-SHRINK GROUT
N.T.S.	NOT TO SCALE
O/	OVER
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
O.H.	OPPOSITE HAND
OPP.	OPPOSITE
OPT.	OPTIONAL
O.W.S.J.	OPEN WEB STEEL JOIST
PAR.	PARALLEL
PC.	PIECE
PENTR.	PENETRATION
PERF.	PERFORATED
PERP.	PERPENDICULAR
PF	PERIMETER FOOTING
PL	PLATE
PLYWD. OR PW	PLYWOOD
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSL	PARALLEL STRAND LUMBER
P.T.	PRESSURE TREATED
P.T.D.F.	PRESSURE TREATED DOUGLAS FIR
PV	PHOTOVOLTAIC
R.	RISER
RECOM. OR REC.	RECOMMENDATIONS
REINF.	REINFORCING
REQ'D.	REQUIRED
REBAR	REINFORCING BARS
R.J.	ROOF JOIST
RM.	ROOM
R.R.	ROOF RAFTER
RSC	RIGID STEEL CONDUIT
R.T.	ROOF TRUSS
RWD.	REDWOOD
S.A.D.	SEE ARCHITECTURAL DRAWINGS
SCBF	SPECIAL CONCENTRICALLY BRACED FRAME
SCHED.	SCHEDULE
S.C.J.	SLIP CONTROL JOINT
SECT.	SECTION
S.E.O.R.	STRUCTURAL ENGINEER OF RECORD
SHT.	SHEET
SIM.	SIMILAR
S.L.V.	SHORT LEG VERTICAL
SNGL.	SINGLE
S.M.S.	SHEET METAL SCREW
S.O.G.	SLAB ON GRADE
SPA.	SPACING
SQ.	SQUARE
S.S.	STAINLESS STEEL
STAGG.	STAGGERED
STD.	STANDARD
STIFF.	STIFFENER
S.W.	SHEARWALL
SYM.	SYMMETRICAL
T&B	TOP AND BOTTOM
T&G	TONGUE & GROOVE
T.	TREAD
T/P	TOP PLATE
THK.	THICK
T.O.	TOP OF
TYP.	TYPICAL
U.O.N.	UNLESS OTHERWISE NOTED
V.I.F.	VERIFY IN FIELD
VERT.	VERTICAL
W/	WITH
W/IN	WITHIN
W/O	WITH OUT
W.W.F.	WELDED WIRE FABRIC
W.W.M.	WELDED WIRE MESH
WD.	WOOD
W.P.	WORK POINT
W.P.J.	WEAKENED PLANE JOINT

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI
ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. RIEGE
SE 2677
12/31/2020
RENEWAL DATE
STRUCTURAL
STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

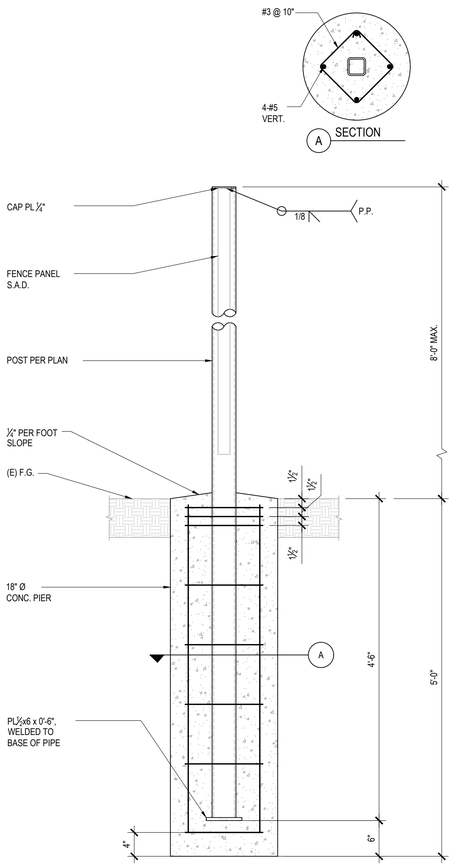
25555 HESPERIAN BLVD
HAYWARD, CA 94545

STRUCTURAL GENERAL NOTES

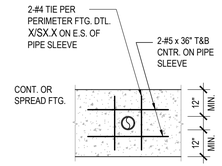
DRAWN BY: m.arquines	CHECKED BY: g.ng
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

S-002

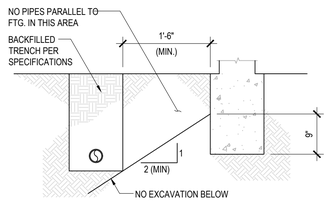
11/13/2019 - 09:02:05 AM
P:\C\C9500 Chabot-Las Positas_CC\C9506_Chabot_MPOE_Rplcmnt\3_Dwgs\S-002_NOTE-S-002.dwg - lxu



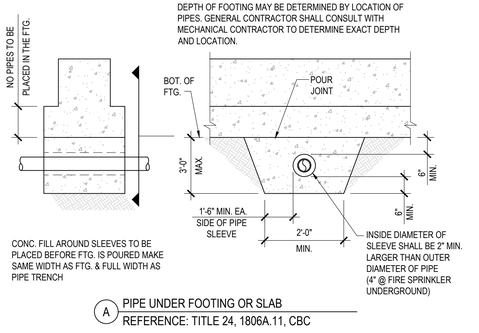
8 TYP. FENCE POST FOOTING
SCALE: 1"=1'-0"
!MSTR - DIMSCALE: 12
03PPBL03.DWG



C PIPE THRU FOOTING



B PIPE/TRENCH PARALLEL TO FOOTING



A PIPE UNDER FOOTING OR SLAB
REFERENCE: TITLE 24, 1806A.11, CBC

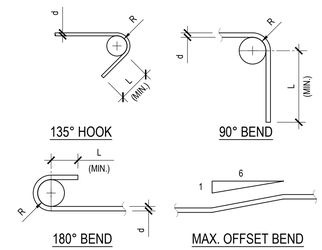
5 TYPICAL PIPE / TRENCH FOOTING TRENCH
SCALE: 3/4"=1'-0"
JOB# - DIMSCALE: 16
S-03-FTNG-PIPE-P01A.DWG

LEGEND FOR REINF. BENDS (NOT SHOWN TO SCALE)

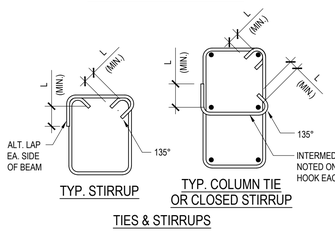
- INDICATES 90° BEND IN PLANE OF DRAWING
- INDICATES 90° BEND PERPENDICULAR TO PLANE OF DRAWING
- INDICATES 135° BEND IN PLANE OF DRAWING
- INDICATES 180° BEND IN PLANE OF DRAWING
- INDICATES 135° OR 180° BEND PERPENDICULAR TO PLANE OF DRAWING
- INDICATES OFFSET IN PLANE OF DRAWING

BARS OTHER THAN STIRRUPS, TIES, HOOPS & CROSS TIES				
BAR SIZE	"R"	180° "L"	135° "L"	90° "L"
#3	1½"	2½"	-	4½"
#4	1½"	2½"	-	6"
#5	1½"	2½"	-	7½"
#6	2½"	3"	-	9"
#7	2½"	3½"	-	10½"
#8	3"	4"	-	12"
#9	4½"	4½"	-	13½"
STIRRUPS, TIES, HOOPS & CROSS TIES				
#3	½"	-	3"	3"
#4	1"	-	3"	3"
#5	1½"	-	3½"	3½"
#6	2½"	-	4½"	9"
#7	2½"	-	5½"	10½"
#8	3"	-	6"	12"
(1) USE 3¾" IN CONC. BLK. CONSTRUCTION				

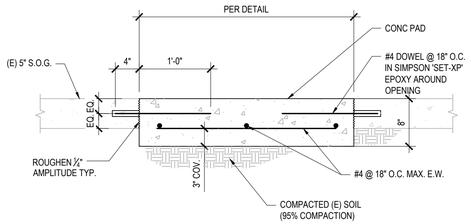
NOTES:
1. ALL BENDS SHALL BE MADE COLD.
2. R = MIN. BEND RADIUS



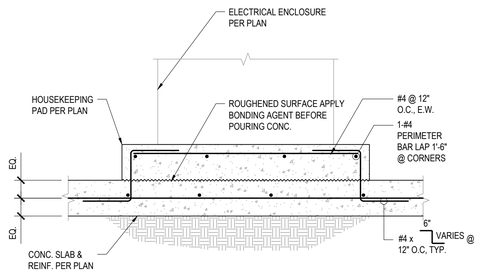
PRIMARY REINFORCEMENT



2 STANDARD HOOKS & BENDS FOR PRIMARY REINFORCEMENT, TIES & SITRRUPS
SCALE: N.T.S.
!MSTR - DIMSCALE: 16
S-05-RBAR-STND+HOOK-M01A.DWG

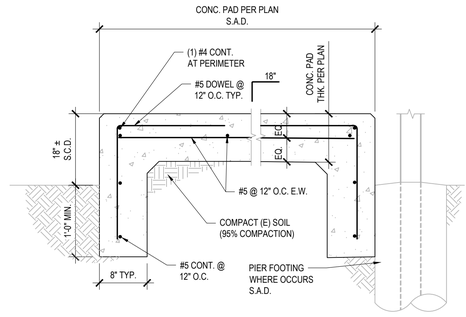


9 NEW CONCRETE THICKEN SLAB DETAIL
SCALE: 1"=1'-0"
JOB# - DIMSCALE: 12
S-03-CONC-PADD-M01A.DWG



NOTES:
1. FOR INFORMATION NOT SHOW SEE DETAIL 3/-

6 HOUSEKEEPING PAD DETAIL
SCALE: 1"=1'-0"
!MSTR - DIMSCALE: 12
S-03-PADD-CURB-M01A.DWG



NOTES:
1. COORDINATE TOP BAR PLACEMENT WITH FUTURE ANCHOR BOLTS, HANDRAILS, ETC.
2. CHAMFER EDGES WHERE REQ'D.

3 CONCRETE PAD DETAIL
SCALE: 1"=1'-0"
!MSTR - DIMSCALE: 12
03PDC803.DWG

DSA:

IDENTIFICATION STAMP
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APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
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3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

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REGISTERED PROFESSIONAL ENGINEER
ROBERT J. RIEGEL
SE 2677
12/31/2020
RENEWAL DATE
STRUCTURAL
STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

CONCRETE DETAILS

DRAWN BY: m.arquines	CHECKED BY: g.ng
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

S-003

11/13/2019 - 09:02:12 AM
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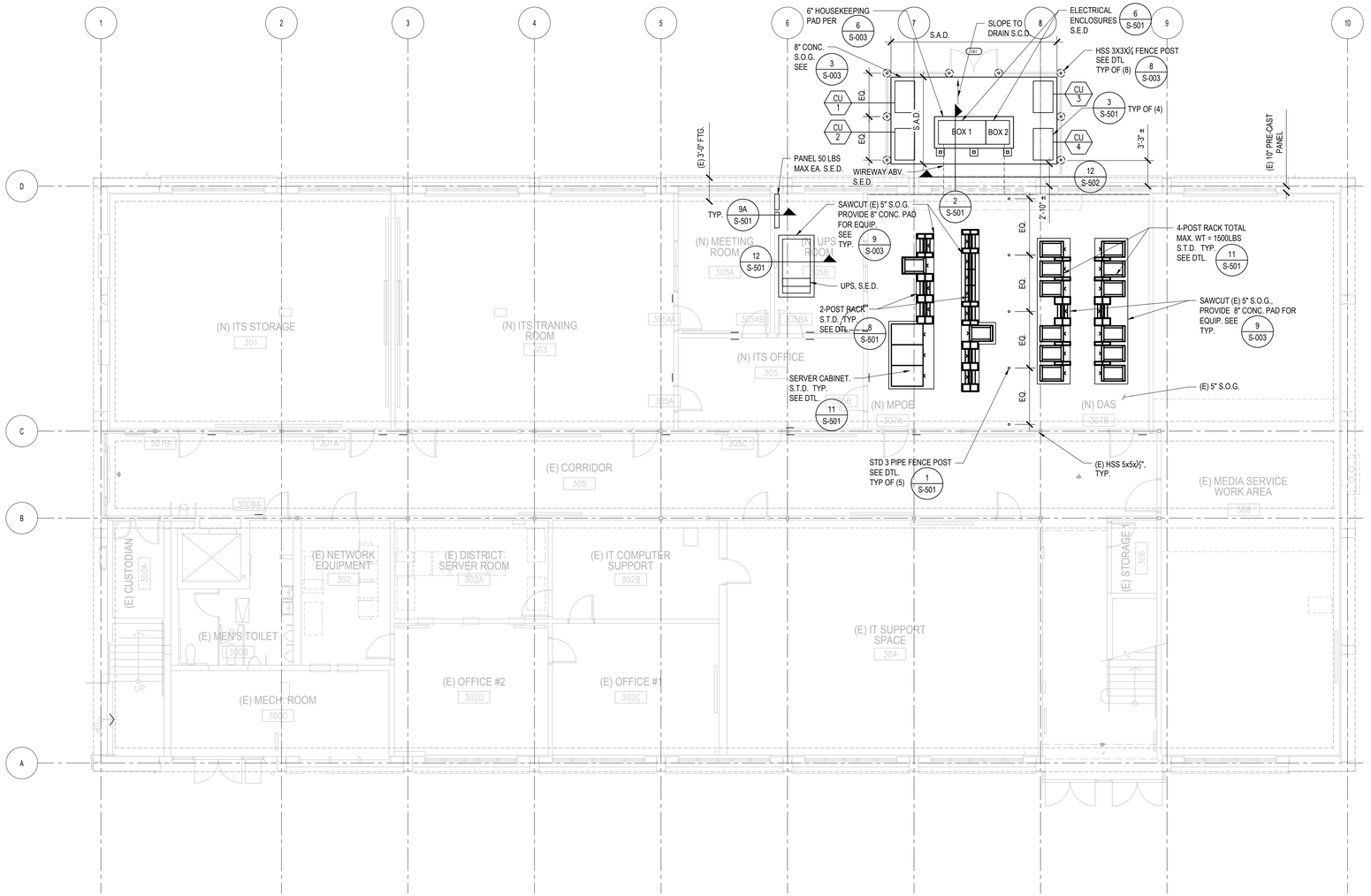

1 FLOOR PLAN
SCALE : 1/8" = 1'-0"

NORTH

SHEET NOTES:

1. SEE SHEETS S-001 AND S-002 FOR GENERAL NOTES.
2. SEE TYPICAL CONCRETE DETAIL ON SHEET S-003.
3. FOR TELECOM ROOM EQUIPMENT SCHEDULE, SEE SHT. T-400

-

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3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

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REGISTERED PROFESSIONAL ENGINEER
ROBERT J. RIEGEL
SE 2677
12/31/2020
RENEWAL DATE
STRUCTURAL
STATE OF CALIFORNIA

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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

**BUILDING 300
FLOOR
PLAN**

DRAWN BY: m.arquines | CHECKED BY: g.ng
DATE: 11/7/2019 | PROJECT NO: C9506
SHEET NO:

S-121

11/13/2019 - 09:05:57 AM
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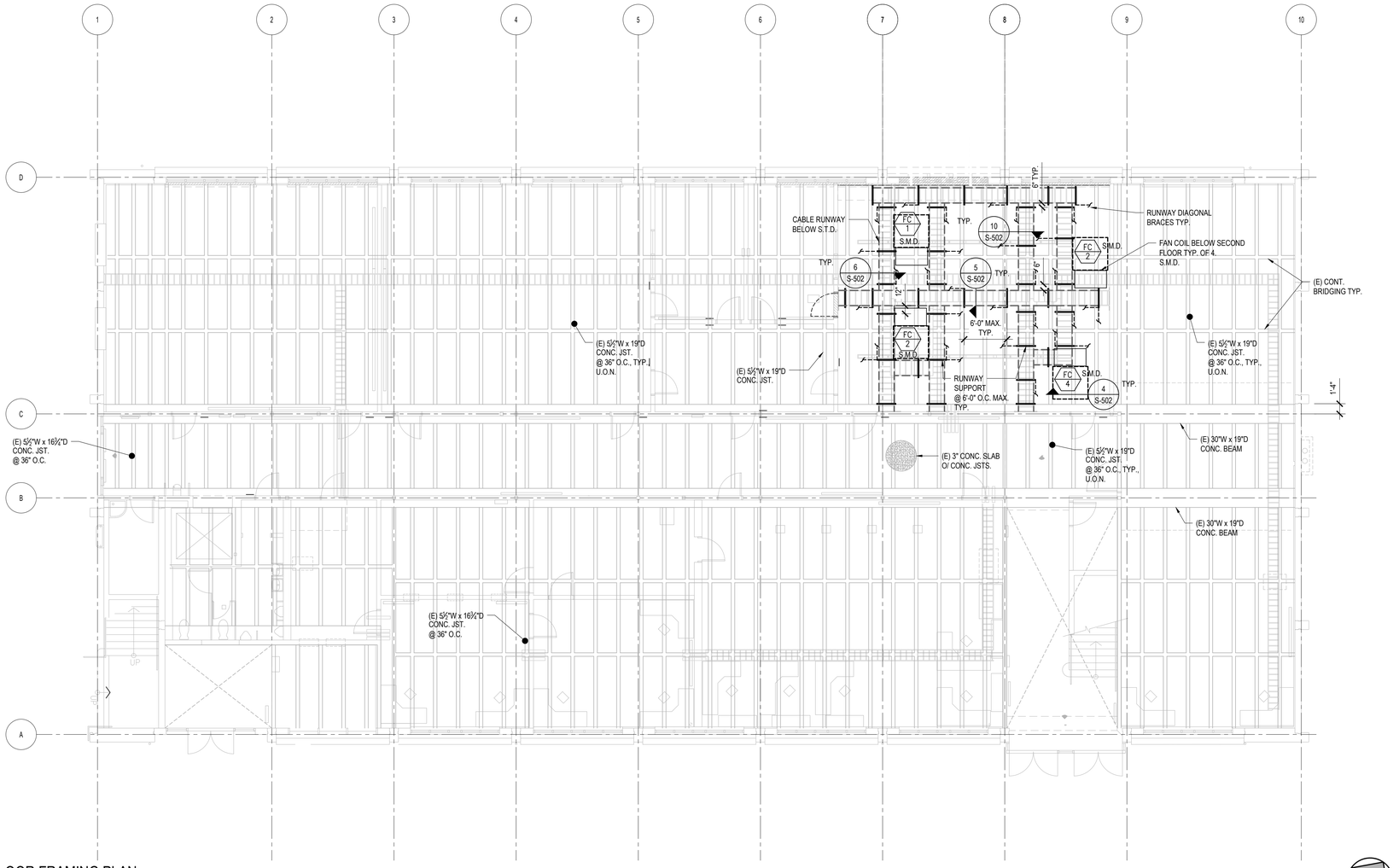

1 SECOND FLOOR FRAMING PLAN

SCALE : 1/8" = 1'-0"

NORTH

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APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

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3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

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REGISTERED PROFESSIONAL ENGINEER
ROBERT J. RIEGEL
SE 2677
12/31/2020
RENEWAL DATE
STRUCTURAL
STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

BUILDING 300 SECOND FLOOR FRAMING PLAN

DRAWN BY: m.arquines	CHECKED BY: g.ng
DATE: 11/7/2019	PROJECT NO: C9506

SHEET NO:

S-141

11/13/2019 - 09:02:21 AM
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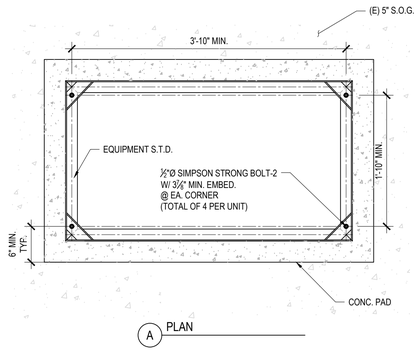
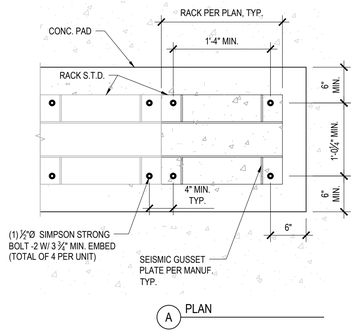
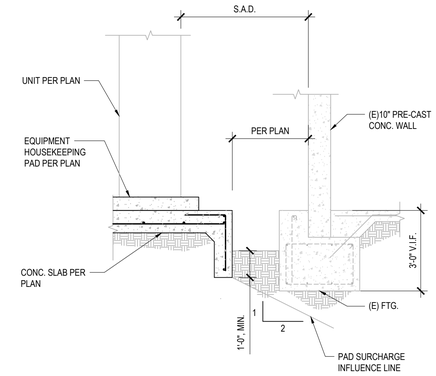
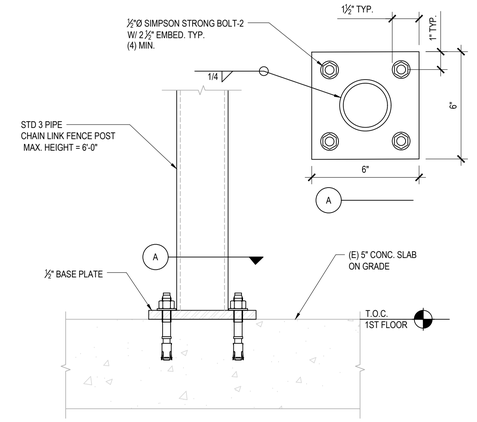


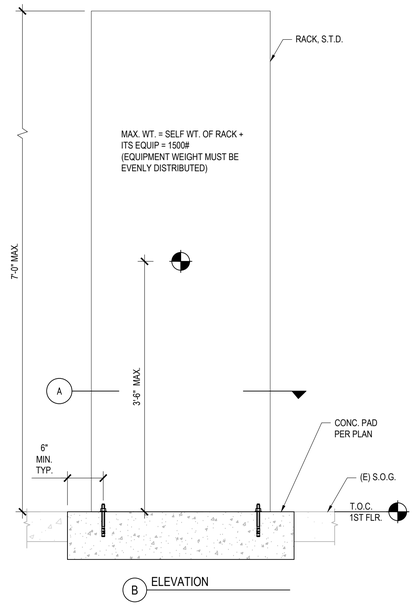




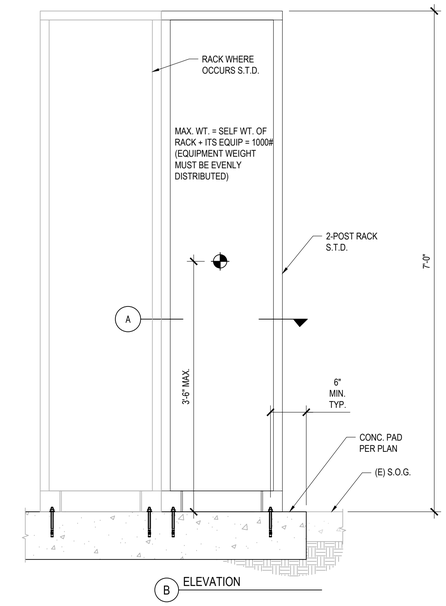
4 SECTION
SCALE: 3/8"=1'-0"
JOB# - DIMSCALE: 32
S-03-EQUIP-PAD-M03.A.DWG



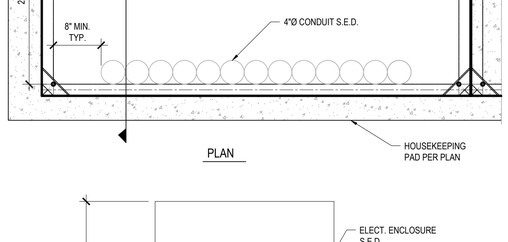
1 CHAIN LINK FENCE POST BASE PLATE DETAIL
SCALE: 3"=1'-0"
JOB# - DIMSCALE: 4
DRAWING2.DWG

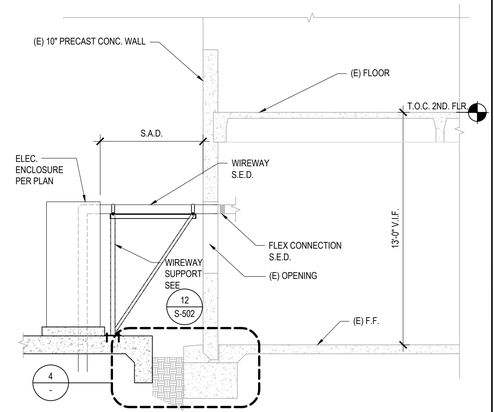


11 4-POST RACK/SERVER CABINET ANCHORAGE DETAIL
SCALE: 1"=1'-0"
IMSTR - DIMSCALE: 12
S-03-EQIP-ANCH-MDF-M01C.DWG

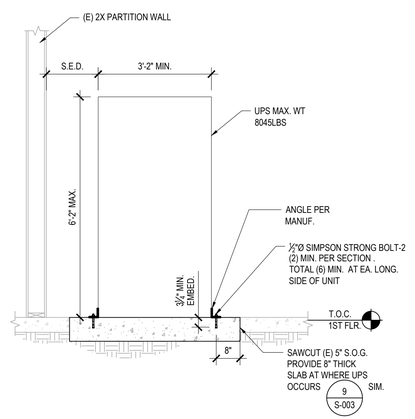


8 2-POST RACK ANCHORAGE DETAIL
SCALE: 1"=1'-0"
IMSTR - DIMSCALE: 12
S-03-EQIP-ANCH-RACK-P01C.DWG





2 BUILDING SECTION
SCALE: 1/4"=1'-0"
JOB# - DIMSCALE: 48
S-03-BLDG-SECT-P01A.DWG



12 UPS SECTION
SCALE: 1/4"=1'-0"
JOB# - DIMSCALE: 48
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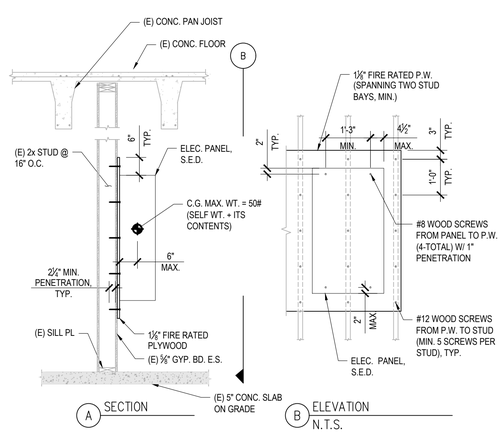
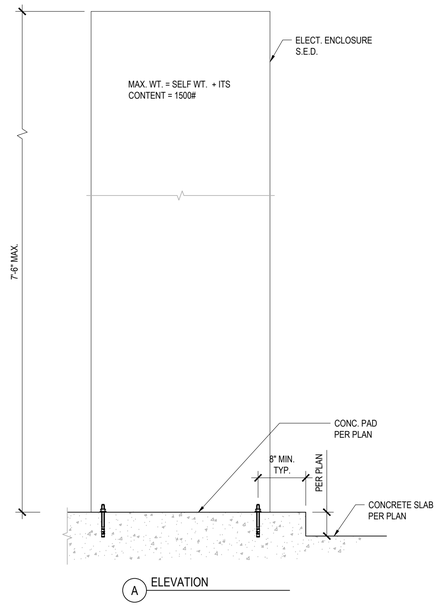
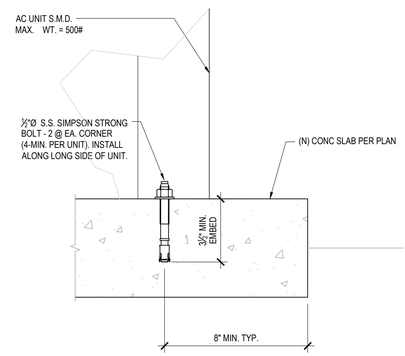


9 WALL MOUNTED PANEL
SCALE: 1/2"=1'-0"
JOB# - DIMSCALE: 24
S-05-EQIP-CONN-IDF-P01A.DWG



6 ELECT. ENCLOSURE ANCHORAGE ON CONC. PAD
SCALE: 1"=1'-0"
IMSTR - DIMSCALE: 12
S-03-EQIP-ANCH-PANL-P01.DWG



3 EQUIPMENT ANCHORAGE DETAIL - AC UNIT
SCALE: 3"=1'-0"
JOB# - DIMSCALE: 4
S-EQIP-ANCH-P06A.DWG

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3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. RIEGEL
SE 2677
12/31/2020
RENEWAL DATE
STRUCTURAL
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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

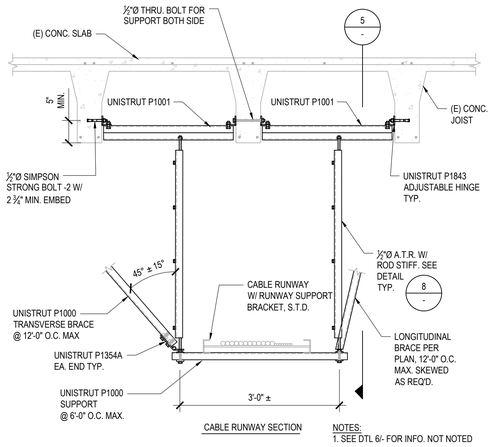
25555 HESPERIAN BLVD
HAYWARD, CA 94545

EQUIPMENT ANCHORAGE DETAILS

DRAWN BY: m.arquines	CHECKED BY: g.ng
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

S-501

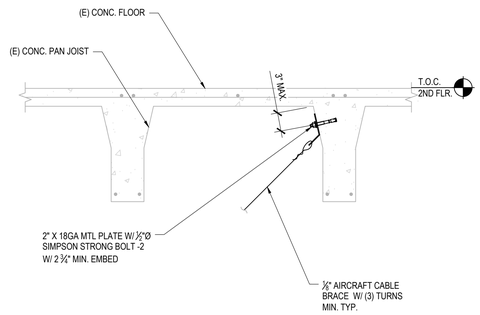
11/13/2019 - 09:02:29 AM
P:\C\C9500 Chabot\4.as Posted\as_CC\C9506_Chabot_MPOE_Rplcmnt\3_Dwgs\S-501_DT1\+S-501.dwg - lxu



10 CABLE RUNWAY SUPPORT - PARALLEL CONCRETE JOIST

SCALE: 3/4"=1'-0"

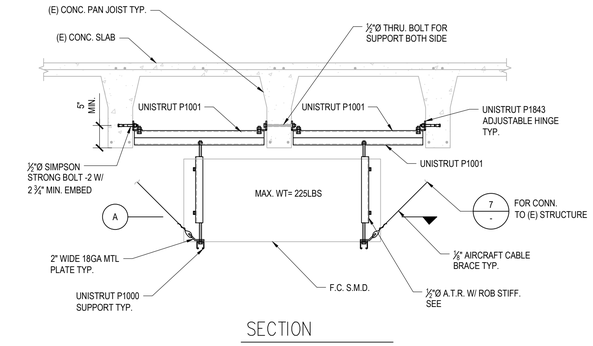
JOB# - DIMSCALE: 16
03-EQUIP-JOST-SUSP-P01A.DWG



7 SEISMIC BRACE DETAIL

SCALE: 3/4"=1'-0"

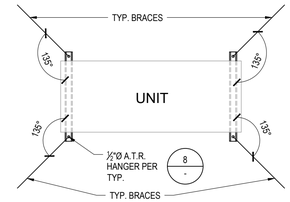
JOB# - DIMSCALE: 16
03-EQUIP-JOST-SUSP-P01A.DWG



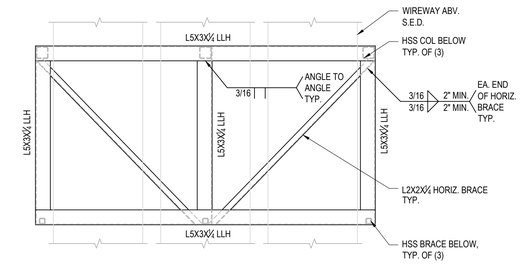
4 FC UNIT SUSPENSION DETAIL

SCALE: 3/4"=1'-0"

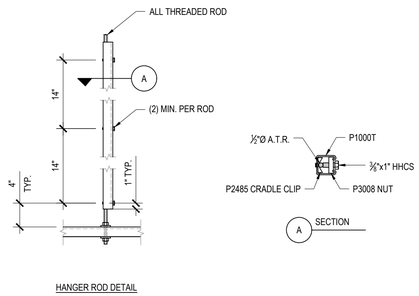
JOB# - DIMSCALE: 16
03-EQUIP-JOST-SUSP-P01A.DWG



A BRACE PLAN



PLAN



HANGER ROD DETAIL

11 WIREWAY SUPPORT FRAME PLAN

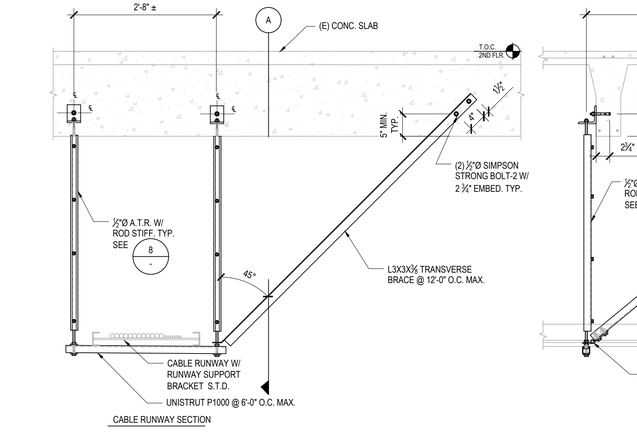
SCALE: 3/4"=1'-0"

JOB# - DIMSCALE: 16
S-05-ELEC-COND-SUPP-P01A.DWG

8 TYP. ROD STIFFENER DETAIL

SCALE: 1"=1'-0"

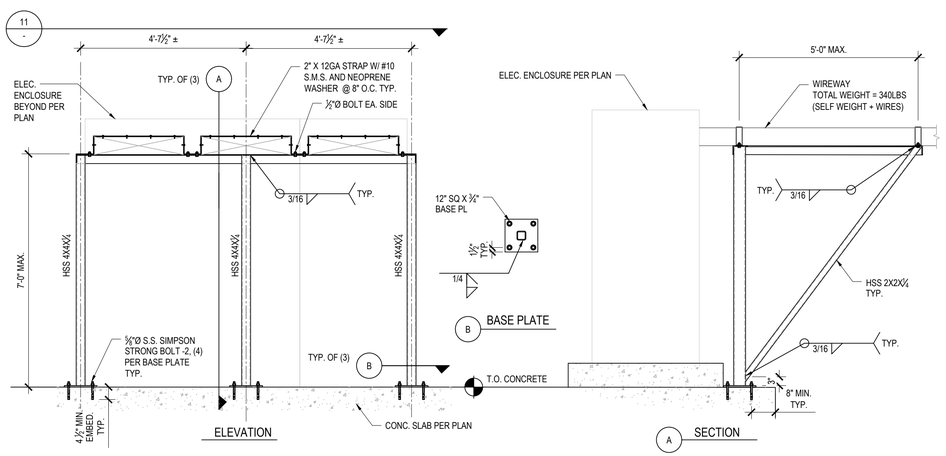
JOB# - DIMSCALE: 12
DRAWING3.DWG



5 CABLE RUNWAY SUPPORT - PERPENDICULAR TO JOIST

SCALE: 3/4"=1'-0"

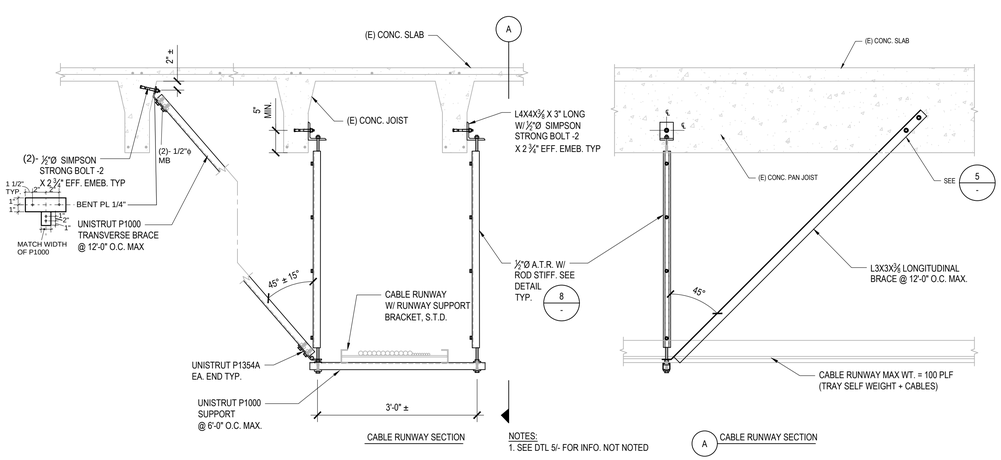
JOB# - DIMSCALE: 16
03-EQUIP-JOST-SUSP-P01A.DWG



12 WIREWAY SUPPORT FRAME

SCALE: 1/2"=1'-0"

JOB# - DIMSCALE: 24
S-05-ELEC-COND-SUPP-ELEV-P01A.DWG



6 CABLE RUNWAY SUPPORT - PARALLEL CONCRETE JOIST

SCALE: 3/4"=1'-0"

JOB# - DIMSCALE: 16
03-EQUIP-JOST-SUSP-P01A.DWG

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

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RENEWAL DATE
STRUCTURAL
STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

EQUIPMENT ANCHORAGE DETAILS

DRAWN BY: m.arquines	CHECKED BY: g.ng
DATE: 11/7/2019	PROJECT NO: C9506
SHEET NO:	

S-502

11/13/2019 - 09:02:39 AM
P:\C\C9500 Chabot-Las Positas_CC\C9506_Chabot_MPOE_Rplcmnt\3_Dwgs\S-502_DTL+S-502.dwg - lxu

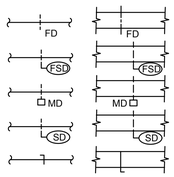
MECHANICAL SYMBOL LIST

NOTE: This is a standard symbol list and not all items listed may be used.

Abbreviations

A/C	AIR CONDITION(ED)
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
BDD	BACKDRAFT DAMPER
BFF	BELOW FINISHED FLOOR
BFP	BACKFLOW PREVENTER
BHP	BRAKE HORSEPOWER
CD	CEILING DIFFUSER
CD	CONDENSATE DRAIN
CF	CUBIC FOOT
CFM	CUBIC FEET PER MINUTE
COP	COEFFICIENT OF PERFORMANCE
CT	COOLING TOWER
CU	CONDENSING UNIT
CV	CHECK VALVE
CW	COLD WATER
D	DROP
DB	DECIBEL
DB	DRY BULB
DI	DIGITAL INPUT TO DDC PANEL
DIA	DIAMETER
DO	DIGITAL OUTPUT FROM DDC PANEL
DX	DIRECT EXPANSION
EAT	ENTERING AIR TEMPERATURE
EER	ENERGY EFFICIENCY RATING
EF	EXHAUST FAN
EFF	EFFICIENT
EL	ELEVATION
ELECT	ELECTRICAL
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
F	FAHRENHEIT
FC	FAN COIL
FD	FIRE DAMPER
FLA	FULL LOAD AMPS
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FEET
GAL	GALLONS
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HD	HEAD
HP	HORSEPOWER
HTG	HEATING
HTR	HEATER
HWC	HOT WATER COIL
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCHES
KW	KILOWATT
LAT	LEAVING AIR TEMPERATURE
LH	LATENT HEAT
LWT	LEAVING WATER TEMPERATURE
MA	MIXED AIR
MBH	THOUSAND BTU'S PER HOUR
MD	MOTORIZED DAMPER
MS	MOTOR STARTER
MW	MAKE-UP WATER
NIC	NOT IN CONTRACT
NO.	NUMBER
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OBD	OPPOSED BLADE DAMPER
OD	OUTSIDE DIAMETER
P	PUMP
PD	PRESSURE DROP
PH	PHASE
PRV	PRESSURE REDUCING VALVE
R	RISE
RA	RETURN AIR
RET	RETURN
RH	RELATIVE HUMIDITY
SA	SUPPLY AIR
SEER	SEASONAL ENERGY EFFICIENCY RATING
SF	SQUARE FEET
SH	SENSIBLE HEAT
SOV	SHUT OFF VALVE
SP	STATIC PRESSURE
T, TEMP	TEMPERATURE
TD	TEMPERATURE DIFFERENCE
TH	TOTAL HEAT
TP	TOTAL PRESSURE
VAV	VARIABLE AIR VOLUME
W	WATT
WB	WET BULB
WC	WATER COLUMN

Dampers



FIRE DAMPER

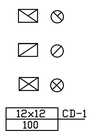
FIRE/SMOKE DAMPER

MOTORIZED DAMPER

SMOKE DAMPER

VOLUME DAMPER

Diffusers and Grilles



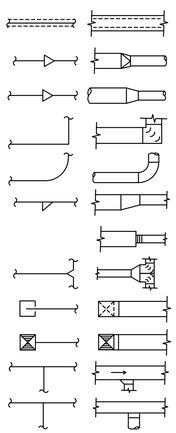
EXHAUST AIR

RETURN AIR

SUPPLY AIR

DIFFUSER OR GRILLE IDENTIFICATION

Ductwork Fittings



ACOUSTICALLY LINED DUCT (SIZES SHOWN ARE NET INSIDE)

CONCENTRIC SQUARE TO ROUND

CONCENTRIC TRANSITION, RECTANGULAR OR ROUND

MITERED ELBOW WITH TURNING VANES

RADIUSED ELBOW

ECCENTRIC TRANSITION, RECTANGULAR OR ROUND

FLEXIBLE CONNECTION

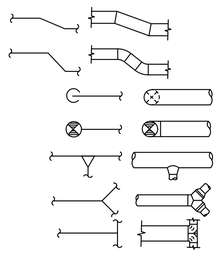
NON-SYMMETRICAL WYE

RECTANGULAR DUCT DROP

RECTANGULAR DUCT RISER

RECTANGULAR MAIN WITH RECTANGULAR BRANCH

RECTANGULAR MAIN WITH ROUND BRANCH



RECTANGULAR OFFSET LESS THAN 15°

RECTANGULAR OFFSET MORE THAN 15°

ROUND DUCT DROP

ROUND DUCT RISER

ROUND DUCT WITH ROUND BRANCH

ROUND WYE

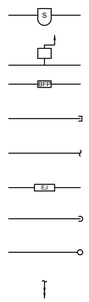
SYMMETRICAL WYE

General

RECTANGULAR DUCT SIZING

ROUND DUCT SIZING

Piping Fittings, Appurtenances and Equipment



AIR SEPARATOR

AUTOMATIC AIR VENT

BACKFLOW PREVENTER

CAP

CONTINUATION

EXPANSION JOINT

PIPE DROP

PIPE RISE

PIPE TO DRAIN

GENERAL SEISMIC BRACING

A. PROVIDE SEISMIC BRACING OF HVAC EQUIPMENT, DUCTWORK, AND PIPING IN ACCORDANCE WITH THE REQUIREMENTS OF THE LATEST BUILDING CODE WITH AN IMPORTANCE FACTOR IDENTIFIED ON ARCHITECTURAL AND STRUCTURAL DOCUMENTS.

B. REFER TO STRUCTURAL DRAWINGS FOR CONCRETE ANCHOR TYPE AND INSTALLATION REQUIREMENTS.

C. SUBMIT SEISMIC BRACING DETAILS FOR REVIEW.

D. UNLESS THE STRUCTURAL DRAWINGS HAVE AN ENGINEERED SYSTEM, OR THE CONTRACTOR PROVIDES ENGINEERED SYSTEMS SIGNED BY A CALIFORNIA REGISTERED CIVIL OR STRUCTURAL ENGINEER, SUPPORT AND BRACE DUCTWORK, PIPING, AND APPURTENANCES WITH OSHPD PRE-APPROVED SYSTEMS (WHETHER AN OSHPD PROJECT OR NOT):

1. OPM-0043-13 MASON SEISMIC RESTRAINT COMPONENTS FOR SUSPENDED UTILITIES.
2. OPM 0052-13 EATON/TOLCO SEISMIC BRACING & HANGERS.

E. WITHOUT ANY EXCEPTIONS, BRACE EVERY RUN OF DUCT DESIGNED TO CARRY TOXIC OR EXPLOSIVE GASSES, OR USED FOR SMOKE CONTROL OR PRESSURIZATION AIR. FOR OTHER DUCTWORK BRACE EVERY RUN OF DUCT WITH A CROSS SECTIONAL AREA OF LARGER THAN 6 SQ.FT., EXCEPT THAT BRACING OF DUCTWORK WITH SUPPORT ROD LENGTH LESS THAN 12" IS NOT REQUIRED. ROD LENGTH SHALL BE AS MEASURED FROM TOP OF DUCT TO BOTTOM OF SUPPORT WHERE THE HANGER IS ATTACHED. SEISMIC BRACING, WHERE SHOWN ON DRAWINGS, IS THE MINIMUM REQUIRED; PROVIDE ADDITIONAL BRACING AS REQUIRED BY OPM-0043-13, OR EQUAL.

F. WHERE BRACING IS REQUIRED, BRACE DUCTWORK FOR EACH STRAIGHT RUN OF DUCT WITH THE FOLLOWING REQUIREMENTS (SEE OPM-0043-13 FOR ADDITIONAL REQUIREMENTS):

1. LONGITUDINAL BRACING: MINIMUM 1, WITH MAXIMUM SPACING OF 60'.
2. TRANSVERSE BRACING: MINIMUM TWO, WITH MAXIMUM SPACING OF 30', AT END OF DUCT RUNS HAVING MIN OF 2 SUPPORTS, AND AT EVERY DROP OR RISE EXCEPT FOR CONNECTION TO DIFFUSERS WHERE THE ELEVATION CHANGE OF CONNECTING DUCTWORK IS LESS THAN 24 INCHES.

SHEET INDEX

GENERAL MECHANICAL NOTES

A. PROVIDE MISCELLANEOUS METALS AND MATERIALS FOR A COMPLETE INSTALLATION (IE. SUPPORT, BRACING, ETC.)

B. PROVIDE EQUIPMENT SUBMITTAL. FOR REVIEW, IN ACCORDANCE WITH THE SPECIFICATIONS. DO NOT DELIVER TO THE JOB SITE ANY PRODUCTS WITHOUT PRIOR REVIEW BY THE ARCHITECT. SUBMIT ALL REQUIRED SUBMITTALS AT ONE TIME. AT CONTRACTOR'S OPTION, 3 SEPARATE SUBMITTALS MAY BE SUMBITTED, CONSISTING OF: UNDERGROUND WORK, BUILDING WORK, AND BUILDING AUTOMATION SYSTEM – DEVIATIONS WILL BE RETURNED WITHOUT REVIEW. INCOMPLETE SUBMITTALS WILL BE RETURNED WITHOUT REVIEW. ENGINEER WILL PROVIDE MAXIMUM OF TWO REVIEWS OF SUBMITTAL PACKAGE. ARRANGE FOR ADDITIONAL REVIEWS AND/OR EARLY REVIEW OF LONG-LEAD ITEMS AND BEAR COSTS OF THESE ADDITIONAL REVIEWS AT ENGINEER'S STANDARD HOURLY RATES. SUBSTITUTION REQUESTS WILL NOT BE REVIEWED AFTER AWARD OF CONTRACT.

C. PROVIDE SMOKE DETECTORS IN MAIN SUPPLY AIR DUCT OF ANY SUPPLY AIR SYSTEM WITH AIR QUANTITY OF MORE THAN 2000 CFM OR OF SUPPLY AIR SYSTEM(S) WHERE THE COMBINED SUPPLY AIR QUANTITY OF SUPPLY AIR SYSTEM(S) SUPPLYING AIR INTO ONE ZONE EXCEED 2000 CFM.

D. WHERE COMBINATION FIRE AND SMOKE DAMPER IS SHOWN IMMEDIATELY BEHIND A WALL MOUNTED GRILLE AND THERE IS INSUFFICIENT ACCESS AT DUCTWORK, ENLARGE THE WIDTH OF THE GRILLE AND FSD BY A MINIMUM OF 6 INCHES, OR AS OTHERWISE REQUIRED BY FSD MANUFACTURER, AND PROVIDE A "FRONT ACCESS" FSD FOR ACCESS TO FSD COMPONENTS FROM FACE OF GRILLE. INSTALL GRILLE FLUSH WITH WALL SURFACE AND LOCATE DAMPER ACTUATOR OUTSIDE OF THE AIRSTREAM. FSD'S SHALL BE RUSKIN FSD-60FA OR EQUAL

E. PRIOR TO SUBMISSION OF BID, REVIEW A COMPLETE SET OF CONSTRUCTION DOCUMENTS (INCLUDING ALL OTHER TRADES). INCLUDE ADDITIONAL PIPE OR DUCT OFF-SETS THAT MAY BE REQUIRED TO CLEAR STRUCTURE, FINISHES OR WORK OF OTHER TRADES. FIELD VERIFY EXACT LOCATION AND SIZES OF EXISTING UTILITIES, THE PROPOSED POINT OF CONNECTIONS TO EXISTING SYSTEMS, AND NEW ROUTINGS. EXTRA PAYMENT WILL NOT BE ALLOWED FOR WORK RESULTING FROM LACK OF APPRAISAL OF ENTIRE SCOPE OF WORK PRIOR TO BID. SYSTEM LAYOUTS AS INDICATED ON DRAWINGS ARE GENERALLY DIAGRAMMATIC BUT SHALL BE FOLLOWED AS CLOSELY AS ACTUAL CONSTRUCTION WILL PERMIT.

F. PROVIDE DUCT ACCESS DOORS FOR EQUIPMENT AND DEVICES REQUIRING ACCESS OR RESETTING (IE. FIRE AND SMOKE DAMPERS, SMOKE DAMPERS, SENSORS, ETC.) INDICATE SIZE AND LOCATION ON COORDINATED SHOP DRAWINGS.

G. FLASH AND COUNTER FLASH ALL ROOF PENETRATIONS TO SEAL WEATHER TIGHT (SEE ARCHITECTURAL ROOFING DETAILS AND SPECIFICATIONS).

H. PROVIDE DUCTWORK AND TRANSITIONS EQUAL TO DUCT FREE AREA SHOWN ON DRAWINGS, TO PREVENT A SPATIAL CONFLICT. AT CONTRACTOR'S OPTION AND IF SPATIAL CONSTRAINTS ALLOW IT, ROUND SPIRAL DUCTWORK, OF EQUAL CROSS-SECTIONAL AREA OR LARGER, MAY BE USED IN LIEU OF RECTANGULAR DUCTWORK WHERE SHOWN ON PLANS.

I. PROVIDE FIELD INSTALLED OR MANUFACTURER'S REFRIGERANT LINE SETS BETWEEN THE SPLIT SYSTEMS' INDOOR AND OUTDOOR COMPONENTS. SIZING, QUANTITY, AND INSTALLATION OF PIPES SHALL BE PER MANUFACTURER'S RECOMMENDATIONS BASED ON ACTUAL FIELD INSTALLED LENGTH. PROVIDE HARD WIRED THERMOSTATS AND CONTROL WIRING IN CONDUIT BETWEEN INDOOR AND OUTDOOR UNITS.

J. EQUIPMENT, HVAC DUCTS, PIPING AND OTHER DEVICES AND MATERIALS INSTALLED OUTDOORS OR EXPOSED TO WEATHER SHALL BE WEATHER PROOF.

K. USE FLEXIBLE DUCTS ONLY FOR THE LAST 5 FEET MAXIMUM AT AIR OUTLETS, EXCEPT FOR OSHPD PROJECTS WHERE A MAXIMUM OF 10 FEET MAY BE USED. PER 2016 CMC-603.4.1 EXCEPT FOR RESIDENTIAL OCCUPANCIES DO NOT USE FLEXIBLE DUCTWORK IN LIEU OF ELBOWS OR FITTINGS.

L. PROVIDE MANUAL VOLUME DAMPERS AT EACH GRILLE, REGISTER, AND DIFFUSER, AND LOCATE EQUIDISTANCE BETWEEN BRANCH TAKEOFF AND AIR INLET/OUTLET. DO NOT USE VOLUME DAMPERS INTEGRAL WITH GRILLES, DIFFUSERS AND REGISTERS FOR AIR BALANCING.

M. INSTALL EQUIPMENT WITH SUFFICIENT ACCESS TO PANELS, CONTROLS, FILTERS, MOTORS, ETC. COORDINATE ACCESS TO ALL DAMPERS, VALVES, AND OTHER SERVICEABLE EQUIPMENT. REVIEW CEILING HEIGHTS AND COORDINATE ACCESS PANEL LOCATIONS.

N. COORDINATE EQUIPMENT PLATFORMS, AND CUTTING AND PATCHING. OBTAIN WRITTEN PERMISSION FROM THE ARCHITECT PRIOR TO ANY STRUCTURAL MODIFICATIONS, CUTTING OR PATCHING WORK. KEEP SAW CUTTING TO A MINIMUM.

O. VERIFY DIFFUSERS, GRILLES, AND REGISTER MOUNTING FRAME TYPES WITH CONSTRUCTION TYPE AND CONFIGURATION.

P. PAINT FLAT BLACK ALL VISIBLE INTERIOR PORTIONS OF DUCTWORK.

Q. PROTECT AND ISOLATE DUCTS STORED ON CONSTRUCTION SITE FROM DUST CONTAMINATION.

R. COORDINATE LOCATION OF SENSORS AND THERMOSTATS WITH ARCHITECT. COMPLY WITH ADA REQUIREMENTS.

S. "DEMOLISH" OR "REMOVE" MEAN: REMOVE AND RETURN TO OWNER FOR ACCEPTANCE, AND DISPOSE OF ANY ITEMS NOT ACCEPTED BY THE OWNER.

T. SEE EQUIPMENT SCHEDULES FOR BRANCH PIPE SIZES TO EQUIPMENT, WHERE PIPE SIZES ARE NOT SHOWN ON PLANS.

U. PROVIDE REMOTE DAMPER OPERATORS AS MANUFACTURED BY YOUNG REGULATOR COMPANY, MODEL 315 AND 270-275, OR EQUAL, FOR DAMPERS ABOVE INACCESSIBLE CEILINGS (SUCH AS GYPBORAD).

V. COORDINATE WITH DIVISION 26 FOR LOCATION OF POWER AND LOCAL DISCONNECTS FOR MECHANICAL EQUIPMENT DEVICES. PROVIDE STARTERS FOR EQUIPMENT WITHOUT VFD'S, ECM MOTORS, OR EQUIPMENT WITHOUT INTEGRAL STARTERS.

W. MAINTAIN MINIMUM ELECTRICAL CODE AND UNIT MANUFACTURER'S CLEARANCES TO ADJACENT CONSTRUCTION OR EQUIPMENT, PER CEC OR THE FOLLOWING TABLE:

	0-150 VOLT	150-600
NO LIVE OR GROUNDED PARTS ON OPPOSITE SIDE	36 INCH	36 INCH
GROUNDED PARTS ON OPPOSITE SIDE	36 INCH	42 INCH
LIVE PARTS ON OPPOSITE SIDE	36 INCH	48 INCH

INTERFACE ENGINEERING
PROJECT 2019-0105
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DSA:

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APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

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STATE OF CALIFORNIA

ITEM:	REVISION / ISSUE:	DATE:
	DSA SUBMITTAL	12/03/19
	DSA BACKCHECK 1	12/03/19

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

SYMBOLS LIST AND GENERAL NOTES - MECHANICAL

DRAWN BY: CHECKED BY:
DATE: 04/30/2019 PROJECT NO: C9506
SHEET NO:

M001

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DIFFUSER, REGISTER AND GRILLE SCHEDULE

SYMBOL	TYPE	FACE	FRAME	DAMPER	FINISH	MFR.	MODEL	NOTES
SG-1	SUPPLY WALL GRILLE	LOUVERED	1-1/4" BORDER	NONE	WHITE	TITUS	301	
RG-1	RETURN WALL GRILLE	LOUVERED	1-1/4" BORDER	NONE	WHITE	TITUS	350	

NOTES:

CONDENSING UNIT SCHEDULE

		BASIS OF DESIGN		AIR SOURCE CONDENSER							ELECTRICAL					
SYMBOL	AREA SERVED	MFR	MODEL	ASSOC FAN	NOM TONS	QTY OF COMPRESSORS	COMPRESSOR TYPE	CAP (MBH)	AMBIENT DB (°F)	EER OR SEER	VOLTS	PH	MCA	MOCP	MAX WT (LBS)	NOTES
CU-1	MPOE ROOM	MITSUBISHI	PUHY-P96TLMU-A	FC-1	8	1	INVERTER	96	95	13.1	460	3	32	50	550	
CU-2	MPOE ROOM	MITSUBISHI	PUHY-P96TLMU-A	FC-2	8	1	INVERTER	96	95	13.1	460	3	32	50	550	
CU-3	MPOE ROOM	MITSUBISHI	PUHY-P96TLMU-A	FC-3	8	1	INVERTER	96	95	13.1	460	3	32	50	550	
CU-4	MPOE ROOM	MITSUBISHI	PUHY-P96TLMU-A	FC-4	8	1	INVERTER	96	95	13.1	460	3	32	50	550	

NOTES:

FAN COIL SCHEDULE

		BASIS OF DESIGN			SUPPLY FAN			DX COOLING COIL				HEATING		FILTER	ELECTRICAL					
SYMBOL	AREA SERVED	MFR	MODEL	ASSOC CU	TOTAL CFM	MIN OSA CFM	ESP (IN H2O)	NOM TONS	TOTAL CAP (MBH)	SENS CAP (MBH)	LDB (°F)	TOT CAP (MBH)	EAT (°F)	EFF MERV	VOLTS	PH	MCA	MOCP	MAX WT (LBS)	NOTES
FC-1	MPOE ROOM	MITSUBISHI	PEFY-P96NMHSU-E	CU-1	2500	NA	0.6	8	96	75	55	NA	NA	8	460	1	8.2	15	250	1,2
FC-2	MPOE ROOM	MITSUBISHI	PEFY-P96NMHSU-E	CU-2	2500	NA	0.6	8	96	75	55	NA	NA	8	460	1	8.2	15	250	1,2
FC-3	MPOE ROOM	MITSUBISHI	PEFY-P96NMHSU-E	CU-3	2500	NA	0.6	8	96	75	55	NA	NA	8	460	1	8.2	15	250	1,2
FC-4	MPOE ROOM	MITSUBISHI	PEFY-P96NMHSU-E	CU-4	2500	NA	0.6	8	96	75	55	NA	NA	8	460	1	8.2	15	250	1,2

NOTES:
1 FAN COILS TO BE USED FOR COOLING ONLY
2 FIRE ALARM TO SHUT OFF FAN COIL DURING FIRE ALARM EVENT.

INTERFACE ENGINEERING
PROJECT 2019-0105
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No. 35930
MECHANICAL
STATE OF CALIFORNIA

ITEM:	REVISION / ISSUE:	DATE:
	DSA SUBMITTAL	12/03/19
	DSA BACKCHECK 1	12/03/19

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

SCHEDULES - MECHANICAL

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506

SHEET NO:

M002

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STATE OF CALIFORNIA
REQUIRED ACCEPTANCE TESTS
CEC-NRCC-MCH-04-E (Revised 01/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-04-E
Required Acceptance Tests	(Page 1 of 3)
Project Name: Chabot College MPOE Replacement / Learning Skills Testing Relocation	Date Prepared: 07/19/2019

A. MECHANICAL COMPLIANCE FORMS & WORKSHEETS
(indicate if worksheet is included)

For detailed instructions on the use of this and all Energy Standards compliance documents, refer to the 2016 Nonresidential Manual
Note: The Enforcement Agency may require all compliance documents to be incorporated onto the building plans. The NRCC-MCH-04-E and NRCC-MCH-05-E are alternative compliance documents to NRCC-MCH-01-E, NRCC-MCH-02-E and NRCC-MCH-03-E for projects using only single zone packaged HVAC systems.

YES	NO	Form	Title
◉	○	NRCC-MCH-04-E (1 of 2)	Certificate of Compliance. Required on plans when used.
◉	○	NRCC-MCH-04-E (2 of 2)	Mechanical Acceptance Tests. Required on plans when used.
◉	○	NRCC-MCH-05-E (1 of 2)	HVAC Prescriptive Requirements. It is required on plans when used.
◉	○	NRCC-MCH-05-E (2 of 2)	Mechanical SWH Equipment Summary is required for all submittals with service water heating, pools or spas. It is required on plans where applicable.

STATE OF CALIFORNIA
REQUIRED ACCEPTANCE TESTS
CEC-NRCC-MCH-04-E (Revised 01/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-04-E
Required Acceptance Tests	(Page 2 of 3)
Project Name: Chabot College MPOE Replacement / Learning Skills Testing Relocation	Date Prepared: 07/19/2019

Designer:
This compliance document is to be used by the designer and attached to the plans. Listed below are all the acceptance tests for mechanical systems. The designer is required to check the applicable boxes by all acceptance tests that apply and list all equipment that requires an acceptance test. If all equipment of a certain type requires a test, list the equipment description and the number of systems. The NA number designates the Section in the Appendix of the Nonresidential Reference Appendices Manual that describes the test. Since this compliance document will be part of the plans, completion of this section will allow the responsible party to budget for the scope of work appropriately.

Enforcement Agency:
Systems Acceptance. Before occupancy permit is granted for a newly constructed building or space, or a new space-conditioning system serving a building or space is operated for normal use, all control devices serving the building or space shall be certified as meeting the Acceptance Requirements for Code Compliance.

Systems Acceptance. Before occupancy permit is granted all newly installed HVAC equipment must be tested using the Acceptance Requirements. The NRCC-MCH-04-E compliance document is not considered a completed document and is not to be accepted by the building department unless the correct boxes are checked. The equipment requiring testing, person performing the test (Example: HVAC installer, TAB contractor, controls contractor, PE in charge of project) and what Acceptance test must be conducted. The following checked-off forms are required for ALL newly installed and replaced equipment. In addition a Certificate of Acceptance compliance documents shall be submitted to the building department that certifies plans, specifications, installation certificates, and operating and maintenance information meet the requirements of Section 10-103(b) and Title 24 Part 6. The building inspector must receive the properly filled out and signed compliance documents before the building can receive final occupancy.

Test Description		MCH-02-A	MCH-03-A	MCH-04-A	MCH-05-A	MCH-06-A	MCH-07-A	MCH-11-A	MCH-12-A	MCH-14-A	MCH-18-A	
Equipment Requiring Testing or Verification	# of Units	Outdoor Air	Single Zone Unitary	Air Distribution Ducts	Economizer Controls	Demand Control Ventilation (DCV)	Supply Fan VAV	Automatic Demand Shed Control	FDD for Packaged DX Units	Distributed Energy Storage DX AC Systems	Energy Management Control System	Test Performed By:
FCU-1, FCU-2, FCU-3, FCU-4	4	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	
Existing FCU-316A	1	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	

Add Row | Remove Last

STATE OF CALIFORNIA
REQUIRED ACCEPTANCE TESTS
CEC-NRCC-MCH-04-E (Revised 01/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-04-E
Required Acceptance Tests	(Page 3 of 3)
Project Name: Chabot College MPOE Replacement / Learning Skills Testing Relocation	Date Prepared: 07/19/2019

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: Jared Doesher	Documentation Author Signature: Jared Doesher
Company: Interface Engineering	Signature Date: 07/19/2019
Address: 135 Main Street, Suite 400	CEA/ HERS Certification Identification (if applicable):
City/State/Zip: San Francisco, CA 94105	Phone: 415-489-7240

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:
1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name: Jared Doescher	Responsible Designer Signature: Jared Doescher
Company: Interface Engineering	Date Signed: 07/19/2019
Address: 135 Main Street, Suite 400	License: M35930
City/State/Zip: San Francisco, CA 94105	Phone: 415-489-7240

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
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3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

CONSULTANT:

REGISTERED PROFESSIONAL ENGINEER
JARED F. DOESCHER
No. 35930
MECHANICAL
STATE OF CALIFORNIA

ITEM:	REVISION / ISSUE:	DATE:
	DSA SUBMITTAL	12/03/19
	DSA BACKCHECK 1	12/03/19

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

TITLE 24 - MECHANICAL

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506
SHEET NO:	

M003

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STATE OF CALIFORNIA
REQUIREMENTS FOR PACKAGED SINGLE ZONE UNITS
CEC-NRCC-MCH-05-E (Revised 01/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-05-E
Requirements for Packaged Single-Zone Units	(Page 1 of 2)
Project Name: Chabot College MPOE Replacement / Learning Skills Testing Relocation	Date Prepared: 07/19/2019

Equipment Tag(s)[1]		FCU-1, FCU-2, FCU-3, FCU-4					
MANDATORY MEASURES	*T-24 Sections*	*Requirement*[2]	*As Scheduled*[3]	*Requirement*[2]	*As Scheduled*[3]	*Requirement*[2]	*As Scheduled*[3]
Heating Equipment Efficiency[4]	110.1 or 110.2(a)	N/A	N/A				
Cooling Equipment Efficiency[4]	110.1 or 110.2(a)	11.2	13.1				
Thermostats[5]	110.2(b), 110.2(c)	Programmable	BMS				
Furnace Standby Loss Control[6]	110.2(d)	N/A	N/A				
Low Leakage AHU	110.2(f)	N/A	N/A				
Ventilation[7]	120.1(b)	160 CFM	160 CFM				
Demand Control Ventilation[8]	120.1(c)4	N/A	N/A				
Occupant Sensor Ventilation Control[8]	120.1(c)5, 120.2(e)3	N/A	N/A				
Shutoff and Reset Controls[9]	120.2(e)	N/A	N/A				
Outdoor Air and Exhaust Damper Control	120.2(f)	N/A	N/A				
Automatic Demand Shed Controls	120.2(h)	N/A	N/A				
Economizer FDD	120.2(i)	N/A	N/A				
Duct Insulation	120.4	N/A	N/A				
PRESCRIPTIVE MEASURES							
Equipment is sized in conformance with 140.4 (a & b)	140.4(a & b)	Yes	Yes				
Economizer	140.4(e)	N/A	N/A				
Electric Resistance Heating[10]	140.4(g)	N/A	N/A				
Duct Leakage Sealing and Testing.[11]	140.4(l)	N/A	N/A				

Notes:
1. *Provide equipment tags (e.g. AC1 or AC1 to 10). Multiple units of the same make and model with the same application and accessories can be grouped together.*
2. *Enter the following information as appropriate: Unit Manufacturer; Unit Model Number (including all accessories); Description of the unit (e.g. gas-pack or heat pump; rated heating capacity (enter "N/A" if no heating); and, rated cooling capacity (enter "N/A" if no cooling). For unit capacities include the units (e.g. kBtuh or tons).*
3. *For each requirement, enter the minimum requirement from the Standard In the left column (under "Standard Requirement"). In the right column (under "As Scheduled") enter the value for the units as specified.*
4. *Where there is more than one requirement (e.g. full and part load efficiency) enter both with the appropriate labels (e.g. COP and IEER).*
5. *In the left column identify the thermostatic requirements from the standard [e.g. programmable setback thermostat or heatpump with electric heat), . In the right column indicate the capabilities of the thermostat as scheduled.*
6. *If the unit has a furnace which is rated at ≥ 225,000 Btuh of capacity, indicate the rated standby loss and ignition source (e.g. IID). If there is no furnace or the unit is rated for <225,000 Btuh indicate "N/A".*
7. *In the left column, enter both the required ventilation value from Table 120.1A and for the number of occupants times 15 cfm/person. In the right column enter the actual minimum ventilation as scheduled. If the space is naturally ventilated enter "N/A" in the left column and "the space is naturally ventilated" in the right column.*
8. *If the space is required to have either DCV or Occupant Sensor Ventilation Control indicate "required" in the left column (otherwise indicate "N/A" in the left column). If either DCV or Occupant Sensor Ventilation Control is provided indicate "provided" in the right column (otherwise indicate "N/A" in the right column)*
9. *In the left column indicate the required time controls from the standard. In the right column identify the device that provides this functionality (e.g. EMCS or programmable timeclock).*
10. *Enter N/A if there is no electric heating. If the system has electric heating indicate which exception to 140.4(g) applies.*
11. *If duct leakage sealing and testing is required, a **MCH-04-A** compliance document must be submitted.*

STATE OF CALIFORNIA
REQUIREMENTS FOR PACKAGED SINGLE ZONE UNITS
CEC-NRCC-MCH-05-E (Revised 01/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-MCH-05-E
Requirements for Packaged Single-Zone Units	(Page 2 of 2)
Project Name: Chabot College MPOE Replacement / Learning Skills Testing Relocation	Date Prepared: 07/19/2019

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: Jared Doescher	Documentation Author Signature: Jared Doescher
Company: Interface Engineering	Signature Date: 07/19/2019
Address: 135 Main Street, Suite 400	CEA/ HERS Certification Identification (if applicable):
City/State/Zip: San Francisco, CA 94105	Phone: 415-489-7240

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:
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Responsible Designer Name: Jared Doescher	Responsible Designer Signature: Jared Doescher
Company : Interface Engineering	Date Signed: 07/19/2019
Address: 135 Main Street, Suite 400	License: M35930
City/State/Zip: San Francisco, CA 94105	Phone: 415-489-7240

DSA:

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DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
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DATE: 12/19/2019

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PROFESSIONAL STAMP:

CONSULTANT:

REGISTERED PROFESSIONAL ENGINEER — JARED F. DOESCHER — No. 35930 — MECHANICAL — STATE OF CALIFORNIA

ITEM:	REVISION / ISSUE:	DATE:
	DSA SUBMITTAL	12/03/19
	DSA BACKCHECK 1	12/03/19

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

TITLE 24 - MECHANICAL

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506

SHEET NO:

M004

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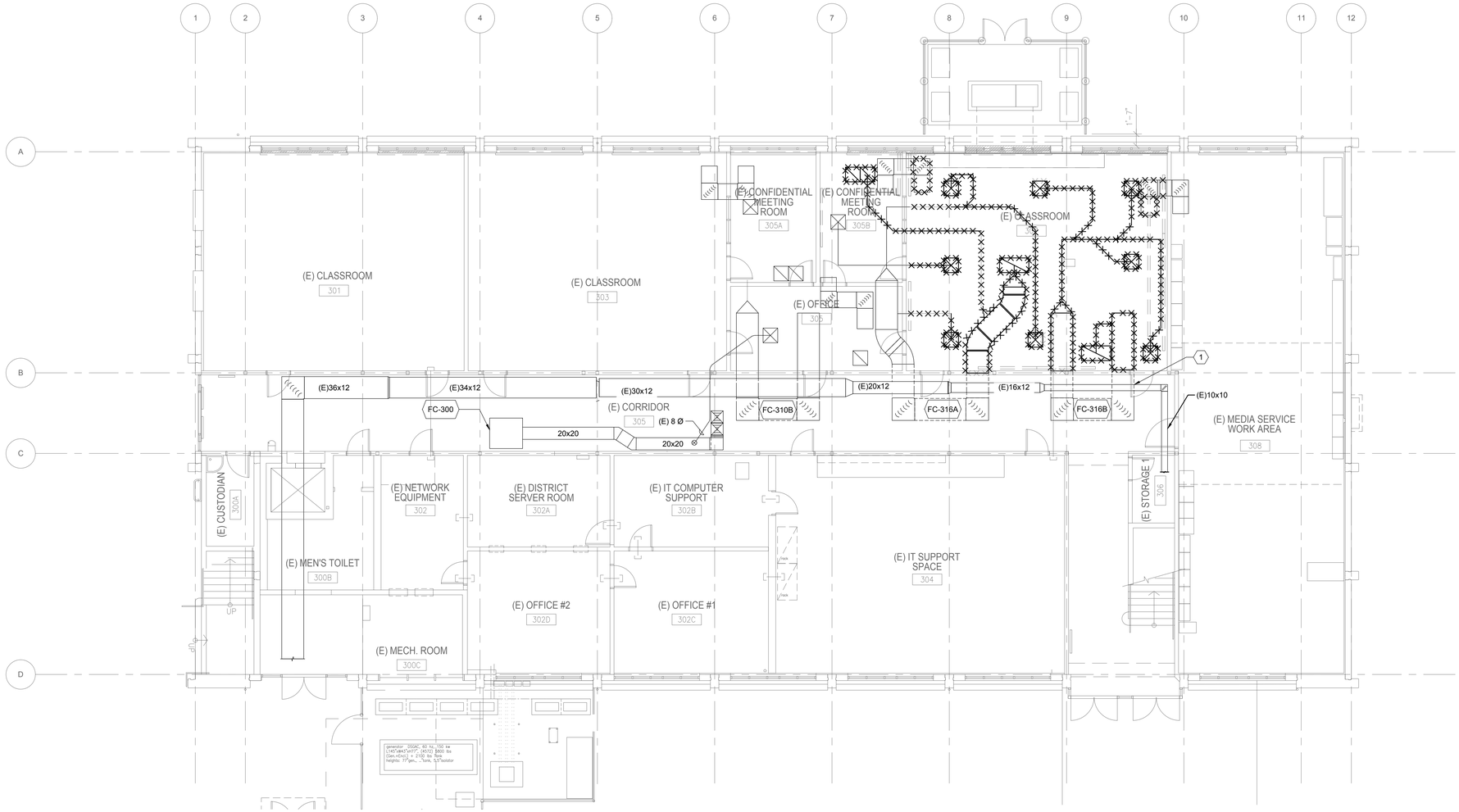
SHEET KEYNOTES

1. CAP OSA DUCT TO FC 316B.



1 LEVEL 1 DEMOLITION FLOOR PLAN - MECHANICAL

0 4' 8' 16'

SCALE: 1/8"=1'-0"

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No. 35930
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STATE OF CALIFORNIA

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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

LEVEL 1 DEMOLITION FLOOR PLAN - MECHANICAL

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506

SHEET NO:

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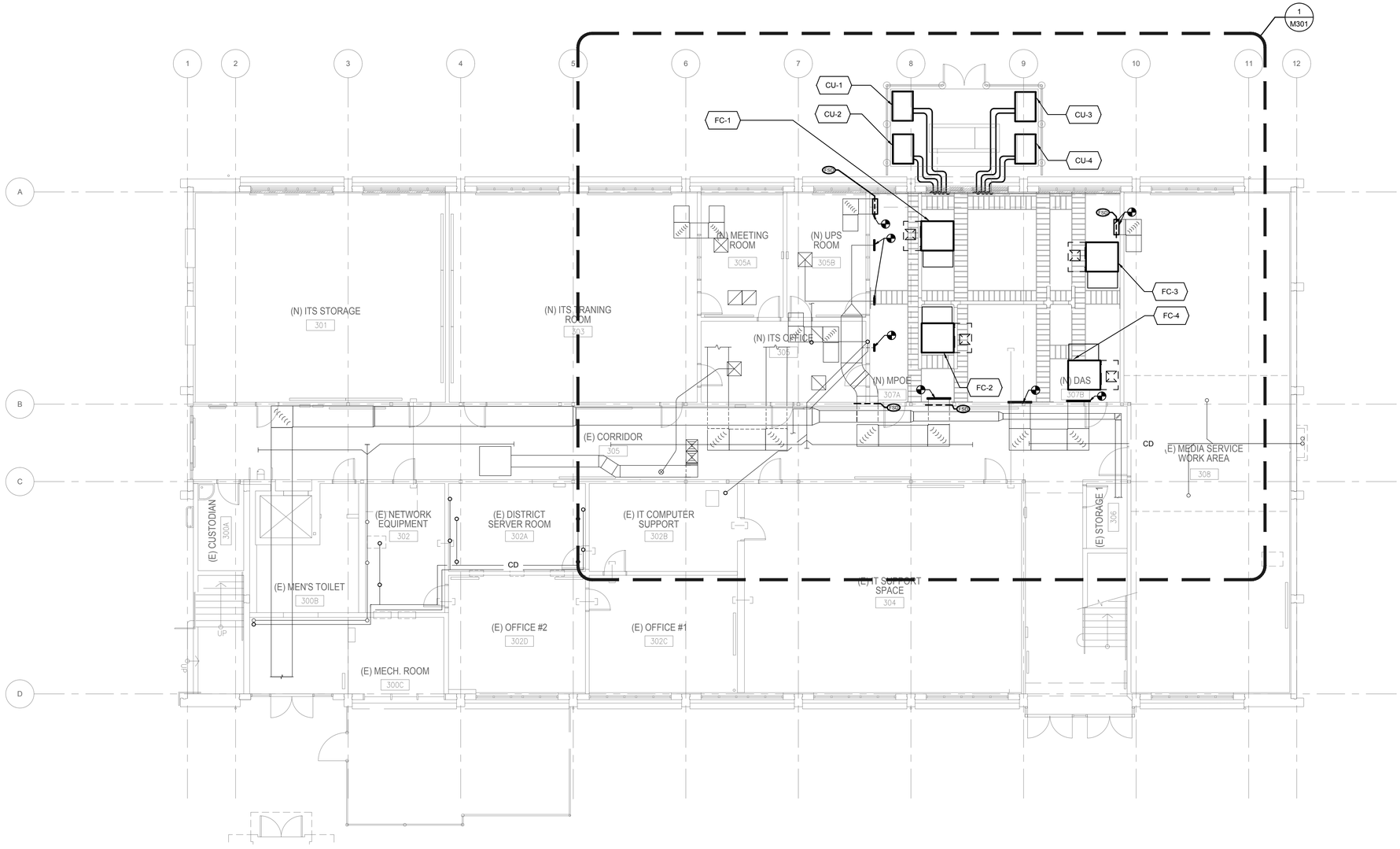

1 LEVEL 1 FLOOR PLAN - MECHANICAL

0 4' 8' 16'

SCALE: 1/8"=1'-0"

DSA:

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STATE OF CALIFORNIA

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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

LEVEL 1 FLOOR PLAN - MECHANICAL

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506

SHEET NO:

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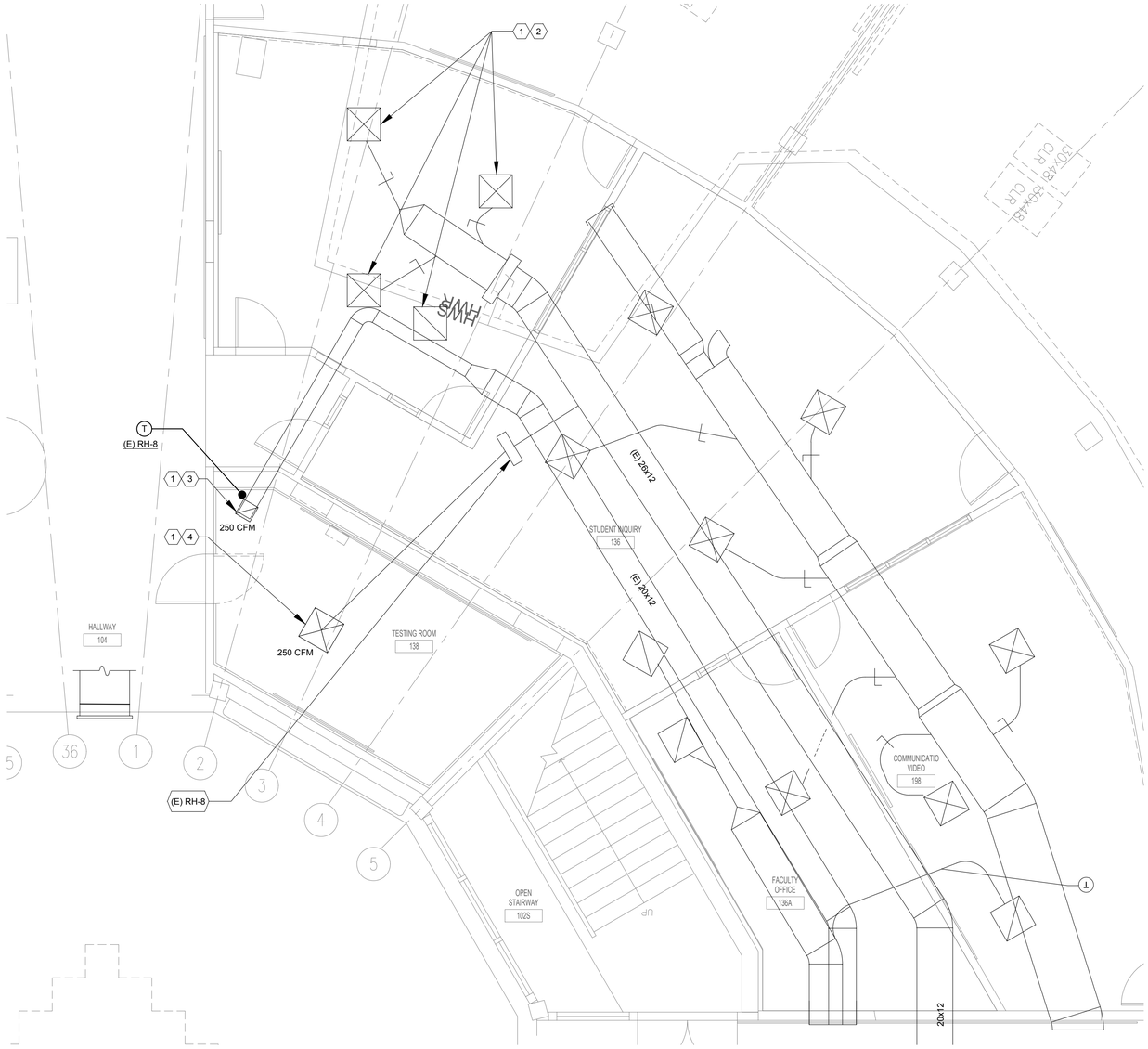

1 TESTING ROOM B138 FLOOR PLAN - MECHANICAL

0 2' 4' 8'

SCALE: 1/4"=1'-0"

SHEET KEYNOTES

1. PRIOR TO CONSTRUCTION MEASURE AIRFLOW AT TERMINAL DIFFUSER/GRILLE AND PROVIDE REPORT TO ARCHITECT AND ENGINEER.
2. BALANCE DIFFUSERS AND GRILLES TO MAINTAIN AIR FLOW AT COMPLETION OF PROJECT.
3. REPLACE DIFFUSER WITH TITUS 50F. DIFFUSERS TO MATCH (E) NECK AND FACE SIZE.
4. REPLACE DIFFUSER WITH TITUS PAR. DIFFUSER TO MATCH (E) NECK AND FACE SIZE.

DSA:

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PROFESSIONAL STAMP:

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No. 35930
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STATE OF CALIFORNIA

ITEM:	REVISION / ISSUE:	DATE:
	DSA SUBMITTAL	12/03/19
	DSA BACKCHECK 1	12/03/19

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

TESTING ROOM B138 FLOOR PLAN - MECHANICAL

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506

SHEET NO:

M202

INTERFACE ENGINEERING
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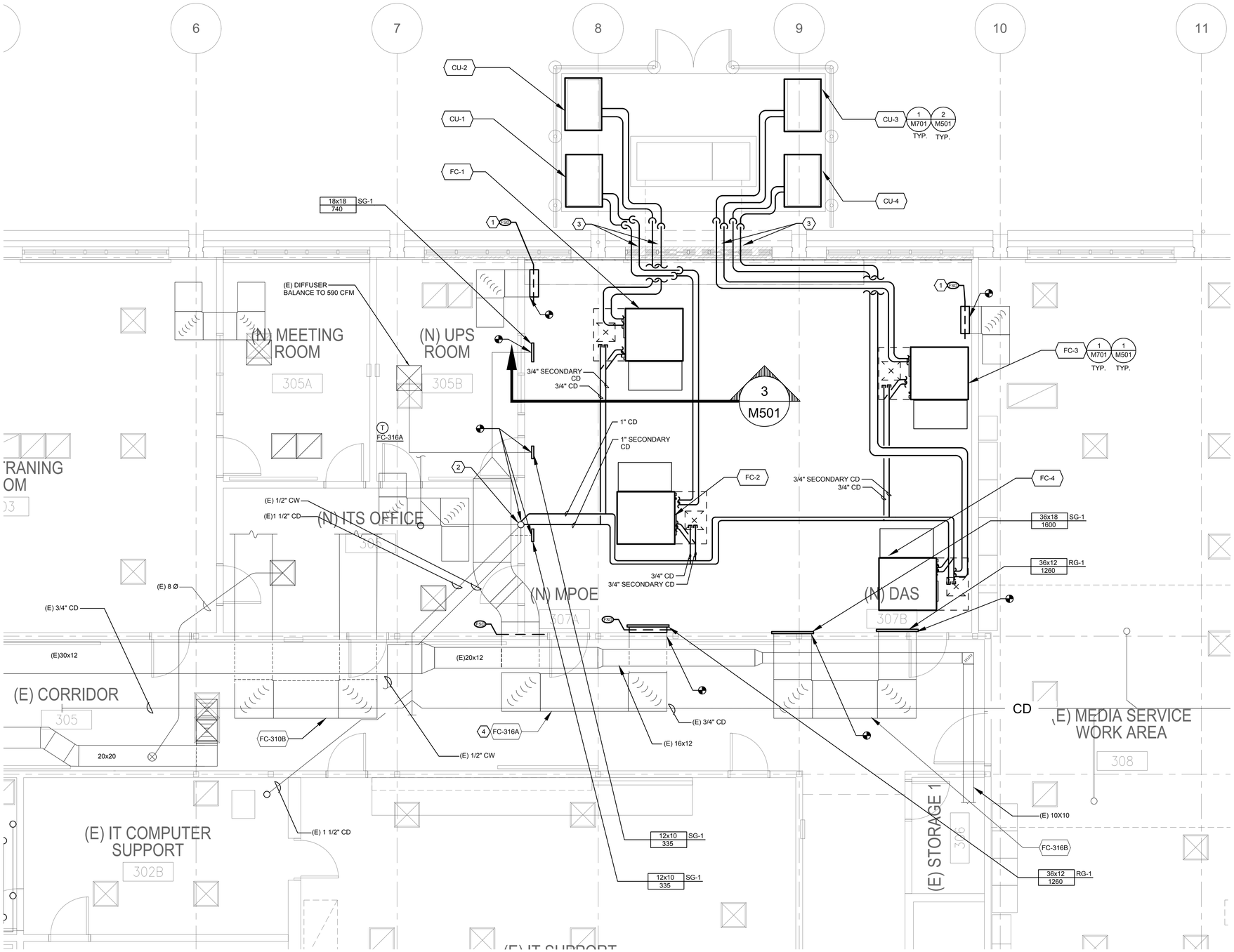

1 ENLARGED PLAN - MECHANICAL

0 2' 4' 8'

SCALE: 1/4"=1'-0"

SHEET KEYNOTES

1. FSD CONTROLLED BY CLEAN AGENT CHEM. FIRE SUPPRESSION SYSTEM TO CLOSE WITH ACTIVATION OF SYSTEM.
2. DAYLIGHT TO (E) INDIRECT WASTE FIXTURE.
3. REFRIGERANT LINES ROUTED INTO BUILDING UNDER TELECOM CABLING IN THE SAME WALL PENETRATION.
4. (E) FC-316A SET TO 160 CFM.
5. (N) FIRE SMOKE DAMPER IN (E) DUCT.

DSA:

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ITEM:	REVISION / ISSUE:	DATE:
	DSA SUBMITTAL	12/03/19
	DSA BACKCHECK 1	12/03/19

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD HAYWARD, CA 94545

ENLARGED PLAN - MECHANICAL

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506

SHEET NO:

M301

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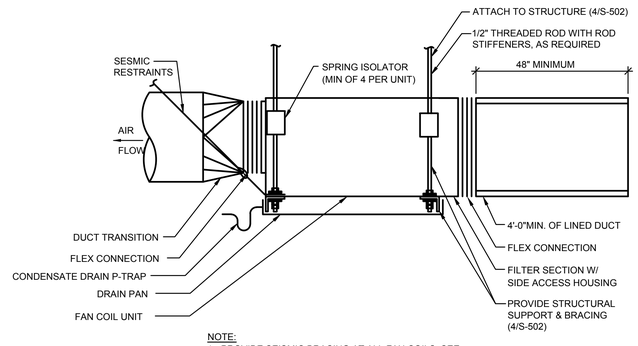
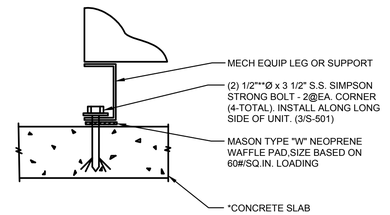


NOTE:
1. PROVIDE SEISMIC BRACING AT ALL FAN COILS. SEE SPECIFICATIONS.FOR SEISMIC DESIGN CRITERIA.

1 FAN COIL UNIT HANGING DETAIL

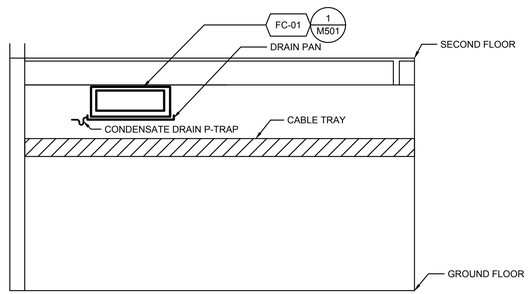
NO SCALE



* BY OTHERS

2 EQUIPMENT ATTACHMENT W/O ISOLATORS

NO SCALE



3 SECTION VIEW - MECHANICAL

0 2' 4' 8'

SCALE: 1/4"=1'-0"

INTERFACE ENGINEERING
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A R C H I T E C T S + E N G I N E E R S
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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

DETAILS AND SECTION VIEW-MECHANICAL

DRAWN BY: CHECKED BY:
DATE: 04/30/2019 PROJECT NO: C9506
SHEET NO:

M501

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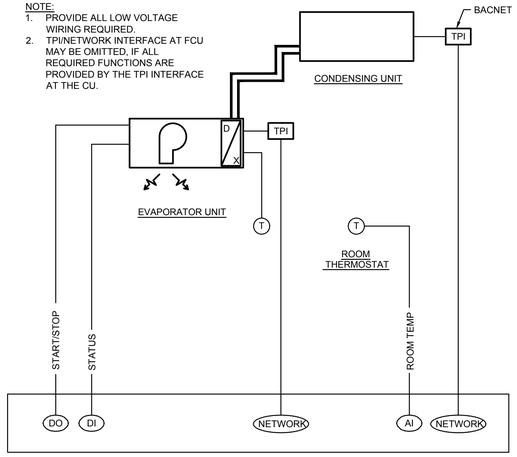
NOTE:
1. PROVIDE ALL LOW VOLTAGE WIRING REQUIRED.
2. TPI/NETWORK INTERFACE AT FCU MAY BE OMITTED, IF ALL REQUIRED FUNCTIONS ARE PROVIDED BY THE TPI INTERFACE AT THE CU.



A. VRF SYSTEM CONTROL - FC-1/CU-1 THROUGH FC-X/CU-X

1. CONNECT WITH THE SPLIT UNIT'S CONTROLLER, AND:
   a. OPERATE UNIT AS INITIATED FROM BAS SCHEDULE.
   b. MONITOR UNIT STATUS.
   c. GENERATE AN ALARM ON RECEIPT OF AN ALARM SIGNAL FROM UNIT CONTROLLER.
2. MONITOR ROOM TEMPERATURE AND GENERATE AN ALARM IF ROOM TEMPERATURE IS MORE THAN 4 F FROM SETPOINT (ADJ).
3. FAN COILS TO OPERATE IN LEAD-LEAD-LAG-LAG. TWO GROUPS OF TWO FAN COILS WILL ALTERNATE LEAD. FC-1 AND FC-3 WILL LEAD TOGETHER AND FC-2 AND FC-4 WILL LEAD TOGETHER. THE LEAD FAN COILS WILL OPERATE INTERMITTENTLY TO MAINTAIN TEMPERATURE. IF SPACE TEMPERATURE EXCEEDS SETPOINT BY 2°F OR MORE ACTIVATE THE LAG FAN COILS UNTIL SPACE SETPOINT IS REACHED.

1 VRF & SPLIT SYSTEM CONTROL DIAGRAM

NO SCALE

CONTROL DIAGRAM SYMBOLS LIST

ABBREVIATIONS		SYMBOLS	
AFMS	AIR FLOW MEASURING STATION	AI	ANALOG INPUT
AI	ANALOG INPUT	AO	ANALOG OUTPUT
AO	ANALOG OUTPUT	CT	ELECTRIC CURRENT TRANSMITTER
BMS/BAS	BUILDING MANAGEMENT SYSTEM	DDC #'s	DIRECT DIGITAL CONTROL
CO	CARBON MONOXIDE SENSOR		
CO2	CARBON DIOXIDE SENSOR		
CT	ELECTRIC CURRENT TRANSMITTER		
DDC	DIRECT DIGITAL CONTROL	DI	DIGITAL INPUT
DI	DIGITAL INPUT	DO	DIGITAL OUTPUT
DO	DIGITAL OUTPUT	DP	DIFFERENTIAL PRESSURE SENSOR
DP	PRESSURE SENSOR		FLOW METER
EA	EXHAUST AIR	FS	FLOW SWITCH
ECM	ELECTRONICALLY COMMUTATED MOTOR	H	ROOM / DUCT RELATIVE HUMIDITY SENSOR / TRANSMITTER
EF	EXHAUST FAN	HS	HIGH STATIC PRESSURE SENSOR
HS	HIGH STATIC	M/S	MOTOR STARTER
HWR	HEATING HOT WATER RETURN	MD	MOTORIZED DAMPER
HWS	HEATING HOT WATER SUPPLY	NETWORK	BACNET COMMUNICATION LINE WITH DEVICE / CONTROLLER
M	MOTORIZED	P	PRESSURE SENSOR
MAU	MAKE UP AIR UNIT	SD	SMOKE DETECTOR
M/S	MOTOR STARTER	SP	SPACE PRESSURE SENSOR
MD	MOTORIZED DAMPER	T	TEMPERATURE SENSOR/ROOM THERMOSTAT
OA	OUTSIDE AIR	TPI	THIRD PARTY INTERFACE (BACNET)
P	PRESSURE SENSOR	VFD	VARIABLE FREQUENCY DRIVE
PPM	PARTS PER MILLION	ECM	ELECTRONICALLY COMMUTATED MOTOR
RA	RETURN AIR / RELIEF AIR		
RF	RETURN FAN / RELIEF FAN		
SA	SUPPLY AIR		
SF	SUPPLY FAN OR SQUARE FOOT		
SD	SMOKE DETECTOR		
T	TEMPERATURE SENSOR / ROOM THERMOSTAT		
TPI	THIRD PARTY INTERFACE		
VFD	VARIABLE FREQUENCY DRIVE		

GENERAL SHEET NOTES

A. PROVIDE ALL THIRD PARTY BACNET INTERFACES WHERE NOT PROVIDED BY EQUIPMENT MANUFACTURER.

B. SEE ELECTRICAL DRAWINGS FOR 120 VOLT JUNCTION BOXES FOR POWER SUPPLY. PROVIDE ADDITIONAL 120V POWER SUPPLY AS REQUIRED, AND PROVIDE 120V TO 24V TRANSFORMERS FOR LOW VOLTAGE CONTROL POWER. PROVIDE 24V POWER TO ALL CONTROL DEVICES. PROVIDE CONTROL WIRING PER DIV. 23 & 26 SPECIFICATIONS. PROVIDE PLENUM RATED CABLE ABOVE REMOVABLE TILE CEILING, AND RACEWAY ABOVE HARD LID CEILINGS.

C. PROVIDE 120V POWER FOR AIRFLOW MEASURING STATIONS, LARGE VALVES, AND BMS CONTROL SYSTEMS INCLUDING ALL PANELS. FOLLOW DIV. 26 SPECIFICATIONS FOR PRODUCTS AND INSTALLATION RELATED TO 120V POWER DISTRIBUTION. PROVIDE EMERGENCY POWER FOR ASSOCIATED BMS CONTROLLERS AND TERMINAL UNITS WHERE AHU IS ON EMERGENCY POWER.

D. PROVIDE COMMUNICATION WIRING AND CONNECT TO THE BUILDING AND/OR CAMPUS' IP NETWORK.

E. CONTROL DIAGRAMS, SEQUENCES, AND SPECIFICATIONS ARE PERFORMANCE BASED. PROVIDE FINAL SEQUENCES, POINT LIST, TRENDING LIST, CONTROL DIAGRAMS, AND ARCHITECTURAL RISER DIAGRAMS (SEE SPECIFICATIONS).

F. PROVIDE FLOOR LEVEL AND BUILDING LEVEL CONTROLLERS, AS NEEDED.

G. MODIFY ADJUSTABLE SETPOINTS DURING FUNCTIONAL TESTING AND COMMISSIONING STAGE FOR PROPER SYSTEMS' OPERATION.

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IDENTIFICATION STAMP
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APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

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REGISTERED PROFESSIONAL ENGINEER JARED F. DOESCHER No. 35930 MECHANICAL STATE OF CALIFORNIA

ITEM:	REVISION / ISSUE:	DATE:
	DSA SUBMITTAL	12/03/19
	DSA BACKCHECK 1	12/03/19

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

CONTROLS - MECHANICAL

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506

SHEET NO:

M701

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FILE: M7.1.DWG — M7.1 | EDIT: 11/22/2019 8:02 AM BY JAREDD | PLOT: 11/22/2019 6:46 PM BY JARED DOESCHER

GENERAL NOTES:

1. THE LATEST ADDITION OF THE DISTRICT'S AND/OR ARCHITECT'S GENERAL, SPECIAL AND SUPPLEMENTARY CONDITIONS AS WELL AS SEPARATE SPECIFICATIONS OR PROJECT MANUALS AREA PART OF THESE CONSTRUCTION DOCUMENTS.

2. THE SCOPE OF WORK SHALL INCLUDE LABOR, MATERIALS, EQUIPMENT, TOOLS AND SERVICES REQUIRED FOR THIS COMPLETE INSTALLATION OF THE ELECTRICAL SYSTEMS AS INDICATED AND SPECIFIED.

3. PROVIDE ELECTRICAL EQUIPMENT, WIRES, CONDUITS, CONNECTIONS, OUTLETS, ETC. NECESSARY TO ACHIEVE A COMPLETE ELECTRICAL INSTALLATION. WHERE AN ELECTRICAL DEVICE IS REQUIRED BY CODE BUT NOT SHOWN, IT SHALL BE FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR AS THOUGH FULLY SHOWN AND SPECIFIED.

4. BE FULLY RESPONSIBLE FOR DAMAGES INCURRED TO WALLS, FLOORS, AND CEILINGS DURING ELECTRICAL CONSTRUCTION. IF DAMAGE OCCURS DURING ELECTRICAL CONSTRUCTION, ELECTRICAL CONTRACTOR SHALL PATCH, REPAIR, AND PAINT DAMAGED SURFACES TO ORIGINAL CONDITION.

5. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND DO NOT SHOW JUNCTION BOXES, PULL BOXES, OFFSETS, BENDS, ELBOWS OR OTHER SPECIFIC ELEMENTS WHICH MAY BE REQUIRED FOR PROPER INSTALLATION OF WORK, SIZE, AND LOCATION OF EQUIPMENT AND WIRING ARE SHOWN TO SCALE WHERE POSSIBLE BUT MAY BE DISTORTED FOR CLARITY OF THE DRAWINGS. IT IS NOT WITHIN THE SCOPE OF DRAWINGS TO SHOW NECESSARY BENDS, OFFSETS, PULL BOXES AND OBSTRUCTIONS. PROVIDE AN INSTALLATION TO MAINTAIN HEADROOM, AND KEEP OPENINGS AND PASSAGEWAYS CLEAR.

6. ELECTRICAL MATERIAL & EQUIPMENT SHALL BE NEW AND IN PERFECT CONDITION WHEN INSTALLED. EQUIPMENT SHALL BE LISTED, LABELED, AND INSTALLED PER A RECOGNIZED ELECTRICAL TESTING LABORATORY, AND MATERIALS SHALL BE MANUFACTURED IN ACCORDANCE WITH APPLICABLE STANDARDS OF ANSI, NEMA & NBFU. REPLACE DEFECTIVE OR DAMAGED MATERIALS, OR REPAIR IN A MANNER APPROVED BY THE OWNER.

7. DEFINITIONS:
   a. "FURNISH": SUPPLY AND DELIVER TO PROJECT SITE, UNLOAD, UNPACK AND ASSEMBLE, AND PUT IN PLACE
   b. "INSTALL": OPERATIONS AT PROJECT SITE INCLUDING, TEMPORARILY STORING, ERECTING, PLACING, ANCHORING, APPLYING, WORKING TO DIMENSION, FINISHING, CURING, PROTECTING, CLEANING, AND SIMILAR OPERATIONS
   c. "PROVIDE": FURNISH AND INSTALL, COMPLETE AND READY FOR THE INTENDED USE.
   d. "SHALL": USED TO QUALIFY AN ACTION WHICH IS MANDATORY

8. PROVIDE SEISMIC SUPPORT DEVICES, RESTRAINTS AND APPURTENANCES INCLUDING HANGERS, ANCHORS, SLEEVES, INSERTS, SEALS, AND ASSOCIATED ELECTRICAL ITEMS IN ACCORDANCE WITH STATE, COUNTY, CITY, AND LOCAL CODES. SEISMIC RESTRAINTS AND ATTACHMENTS FOR ELECTRICAL EQUIPMENT AND SYSTEM COMPONENTS SHALL BE PROVIDED IN ACCORDANCE WITH CBC AND SMACNA REQUIREMENTS.

9. REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR EXACT LOCATIONS, DIMENSIONS, AND/OR RATINGS OF FIRE RATED SEPARATIONS, EXPANSION JOINTS, AND SEISMIC JOINTS.

10. KEEP CONDUITS AND OTHER OPENINGS CLOSED TO PREVENT ENTRY OF FOREIGN MATTER. COVER FIXTURES, EQUIPMENT AND APPARATUS AND PROTECT AGAINST DIRT, WATER, CHEMICAL OR MECHANICAL DAMAGE BEFORE AND DURING THE CONSTRUCTION PERIOD UNTIL FINAL ACCEPTANCE. RESTORE TO ORIGINAL CONDITION ANY FIXTURES, APPARATUS OR EQUIPMENT DAMAGED PRIOR TO FINAL ACCEPTANCE, INCLUDING RESTORATION OF DAMAGED SHOP COATS OF PAINT. DELIVER EQUIPMENT AND STORE AT THE SITE, PROPERLY PACKED AND CRATED, UNTIL FINALLY INSTALLED.

11. INCONSISTENCIES OR DISCREPANCIES IN THE DRAWINGS OR SPECIFICATIONS SHALL BE CLARIFIED WITH THE DISTRICT PROJECT MANAGER PRIOR TO ROUGH IN OR INSTALLATION. IT IS FURTHER UNDERSTOOD THAT THE CONTRACTOR HAS READ AND FULLY UNDERSTANDS THE DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS FOR THIS PROJECT PRIOR TO THE COMMENCEMENT OF WORK, INCLUDING DOCUMENTS OF OTHER DIVISIONS WHICH MAY INTERFERE OR OTHERWISE AFFECT THE WORK OF THIS DIVISION. NO CONSIDERATION WILL BE GRANTED BY REASON OF LACK OF FAMILIARITY ON THE PART OF THIS DIVISION WITH THOSE DOCUMENTS.

12. UNDERTAKE THE WORK IN ITS ENTIRETY IN ACCORDANCE WITH ITS DESIGN AND PURPOSE. WORK SHALL BE CARRIED OUT IN A PROFESSIONAL MANNER WITH MAXIMUM EFFICIENCY, EXCELLENT WORKMANSHIP AND SHALL MEET THE REQUIREMENTS OF BUT NOT LIMITED TO THE LATEST EDITION FOR THE FOLLOWING:
   a. CALIFORNIA CODE OF REGULATIONS:
      TITLE 8 – INDUSTRIAL RELATIONS (ELEVATOR SAFETY ORDERS)
      TITLE 19 – PUBLIC SAFETY
      TITLE 22 – SOCIAL SECURITY
      TITLE 24 – CALIFORNIA BUILDING STANDARDS CODE, (PARTS 1, 2 (CALIFORNIA BUILDING CODE), 3 (CALIFORNIA ELECTRICAL CODE), 4, 5, 6 (CALIFORNIA ENERGY CODE), 7 THRU 12)
   b. CALIFORNIA STATE AND LOCAL FIRE MARSHAL.
   c. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI).
   d. INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE).
   e. INSTITUTE OF CABLE ENGINEERS ASSOCIATION (ICEA).
   f. NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION STANDARDS FOR CONSTRUCTION (NECA).
   g. UNDERWRITERS LABORATORIES, INC, (UL).
   h. INSTRUMENT SOCIETY OF AMERICA (ISA).
   i. NFPA 72
   j. STATE INDUSTRIAL ACCIDENT COMMISSION.
   k. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).
   l. NATIONAL ELECTRICAL TESTING ASSOCIATION (NETA).
   m. AUTHORITIES HAVING JURISDICTION

13. SECURE AND PAY FOR PERMITS AND FEES NECESSARY FOR EXECUTION AND COMPLETION OF ELECTRICAL WORK, INCLUDING BUT NOT LIMITED TO CHARGES BY STATE, COUNTY, CITY, AND LOCAL GOVERNMENT AND AGENCIES. OBTAIN REQUIRED CERTIFICATES OF INSPECTION FOR THE ELECTRICAL WORK AND DELIVER SAME TO THE DISTRICT BEFORE REQUESTING ACCEPTANCE AND FINAL PAYMENT FOR WORK.

14. CAREFULLY LAY OUT WORK IN ADVANCE TO AVOID UNNECESSARY CUTTING, CHANNELING, CHASING OR DRILLING OF FLOORS, WALLS, PARTITIONS, CEILINGS OR OTHER SURFACES. STRUCTURAL MEMBERS SHALL NOT BE CUT OR DRILLED WITHOUT THE APPROVAL OF THE DISTRICT. HOWEVER, WHERE SUCH WORK IS NECESSARY PROVIDE CUTTING, CORING AND PATCHING OF THE CONSTRUCTION WORK WHICH MAY BE REQUIRED FOR THE PROPER INSTALLATION OF THE ELECTRICAL WORK, PATCHING SHALL BE OF THE SAME MATERIALS, WORKMANSHIP AND FINISH, AND SHALL ACCURATELY MATCH SURROUNDING WORK. AFTER COMPLETION OF WORK, CLEAN UP RESULTANT DEBRIS AND REMOVE FROM SITE.

15. ENCLOSURES, J-BOXES, GUTTERS ETC, INSTALLED OUTDOORS OR SUBJECT TO WEATHER SHALL BE WEATHER PROOF. RECEPTACLES INSTALLED OUTDOORS SHALL BE GFI TYPE WITH "IN USE" TYPE WEATHERPROOF ENCLOSURES. GFI TYPE RECEPTACLES LOCATED ON ROOF SHALL HAVE "IN USE" TYPE WEATHER PROOF ENCLOSURES, AND MUST BE LOCATED WITHIN 25' OF ROOF MOUNTED EQUIPMENT.

16. INSTALL EXPOSED CONDUITS PARALLEL TO OR AT RIGHT ANGLES TO NEARBY SURFACES OR STRUCTURAL MEMBERS AND FOLLOW SURFACE CONTOURS AS MUCH AS POSSIBLE.

17. PROVIDE ACCESS PANELS AS REQUIRED FOR CODE REQUIRED ACCESS IN HARD CEILING AREAS. PANEL LOCATIONS SHALL BE SUBMITTED TO AND APPROVED BY ARCHITECT PRIOR TO INSTALLATION.

18. PROVIDE ELECTRICAL FINAL CONNECTIONS TO ELECTRICAL EQUIPMENT AND OUTLETS FOR A COMPLETE AND OPERABLE SYSTEM UNLESS OTHERWISE NOTED.

19. PENETRATIONS OF FLOORS, ROOF, WALLS, AND WALL MEMBRANES REQUIRED TO HAVE A FIRE-RESISTANCE RATINGS SHALL BE PROTECTED WITH THROUGH-PENETRATION FIRE STOPS SUITABLE FOR THE METHOD OF PENETRATION. THROUGH-PENETRATION FIRE STOPS SHALL BE TESTED IN ACCORDANCE WITH UL AND CBC REQUIREMENTS.

20. PROVIDE HOUSEKEEPING PADS MINIMUM 4" ABOVE FINISHED FLOOR FOR INTERIOR MOUNTED EQUIPMENT AND 4" ABOVE FINISHED GRADE FOR EXTERIOR MOUNTED EQUIPMENT. PROVIDE A MINIMUM OF 6" FROM EDGE OF PAD ON ALL SIDES, UNLESS OTHERWISE NOTED. FOR PAD DETAIL SEE STRUCTURAL DRAWINGS.

21. VISIT THE JOBSITE PRIOR TO SUBMITTING PROPOSAL TO BECOME FAMILIAR WITH EXISTING CONDITIONS.

22. PROVIDE ENGRAVED LAMINATED PLASTIC NAMEPLATES FOR THE FOLLOWING EQUIPMENT INCLUDING BUT NOT LIMITED TO: METERS, PANELBOARDS, SWITCHBOARDS INCLUDING EACH INDIVIDUAL DEVICE OR PIECE OF EQUIPMENT WITHIN THE SWITCHBOARD, MOTOR CONTROL CENTERS (MCC) INCLUDING EACH DEVICE WITHIN THE MCC, ENCLOSED SWITCHES, STARTERS, CONTACTORS, CIRCUIT BREAKERS AND TRANSFORMERS.

23. SEE DRAWINGS AND SPECIFICATIONS OF OTHER DIVISIONS FOR ADDITIONAL CONNECTION REQUIREMENTS FOR CONTROL DEVICES AND EQUIPMENT, INCLUDING BUT NOT LIMITED TO CONTROL PANELS & TRANSFORMERS, 120V FOR CONTROL SYSTEM SWITCHES, TIME CLOCK, VALVES, STATS, RELAYS, DUCT SMOKE DETECTORS, ETC. VERIFY FINAL CONTROL WIRING REQUIREMENTS WITH CONTRACTORS OF OTHER DIVISIONS PRIOR TO COMMENCEMENT OF WORK, AND PROVIDE NECESSARY DEVICES AND CONNECTIONS.

24. EQUIPMENT SHALL BE BONDED AND GROUNDED IN ACCORDANCE WITH STATE, COUNTY, CITY, AND LOCAL CODES, APPLICABLE CODES AND JURISDICTIONS. REFER TO SPECIFICATIONS FOR DETAILS. ALL FEEDERS AND BRANCH CIRCUIT CONDUITS SHALL BE PROVIDED WITH AN INSULATED EQUIPMENT BONDING CONDUCTOR.

25. EQUIPMENT SHALL BE FULLY RATED FOR THE MAXIMUM AVAILABLE SHORT CIRCUIT CURRENT, REFER TO FEEDER LOAD SUMMARY AND CALCULATIONS TABLES FOR VOLTAGE DROP AND AVAILABLE FAULT CURRENT VALUES. FEEDER LENGTHS SHOWN ARE ESTIMATES FOR CALCULATION PURPOSES ONLY. CONTRACTOR SHALL DETERMINE ACTUAL LENGTHS BASED ON ROUTING AND FIELD CONDITIONS.

26. CONTRACTORS SHALL BE LICENSED IN THE STATE OF CALIFORNIA AND WORKERS SHALL BE CERTIFIED IN ACCORDANCE WITH THE DEPARTMENT OF INDUSTRIAL RELATIONS, DIVISION OF APPRENTICESHIP STANDARDS AND CALIFORNIA LABOR CODE SECTION 3099.

27. PRIOR TO PLANNING EXCAVATION WORK, RETAIN THE SERVICES OF AN INDEPENDENT ELECTRONIC LOCATOR SERVICE TO PROVIDE THE EXACT LOCATION OF UNDERGROUND UTILITY SERVICES AND VERIFY POSSIBLE CONFLICTS WITH THAT WHICH IS INDICATED ON THE SITE OR OTHER UTILITY DRAWINGS. REPORT CONFLICTS TO THE OWNER AND ARCHITECT WITHIN 5 DAYS OF THE COMPLETION OF THE SURVEY.

28. PROVIDE WIRING FOR EQUIPMENT FURNISHED BY OTHER DIVISIONS. THE TERM "WIRING" AS USED HEREIN, INCLUDES FURNISHING AND INSTALLING CONDUIT, WIRE, JUNCTION BOXES, DISCONNECTS ETC., AND MAKING CONNECTIONS TO THE EQUIPMENT. BE RESPONSIBLE FOR PROPER WIRING AND NECESSARY ELECTRICAL ADJUSTMENTS TO EQUIPMENT CONFORMING TO SPECIFIED REQUIREMENTS OF THE EQUIPMENT. REVIEW DRAWINGS OF OTHER DISCIPLINES TO ASCERTAIN THE REQUIREMENTS OF EQUIPMENT BEING FURNISHED AND/OR INSTALLED BY THAT DIVISION PRIOR TO BID. COORDINATE EXACT DETAILS AND LOCATIONS OF EQUIPMENT AND DEVICES PRIOR TO ROUGH IN WITH OTHER DIVISIONS. PROVIDE FLUSH MOUNTED BACKBOXES AND 3/4" CONDUIT ONLY STUBBED INTO CEILING SPACE (ABOVE OR LEVEL BELOW) FOR TEMPERATURE AND CO2 SENSORS, AND/OR CONDUIT RACEWAYS AS SHOWN ON THESE DRAWINGS. OTHER DIVISIONS WILL PROVIDE CONDUIT CONTINUATIONS, CONTROL WIRING, AND TERMINATIONS TO EQUIPMENT AND DEVICES UNLESS NOTED OTHERWISE.

29. PROVIDE REQUIRED HARDWARE FOR CONNECTION TO DEVICES WHICH LUGS DO NOT ACCEPT OVERSIZED CONDUCTORS. SUBMIT TO DISTRICT PROJECT MANAGER FOR APPROVAL APPLICABLE VOLTAGE DROP CALCULATIONS PRIOR TO REDUCING CONDUCTOR SIZE.

30. CONDUITS EMBEDDED WITHIN CONCRETE FLOORS SHALL BE ROUTED PARALLEL TO OR AT RIGHT ANGLES TO STRUCTURAL MEMBERS AND SHALL HAVE A MINIMUM OF 1 1/2" COVER ABOVE AND BELOW THE CONDUIT.

31. ADJACENT LIGHT SWITCHES AND OTHER WIRING DEVICES SHALL
32. BE PROVIDED WITH A SINGLE COVER PLATE, BARRIERS SHALL BE PROVIDED IN BOXES FOR DIFFERENT VOLTAGES AS REQUIRED. VERIFY COLOR WITH DISTRICT PROJECT MANAGER.

33. WALL OUTLETS SHALL NOT BE INSTALLED IN A BACK TO BACK CONFIGURATION BUT SHALL BE INSTALLED SEPARATED HORIZONTALLY BY A MINIMUM OF 18 INCHES IN NON-FIRE-RATED WALLS, AND A MINIMUM OF 24 INCHES IN FIRE RATED WALLS. WHERE THESE SEPARATIONS ARE NOT POSSIBLE TO MAINTAIN, PROVIDE SOUND DEADENING FIRE RATED PADS AROUND THE BOXES.

34. DEVICES AND EQUIPMENT INSTALLED OUTDOORS OR IN DAMP OR WET LOCATIONS SHALL BE APPROVED AND UL LISTED FOR SUCH USE.

35. 125 VOLT, 20 AMPERE RATED, SINGLE PHASE DUPLEX RECEPTACLES WITH GROUND FAULT CIRCUIT INTERRUPTER PROTECTIONS SHALL BE INSTALLED OUTDOORS, WITHIN 6 FEET OF A SINK OR WET EQUIPMENT OR OTHER SOURCE OF WATER, ELEVATOR MACHINE ROOMS AND PITS, KITCHENS, AND IN SURFACE METAL RACEWAYS OR ENCLOSURES. FEED THROUGH WIRING OF GROUND FAULT CIRCUIT INTERRUPTER TYPE RECEPTACLES SHALL NOT BE PERMITTED UNLESS NOTED OTHERWISE.

36. LIGHT FIXTURES WITH "NL" (NIGHT LIGHT) DESIGNATION AND EXIT SIGNS SHALL BE PROVIDED WITH AN UNSWITCHED "HOT" LIGHTING BRANCH CIRCUIT.

37. PROVIDE BRANCH CIRCUIT CONDUCTORS SIZED SO THAT VOLTAGE DROP DOES NOT EXCEED 3% TO THE LAST DEVICE.

38. BRANCH CIRCUITS WITH MORE THAN THREE CURRENT CARRYING CONDUCTORS IN A SINGLE CONDUIT SHALL HAVE THEIR AMPACITY DERATED PER ELECTRICAL CODE SECTION 315(B)(2).

39. COMPLETE, POST, SUBMIT, OR MAKE AVAILABLE TO THE ENFORCEMENT AGENCY FOR ALL APPROPRIATE INSPECTIONS OR BUILDING OWNER, DOCUMENTATION IN ACCORDANCE WITH TITLE 24 PART 6 SECTION 10-103 TO INCLUDE BUT NOT LIMITED TO:
   a. INSTALLATION CERTIFICATE(S) FOR MANUFACTURED DEVICES REGULATED BY THE APPLIANCE EFFICIENCY REGULATIONS OF PART 6.
   b. CERTIFICATE(S) OF ACCEPTANCE FORMS. FORMS MUST BE FILED WITH THE ENFORCING AGENCY PRIOR TO RECEIVING FINAL OCCUPANCY PERMIT.
   c. APPROPRIATE CERTIFICATE(S) OF COMPLIANCE AND A LIST OF THE FEATURES, MATERIALS, AND COMPONENTS INSTALLED IN THE BUILDING(S) TO THE OWNER WITH INSTRUCTIONS ON HOW TO OPERATE THEM EFFICIENTLY.
   d. MAINTENANCE INFORMATION FOR ALL FEATURES, MATERIALS, COMPONENTS, AND MANUFACTURED DEVICES THAT REQUIRE ROUTINE MAINTENANCE FOR EFFICIENT OPERATION.

39. DELIVER COMPLETE AND ACCURATE RECORD DRAWINGS (AS-BUILT) TO BUILDING OWNER WITHIN 90 DAYS OF RECEIVING FINAL OCCUPANCY PERMIT FOR THE ENFORCING AGENCY (AUTHORITY HAVING JURISDICTION). IF ANY CHARACTERISTIC IS MATERIALLY CHANGED BEFORE FINAL CONSTRUCTION AND INSTALLATION, SUCH THAT THE BUILDING MAY NO LONGER COMPLY WITH TITLE 24, PART 6, THE BUILDING MUST BE BROUGHT BACK INTO COMPLIANCE, AND SO INDICATED ON AMENDED PLANS, SPECIFICATIONS, AND CERTIFICATE(S) OF COMPLIANCE AND SHALL BE SUBMITTED TO THE ENFORCEMENT AGENCY. SUCH CHARACTERISTICS SHALL INCLUDE THE EFFICIENCY (OR OTHER CHARACTERISTIC REGULATED BY PART 6) OF EACH DEVICE.

40. FOR ELECTRICAL WORK RELATED TO SPECIALTY SYSTEMS NOT SHOWN ON THESE DRAWINGS, REFER TO DRAWINGS AND SPECIFICATIONS FOR THE FOLLOW SYSTEMS:
   a. FIRE ALARM – "F" SERIES SHEETS

41. POWDER ACTUATED FASTENERS ARE NOT PERMITTED FOR USE ON THIS PROJECT.

42. PROVIDE CONDUIT PENETRATIONS THROUGH ROOF FOR FIRE ALARM DEVICES LOCATED ON ROOF.

43. PERFORM AN ARC FLASH ANALYSIS STUDY IN CONJUNCTION WITH SPECIFIED SHORT CIRCUIT AND PROTECTIVE DEVICE COORDINATION STUDY. THIS ARC FLASH ANALYSIS STUDY TO BE PERFORMED IN ACCORDANCE WITH IEEE STANDARD 1584a. DETERMINE THE FOLLOWING FOR EACH BUS ANALYZED:
   A. FLASH HAZARD PROTECTION BOUNDARY
   B. INCIDENT ENERGY LEVEL
   C. REQUIRED PERSONAL PROTECTIVE EQUIPMENT CATEGORY
   D. TYPE OF FIRE RATED CLOTHING
   E. LIMITED APPROACH BOUNDARY
   F. RESTRICTED APPROACH BOUNDARY

44. PRODUCE AN ARC FLASH WARNING LABEL FOR EACH PIECE OF ELECTRICAL EQUIPMENT WITH IDENTIFICATION AND RESULTANT VALUES OF THE ARC FLASH STUDY ITEMS LISTED ABOVE FOR THAT EQUIPMENT. INCLUDE THE SYSTEM OPERATING VOLTAGE AND DATE OF ISSUE. LABELS SHALL BE PRINTED IN COLOR ON ADHESIVE BACKED NYLON LABELS AND APPLIED TO EQUIPMENT FRONT.

45. MINIMUM CONDUIT SIZE SHALL BE 3/4" STEEL, UNLESS OTHERWISE NOTED.

46. MINIMUM WIRE SIZE SHALL BE AWG #12 MINIMUM, UNLESS OTHERWISE NOTED.

47. WORK SHALL BE COORDINATED WITH OTHER TRADES TO AVOID CONFLICTS AND/OR DELAYS.

48. ALL WIRE SHALL BE COPPER.

49. WHEN NECESSARY ADJUST FIXTURE PLACEMENT TO FIELD CONDITIONS.

50. RECEPTACLES SHALL BE 20 AMPERE, HEAVY DUTY, UNLESS OTHERWISE NOTED.

51. THE CONTRACTOR SHALL NOTIFY THE DISTRICT PROJECT MANAGER 24 HOURS PRIOR TO PLANNED INSPECTIONS.

52. IMMEDIATELY NOTIFY THE DISTRICT PROJECT MANAGER UPON DISCOVERY OF CONFLICTS.

53. DAMAGE TO EXISTING FACILITIES INCLUDING BUT NOT LIMITED TO FENCES, WALLS, SIDEWALK AND OTHER PAVEMENT SURFACES SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE.

54. BE RESPONSIBLE FOR WORKING CONDITIONS ON THE JOB SITE. INCLUDING BUT NOT LIMITED TO THE SAFETY OF ALL PERSONS AND PROPERTY DURING THE PERFORMANCE OF THE WORK, INCLUDING OUTSIDE OF NORMAL WORKING HOURS.

55. ELECTRICAL SWITCHES AND CONTROLS TO BE USED BY THE OCCUPANTS OF THE ROOM OR AREA TO CONTROL LIGHTING AND RECEPTACLE OUTLETS, APPLIANCES, OR COOLING, HEATING AND VENTILATING EQUIPMENT SHALL BE LOCATED NO MORE THAN 48 INCHES MEASURED FROM THE TOP OF OUTLET BOX NOR LESS THAN 15 INCHES MEASURES FROM THE BOTTOM OF THE OUTLET BOX TO THE LEVEL OF THE FINISH FLOOR OR WORKING PLATFORM.

56. ELECTRICAL RECEPTACLE OUTLETS ON BRANCH CIRCUITS OF 30 AMPS OR LESS AND COMMUNICATION SYSTEM RECEPTACLES SHALL BE LOCATED NO MORE THAN 48 INCHES MEASURED FROM THE TOP OF THE RECEPTACLE OUTLET BOX OR RECEPTACLE HOUSING NOR LESS THAN 15 INCHES MEASURED FROM THE BOTTOM OF THE RECEPTACLE OUTLET BOX OR RECEPTACLE HOUSING TO THE LEVEL OF THE FINISH FLOOR OR WORKING PLATFORM.

P COMPONENT ANCHORAGE NOTE:

57. MEALL MECHANICAL, PLUMBING, AND ELECTRICAL COMPONENTS SHALL BE ANCHORED AND INSTALLED PER THE DETAILS ON THE DSA APPROVED CONSTRUCTION DOCUMENTS. WHERE NO DETAIL IS INDICATED, THE FOLLOWING COMPONENTS SHALL BE ANCHORED OR BRACED TO MEET THE FORCE AND DISPLACEMENT REQUIREMENTS PRESCRIBED IN THE 2016 CBC, SECTIONS 1615A.1.12 THROUGH 1615A.1.22 AND ASCE 7-05 CHAPTER 6 AND 13.
   1. ALL PERMANENT EQUIPMENT AND COMPONENTS.
   2. TEMPORARY OR MOVABLE EQUIPMENT THAT IS PERMANENTLY ATTACHED (E.G. HARD WIRED) TO THE BUILDING UTILITY SERVICES SUCH AS ELECTRICITY, GAS OR WATER.
   3. MOVABLE EQUIPMENT WHICH IS STATIONED IN ONE PLACE FOR MORE THAN 8 HOURS AND HEAVIER THAN 400 POUNDS ARE REQUIRED TO BE ANCHORED WITH TEMPORARY ATTACHMENTS.

58. THE ATTACHMENT OF THE FOLLOWING MECHANICAL AND ELECTRICAL COMPONENTS SHALL BE POSITIVELY ATTACHED TO THE STRUCTURE, BUT NEED NOT BE DETAILED ON THE PLANS. THESE COMPONENTS SHALL HAVE FLEXIBLE CONNECTIONS PROVIDED BETWEEN THE COMPONENT AND ASSOCIATED DUCTWORK, PIPING, AND CONDUIT.
   A. COMPONENTS WEIGHING LESS THAN 400 POUNDS AND HAVE A CENTER OF MASS LOCATED 4 FEET OR LESS ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT.
   B. COMPONENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, LESS THAN 5 POUNDS PER FOOT, WHICH ARE SUSPENDED FROM A ROOF OR FLOOR OR HUNG FROM A WALL.

59. FOR THOSE ELEMENTS THAT DO NOT REQUIRE DETAILS ON THE APPROVED DRAWINGS, THE INSTALLATION SHALL BE SUBJECT TO THE APPROVAL OF THE STRUCTURAL ENGINEER OF RECORD AND THE DSA DISTRICT STRUCTURAL ENGINEER. THE PROJECT INSPECTOR WILL VERIFY THAT ALL COMPONENTS AND EQUIPMENT HAVE BEEN ANCHORED IN ACCORDANCE WITH ABOVE REQUIREMENTS.

PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEM BRACING NOTE:

60. PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEMS SHALL BE BRACED TO COMPLY WITH THE FORCES AND DISPLACEMENTS PRESCRIBED IN ASCE 7-05 SECTION 13.3 AS DEFINED IN ASCE 7-05 SECTION 13.6.8, 13.6.7, 13.6.5.6, AND 2016 CBC, SECTIONS 1615A.1.20, 1615A.1.21 AND 1615A.1.22.

61. THE BRACING AND ATTACHMENTS TO THE STRUCTURE SHALL BE DETAILED ON THE APPROVED DRAWINGS OR THEY SHALL COMPLY WITH ONE OF THE OSHPD PRE-APPROVALS (OPA#) AS MODIFIED TO SATISFY ANCHORAGE REQUIREMENTS OF ACI 318, APPENDIX D.

62. COPIES OF THE MANUAL SHALL BE AVAILABLE ON THE JOBSITE PRIOR TO THE START OF HANGING AND BRACING OF THE PIPE, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEMS.

63. THE STRUCTURAL ENGINEER OF RECORD SHALL VERIFY THE ADEQUACY OF THE STRUCTURE TO SUPPORT THE HANGER AND BRACE LOADS.

LEGEND (ALL SYMBOLS SHOWN ARE NOT NECESSARILY ON DRAWINGS)

CALLOUTS

- AC / 1 — EQUIPMENT TYPE, SEE ABBREVIATIONS; EQUIPMENT NO.
- A11 — FEEDER TAG
- [HA-1] — LIGHTING PANEL AND CIRCUIT/RELAY NUMBER
- 1 / E4.1 — FLOOR PLAN/DETAIL NO.; SHEET NO.
- 1 — NOTE CALLOUTS PER FLOOR PLAN
- 1 — CONDUIT TAG, "E"= ELECTRICAL, "D"= DATA AND SIGNAL
- A — LIGHTING FIXTURE DESIGNATION
- EQUIPMENT (NIC) OR ELECTRICAL EQUIPMENT FURNISHED BY OWNER
- FUTURE EQUIPMENT
- WORKING SPACE CLEARANCE; ELECTRICAL EQUIPMENT
- 1 — SHEET NOTE TAG
- 1 — REVISION REFERENCE
- 1B / E1.1 — SECTION DETAIL NO.; REFERENCE SHEET NO.

LIGHTING

- RECESSED FIXTURE
- EMERGENCY LIGHTING UNIT
- ILLUMINATED EXIT SIGN AND JUNCTION BOX, CEILING OR WALL MOUNTED, DARK AREA INDICATES FACE(S) ON SIGN, ARROW(S) INDICATE DIRECTION TO EXIT
- WALKWAY LIGHTING
- PARKING LOT LIGHTING. POLE MOUNTED. ONE OR TWO HEAD
- $ — ALL SWITCHES SPST, 12/277V, 15A UON, SUBSCRIPTS AS NOTED:

a	OUTLET SWITCHED	2	DOUBLE POLE
3	THREE WAY	4	FOUR WAY
K	KEYED	LV	LOW VOLTAGE
OS	OCCUPANCY SENSOR EQUIPPED	S	SENTRY SWITCH
D	DIMMER SWITCH		
T	SINGLE POLE MOTOR RATED SWITCH WITH THERMAL OVERLOAD ELEMENT		

- OS — OCCUPANCY SENSOR SWITCH – WALL MOUNTED
- PS OS — OCCUPANCY SENSOR AND POWER PACK – CEILING MOUNTED
- PC — PHOTOCELL
- RC — ROOM CONTROL

CONDUIT

- CONDUIT RUN CONCEALED IN WALL OR CEILING – 3/4", UNO
- CONDUIT IN OR BELOW FLOOR SLAB OR GRADE – 3/4", UNO
- CONDUIT UP
- CONDUIT DOWN
- CONDUIT STUB-OUT WITH CAP
- W — WIREMOLD
- LA-1,3,5 — HOMERUN TO PANEL LA, CIRCUITS #1,3,5 & LONG HASH MARK INDICATE NEUTRAL, "HOOK" INDICATES GND. W/O LONG HASH MARK INDICATES SHARED NEUTRAL. 3/4" CONDUIT UON
- #10 — 3/4" CONDUIT WITH QUANTITY OF CONDUCTORS AS INDICATED BY HASH MARKS. NUMBER ADJACENT TO HASH MARKS INDICATES WIRE SIZE. HASH MARKS WITHOUT NUMBER INDICATES #12 CONDUCTORS. NO HASH MARKS INDICATES 2 #12 CONDUCTORS.
- FLEXIBLE CONDUIT

LOW VOLTAGE

- AV — A/V CONTROL STATION WITH A/V INPUT OUTLET BELOW
- V — PROJECT A/V OUTLET
- CLOCK OUTLET – WALL MOUNTED, FLUSH
- TELEPHONE OUTLET, FLUSH MOUNTED WITH CONDUIT AND CABLE UON
- COMBINATION DATA/TELEPHONE OUTLET – FLUSH MOUNTED
- DUPLEX DATA OUTLET – FLUSH MOUNTED WITH CONDUIT CABLE(S) UON – W/ CONDUIT TO ACCESSIBLE CEILING FOR FUTURE
- C — COMBO PROJECTOR/TEACHER OUTLET BOX FLUSH MOUNTED EITHER IN CEILING OR WALL – "C"=FLUSH CEILING MOUNTED
- CALL BUTTON
- FUTURE CAMERA
- WP S — SPEAKER OUTLET – FLOOR MOUNTED, FLUSH, WP = WEATHER PROOF
- M — MICROPHONE OUTLET – FLOOR MOUNTED, FLUSHED
- T — TEMPERATURE SENSOR/THERMOSTAT – WALL MOUNTED – PROVIDE FLUSH BACK BOX AND 3/4" CONDUIT ONLY TO ACCESSIBLE CEILING SPACE
- USB — USB SMARTBOX OUTLET
- M — MICROPHONE OUTLET – FLOOR MOUNTED, FLUSHED

MISCELLANEOUS

- J — JUNCTION BOX – CEILING MOUNTED, SURFACE
- WP J — JUNCTION BOX – WALL MOUNTED, FLUSH – WP=WEATHER PROOF
- J — JUNCTION BOX – FLOOR MOUNTED, FLUSH
- PB — PULL BOX – FLUSH OR SURFACE MOUNTED – SIZE PER CEC
- WIRELESS MICROPHONE RECEIVER
- PRIORITY PAGE SENSOR
- A — METALLIC COMBINATION FLOOR BOX WITH 2-GANG COVER PLATE – FLOOR MOUNTED FLUSH – (2) WIREMOLD #880S2 WITH #827B FLANGE "A"=PROVIDE (2) #828R AND #828 GFI TC COVERS (SSCP TABLES) "B"=PROVIDE #828 SPTC AND #829 STC COVERS (ATM AND PHONE)
- RECESSED LARGE CAPACITY FLOOR BOX WITH BRASS COVER – FLOOR MOUNTED, FLUSH – (2) WIREMOLD #RFB9 WITH #RFB119 BTCAL COVER (SSCP)
- A — NON-METALLIC COMBINATION FLOOR BOX WITH FLANGED COVER – FLOOR MOUNTED, FLUSH (SLAB ON GRADE) – (2) WIREMOLD #880MP, "A"=PROVIDE (2)#830CKTAL-3/4" COVERS AND #828TCAL FLANGE, "B"=PROVIDE #828 AND #828 GFI TC COVERS AND #827B FLANGE, "C"=PROVIDE SINGLE #880MP WITH #880CKTAL-3/4" COVER (POWER ONLY)
- A — FURNITURE FEED FLOOR POKE THRU WITH CONDUIT CONNECTIONS – FLOOR MOUNTED, FLUSH – (2) WIREMOLD #4AFFATC BS, "A"=FLEX CONNECTION FOR POWER AND DATA, "B"=FLEX CONNECTION FOR POWER ONLY
- FIRE RATED PARTITION
- SEISMIC JOINT – REFER TO SPECIFICATIONS

POWER

- 4 — RECEPTACLE – FLUSH WALL MOUNTED DUPLEX (NEMA 5-20R UNO) NUMERAL INDICATES CIRCUIT NUMBER
- RECEPTACLE – FLUSH WALL MOUNTED DOUBLE DUPLEX (NEMA 5-20R UNO)
- COMBINATION DUPLEX RECEPTACLE & FLASH USB
- RECEPTACLE – FLUSH WALL MOUNTED, GROUND FAULT CIRCUIT INTERRUPTING (GFCI), DUPLEX (NEMA 5-20R UNO)
- RECEPTACLE (NEMA 5-204 UNO) – CEILING, FLUSH
- RECEPTACLE (NEMA 5-20R UNO) – FLOOR, FLUSH
- RECEPTACLE – SPECIFIC – NEMA RATING INDICATED FLUSH MOUNTED
- RECEPTACLE – SPECIFIC – NEMA CONFIGURATION INDICATED-FLOOR MOUNTED, FLUSH
- DISCONNECT SWITCH – NON-FUSED 30 AMP, 3P UNO
- DISCONNECT SWITCH – FUSED 30 AMP, 3P UNO, AS – AMPERE SWITCH, AF – AMPERE FUSE
- COMBINATION MAGNETIC MOTOR STARTER WITH OVERLOADS
- CONNECTION TO GROUND
- COPPER CLAD GROUND ROD – 3/4" DIA. x 10'-0" LONG
- MAGNETIC MOTOR STARTER WITH OVERLOADS
- $T — MANUAL MOTOR STARTER WITH OVERLOADS – o=PILOT LIGHT. HORSEPOWER RATING AND OVERLOAD SIZED FOR MOTOR CONTROLLED
- T/C — TIMECLOCK AND CONTACTORS PANEL
- BRANCH PANEL – FLUSH MOUNTED
- BRANCH PANEL – SURFACE MOUNTED
- MAIN OR DISTRIBUTION SWITCHBOARD
- CABINET OR CONTROL PANEL – WALL MOUNTED, SURFACE
- CIRCUIT BREAKER (SINGLELINE), 3P UON, SEE PLANS FOR ADDITIONAL REQUIREMENTS
- M — METER
- X — MOTOR, PROVIDED BY DIVISION 22 OR 23, X DENOTES HORSEPOWER
- GFI — GROUND FAULT INTERRUPTING MODULE OR DEVICE (SINGLELINE)
- ST — SHUNT TRIP MODULE OR DEVICE (SINGLELINE)
- T — TRANSFORMER

SHEET INDEX:

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E-211D	BUILDING 300 PLAN DEMOLITION PLAN-LIGHTING
E-311D	BUILDING 300 PLAN DEMOLITION PLAN – POWER & SIGNAL
E-211	BUILDING 300 PLAN LIGHTING
E-221	BUILDING 100 PLAN – DEMOLITION PLAN – POWER & SIGNAL
E-251	BUILDING 100 PLAN – DEMOLITION PLAN-LIGHTING
E-311	BUILDING 300 PLAN POWER & SIGNAL
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E-401	BUILDING 300 PANEL BOARDS
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F-000	BUILDING 300 PLAN FIRE ALARM NOTES, SYMBOLS & EQUIP LIST
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F-121	BUILDING 300 PLAN FIRE ALARM/CLEAN AGENT
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F-201	BUILDING 300 FIRE ALARM RISER DIAGRAM
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F-300	BUILDING 300 PLAN FIRE ALARM DETAILS
F-301	BUILDING 300 PLAN FIRE ALARM DETAILS
F-400	BUILDING 300 FIRE CALCULATIONS
EN-100	BUILDING 300 TITLE 24 COMPLIANCE
EN-101	BUILDING 300 TITLE 24 COMPLIANCE
EN-102	BUILDING 300 TITLE 24 COMPLIANCE
EN-103	BUILDING 300 TITLE 24 COMPLIANCE
EN-104	BUILDING 100 TITLE 24 COMPLIANCE
EN-105	BUILDING 100 TITLE 24 COMPLIANCE

ABBREVIATIONS

(ALL ABBREVIATIONS SHOWN ARE NOT NECESSARILY ON DRAWINGS)

A	AMPERE
AC	ALTERNATING CURRENT
A/C	AIR CONDITIONER
ADJ	ADJACENT
AIC	MINIMUM AMPERE INTERRUPTING CAPACITY
AF	AMPERE FRAME OR FUSE
AF/AT	AMP FRAME/AMP TRIP
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AFS	AUTOMATIC FIRE SPRINKLER/ABOVE FINISHED SURFACE
AGL	ABOVE GROUND LEVEL
AHJ	AUTHORIZES HAVING JURISDICTION
APPROX	APPROXIMATE
ARCH	ARCHITECT/ARCHITECTURAL
AS	AMPERE SWITCH
AS/AF	AMP SWITCH/AMP FUSE
ATS	AUTOMATIC TRANSFER SWITCH
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
BCW	BARE COPPER WIRE
BLDG	BUILDING
C	CONDUIT
CAB	CABINET
CATV	CABLE TELEVISION
CB	CIRCUIT BREAKER
CBC	CALIFORNIA BUILDING CODE
CFC	CALIFORNIA FIRE CODE
CCTV	CLOSED CIRCUIT TELEVISION
CKT	CIRCUIT
CLG	CEILING
CNTL	CONTROL
CO	CONDUIT ONLY
COAX	COAXIAL CABLE
COL	COLUMN
COMM	COMMUNICATIONS
CONT	CONTINUATION/CONTINUOUS
CT	CURRENT TRANSFORMER
CU	COPPER
DIA	DIAMETER
DISC	DISCONNECT
DN	DOWN
DWG	DRAWING
(E)	EXISTING
EA	EACH
EF	EXHAUST FAN
EL	ELEVATION
ELECT/ELEC	ELECTRICAL
EMERG	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EOL	END OF LINE
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FAPS	FIRE ALARM POWER SUPPLY
FATC	FIRE ALARM TERMINAL CABINET
FBO	FURNISHED BY OTHER DIV. OF WORK
FDR	FEEDER
FIXT	FIXTURE
FL	FLOOR
FLEX	FLEXIBLE
FPL(S)	FIRE ALARM POWER LIMITED (SHIELDED)
FS	FLOW SWITCH
FT	FEET/FOOT
G	GROUND
GFI	GROUND FAULT INTERRUPTION
GND	GROUND
GRS	GALVANIZED RIGID STEEL CONDUIT
HH	HANDHOLE
HID	HIGH INTENSITY DISCHARGE
HOA	HAND OFF AUTOMATIC
HP	HORSE POWER, HEAT PUMP
HZ	HERTZ
IC	INTERRUPTING CAPACITY
IDF	INTERMEDIATE DISTRIBUTION FRAME
IMC	INTERMEDIATE METALLIC CONDUIT
JB	JUNCTION BOX
KCMIL	THOUSAND CIRCULAR MILS
KVA	KILOVOLT AMPERES
KW	KILOWATT
KWH	KILOWATT-HOUR
LCP	LIGHTING CONTROL PANEL
LTG	LIGHTING
LV	LOW VOLTAGE
M	METER
MAX	MAXIMUM
MCA	MINIMUM CIRCUIT AMPACITY
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MDF	MAIN DISTRIBUTION FRAME
MECH	MECHANICAL
MFR	MANUFACTURER
MIN	MINIMUM
MLO	MAIN LUG(S) ONLY
MOCP	MAXIMUM OVERCURRENT PROTECTION
MSB	MAIN SWITCHBOARD
MTD	MOUNTED
(N)	NEW
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NETA	INTERNATIONAL ELECTRICAL TESTING ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OC	ON CENTER
OFCI	OWNER FURNISHED: CONTRACTOR INSTALLED
PA	PUBLIC ADDRESS
PB	PULL BOX
PH,ø	PHASE
PM	PLUG MOLD
PNL	PANEL
PT	POTENTIAL TRANSFORMER
PV	PHOTOVOLTAIC
PVC	POLYVINYL CHLORIDE DUCT
PWR	POWER
(R)	REMOVE
REC	RECESSED
RECEPT	RECEPTACLE
RGS	RIGID GALVANIZED STEEL
(RL)	RELOCATE
RSC	RIGID STEEL CONDUIT
SAD	SEE ARCHITECTURAL DOCUMENTS
SMD	SEE MECHANICAL DRAWINGS
SN	SOLID NEUTRAL
SPECS	SPECIFICATIONS
SPKR	SPEAKER
SPST	SINGLE POLE SINGLE THROW
SSD	SEE STRUCTURAL DOCUMENTS
STBY	STANDBY
STC	SIGNAL TERMINAL CABINET
SW	SWITCH
T	TRANSFORMER
TEL	TELEPHONE
TEMP	TEMPERATURE
THERM	THERMOSTAT
TRANSF	TRANSFORMER
TS	TAMPER SWITCH
TTB	TELEPHONE TERMINAL BOARD
TV	TELEVISION
TYP	TYPICAL
UGPS	UNDERGROUND PULL SECTION
U/G	UNDERGROUND
UL	UNDERWRITERS LABORATORIES
UNO	UNLESS NOTED OTHERWISE
UON	UNLESS OTHERWISE NOTED
V	VOLT/VOLTAGE
VA	VOLT AMPERE(S)
VDC	VOLTAGE DIRECT CURRENT
VM	VOLT METER
W	WATT
W/	WITH
W/O	WITHOUT
WP	WEATHERPROOF
XFMR	TRANSFORMER

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APP. 01-118445 INC:
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DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS

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3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER ANTONIO QUIOBO MORTERA No. E 16739 Exp. 09/30/20 ELECTRICAL STATE OF CALIFORNIA

CONSULTANT:

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TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

LE□ EN□ S□ NOTES □ S□ M□ OLS

DRAWN BY: CHECKED BY:
DATE: 04/30/2019 PROJECT NO: C9506
SHEET NO:

E-000

1 **S[illegible]**
1" = 160'-0"

[illegible] **S[illegible] C[illegible] [illegible] 1**
1" = 40'-0"

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REGISTERED PROFESSIONAL ENGINEER ANTONIO QUIJOBO MORALES No. E 18720 Exp. 09/30/20 ELECTRICAL STATE OF CALIFORNIA

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TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

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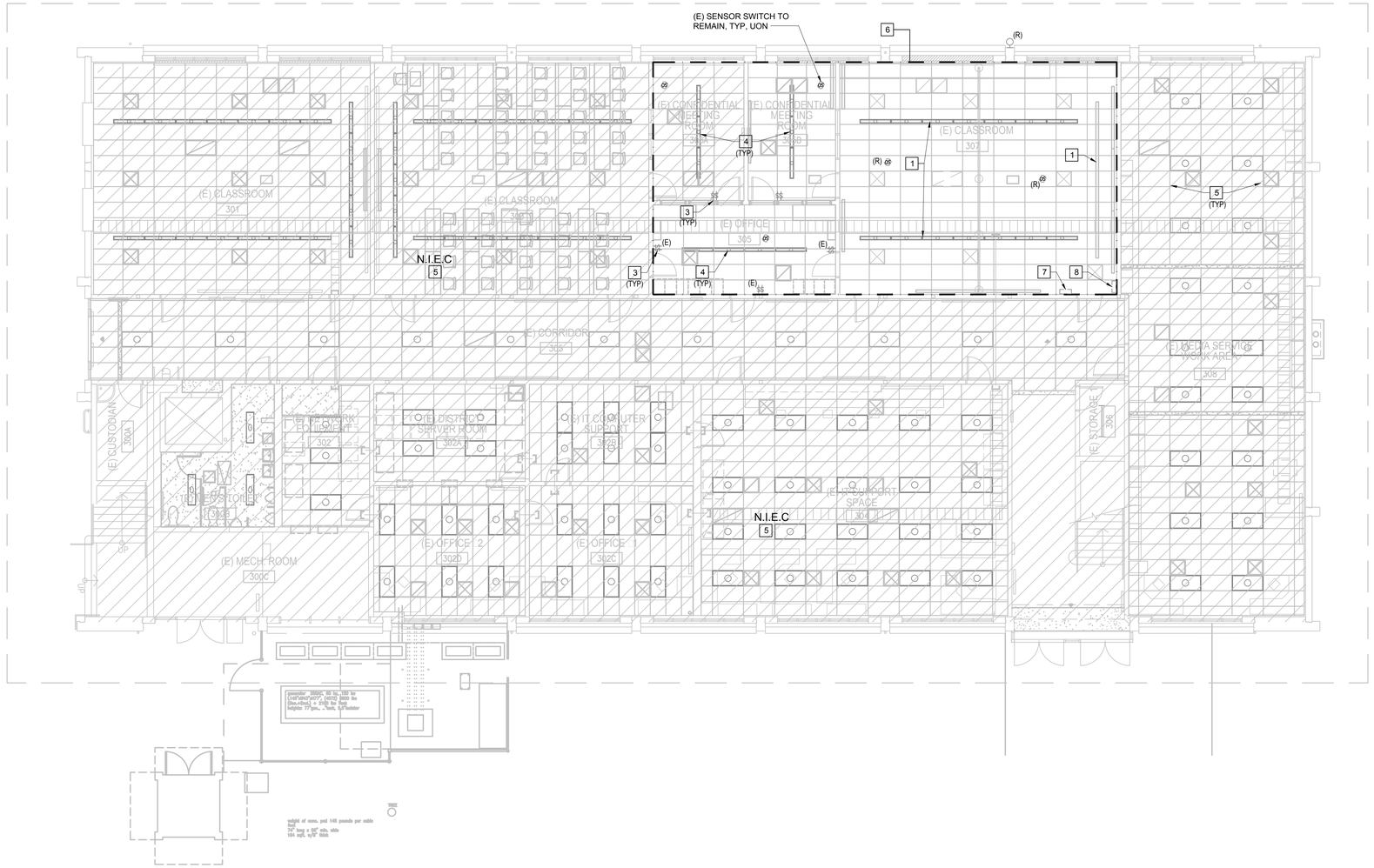
DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506
SHEET NO:	

E-110



1 LEVEL 1-PART LIGHTING SCALE : 1/16" = 1'-0"

GENERAL NOTES:

1. CONTRACTOR TO CAREFULLY REMOVE (E) FIXTURES AND ASSOCIATED CONTROL WIRING & DEVICES. MAINTAIN UNAFFECTED FIXTURES BY RECONNECTION TO (E) BRANCH CIRCUIT. CIRCUIT TRACE AS NECESSARY. MAKE READY THE (E) BRANCH CIRCUIT WIRING FOR (N) LIGHTING INSTALLATION.
2. STORE OLD FIXTURES TO LOCATION AS DIRECTED BY OWNER.

KEY NOTES:

1. SEE GENERAL NOTES FOR FIXTURES AND CONTROLS FOR THIS MODIFIED AREA.
2. NOT USED.
3. (E) SWITCHES TO REMAIN, UON.
4. (E) PENDANT LINEAR LIGHTING TO REMAIN, UON.
5. NOT IN ELECTRICAL CONTRACT NOR SCOPE, UON.
6. PROJECT AREA WITH LIGHTING MODIFICATION, UON.
7. (R) INTEGRATED CLASSROOM CONTROL BOX INSIDE CEILING.
8. (R) TEACHER'S REMOTE CONTROL SWITCHES.

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MPOE REPLACEMENT/
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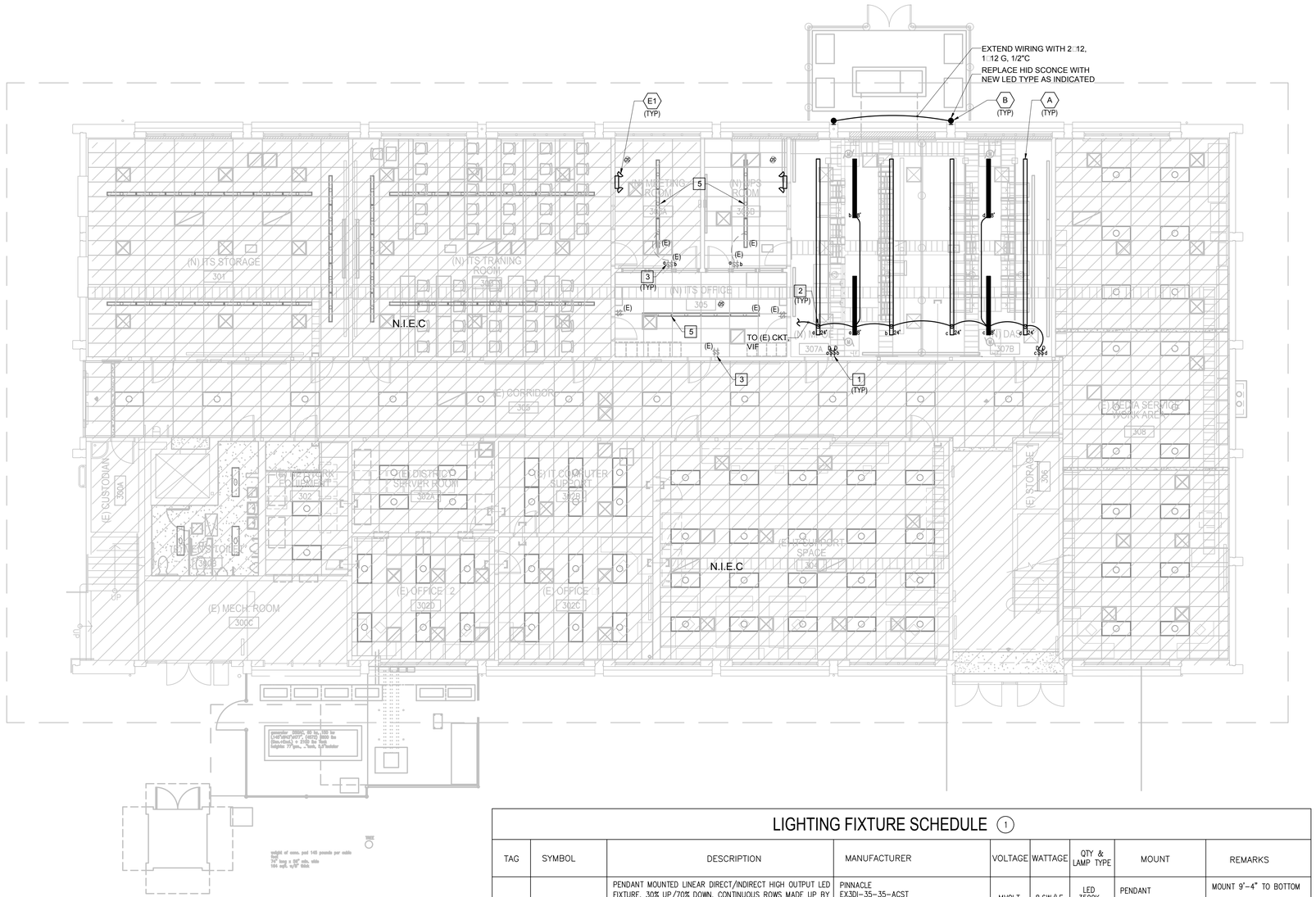
DATE: 04/30/2019	PROJECT NO: C9506

SHEET NO:

E- 11



GENERAL NOTES:

1. CONTRACTOR TO PROVIDE NEW FIXTURES AND CONTROLS AS CALLED FOR AND AS SPECIFIED HEREIN.
2. (N) FIXTURES SHALL BE LED, NO EXCEPTIONS.
3. PROVIDE WIRING TO MATCH (E) VOLTAGE OF FIXTURES REPLACED AND EXTEND AS REQUIRED.
4. COORDINATE LAYOUT OF FIXTURES WITH OTHER TRADES PRIOR TO ROUGH-IN. FIXTURES SHALL BE INSTALLED ABOVE NEW DATA EQUIPMENT, AND NOT LESS THAN 8'-0" AFF, UON.

KEY NOTES:

1. REMOVE AND REPLACE (E) SWITCH CONTROL DEVICE WITH (N) DIMMING SWITCHES AS SHOWN.
2. PROVIDE INTEGRAL DUAL TECH SENSORS WITH POWER PACK AND RELAY PROPRIETARY TO SUPPLIED FIXTURES BY VENDOR AS WELL AS THE LOW VOLTAGE CONTROL WIRING TO BE USED.
3. (E) CONTROL SWITCHES TO REMAIN, UON.
4. CONNECT TO (E) EXIT LIGHT, UON.
5. REFURBISH AND RELAMP FIXTURES WITH (N)-(3)-F032/835. TYPE, QUANTITY AND LAMP WATTAGE TO MATCH (E).

LIGHTING FIXTURE SCHEDULE (1)

TAG	SYMBOL	DESCRIPTION	MANUFACTURER	VOLTAGE	WATTAGE	QTY & LAMP TYPE	MOUNT	REMARKS
A		PENDANT MOUNTED LINEAR DIRECT/INDIRECT HIGH OUTPUT LED FIXTURE, 30% UP/70% DOWN, CONTINUOUS ROWS MADE UP BY COMBINING 8'FT MODULES, SINGLE CIRCUIT, COLD ROLLED STEEL, WHITE END CAPS, 36" AIRCRAFT CABLE MOUNTING CERTIFIED TO ZONE 4 SEISMIC REQUIREMENTS, WHITE TEXTURED MATTE FINISH, DUST COVER, INTEGRAL DIMMING AND OCCUPANCY DETECTION WITH NETWORKING, 20LBS MAX.	PINNACLE EX3DI-35-35-ACST PEERLESS STAPLE: SPM9L-HI-I4-WHR-30/70-24-R8-X-ENNB-SCT-LP835-F2-36-C032-DU-MSD7NL-DSCNL, OR APPROVED EQUAL	MVOLT	8.6W/LF	LED 3500K	PENDANT	MOUNT 9'-4" TO BOTTOM
B		WALL MOUNTED ARCHITECTURAL WALL SCONCE WITH CAST ALUMINUM HOUSING, CORROSION RESISTANT POLYESTER POWDER, IMPACT RESISTANT ACRYLIC LENS, TYPE IV DISTRIVUTION, 20LBS MAX.	LITHONIA: WSQLED-P1-40K-SR4-X-PE-E20WC GARDCO: 106L-3-35LA-NW-UNV-ELCW, OR APPROVED EQUAL	MVOLT	20W	LED 4000K	SURFACE	
E		EMERGENCY TWN HEAD WITH LED LAMPS, INTEGRAL NICAD BATTERY WITH 90MIN MINIMUM POWER CAPACITY, WHITE FINISH, COMPLETE	SURELIGHT/EATON LIGHTING CU2-LED OR APPROVED EQUAL	MVOLT	10W	LED –	SURFACE	CONNECT TO UNSWITCHED LEG OF THE CKT, VIF

(1) NOTES: 1. SHADED FIXTURE INDICATES UNIT WITH EMERGENCY BALLAST, BODINE 50 OR APPROVED EQUAL.

1 LEVEL 1-PART LIGHTING

SCALE : 1/18" = 1'-0"

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PROFESSIONAL STAMP:

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ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

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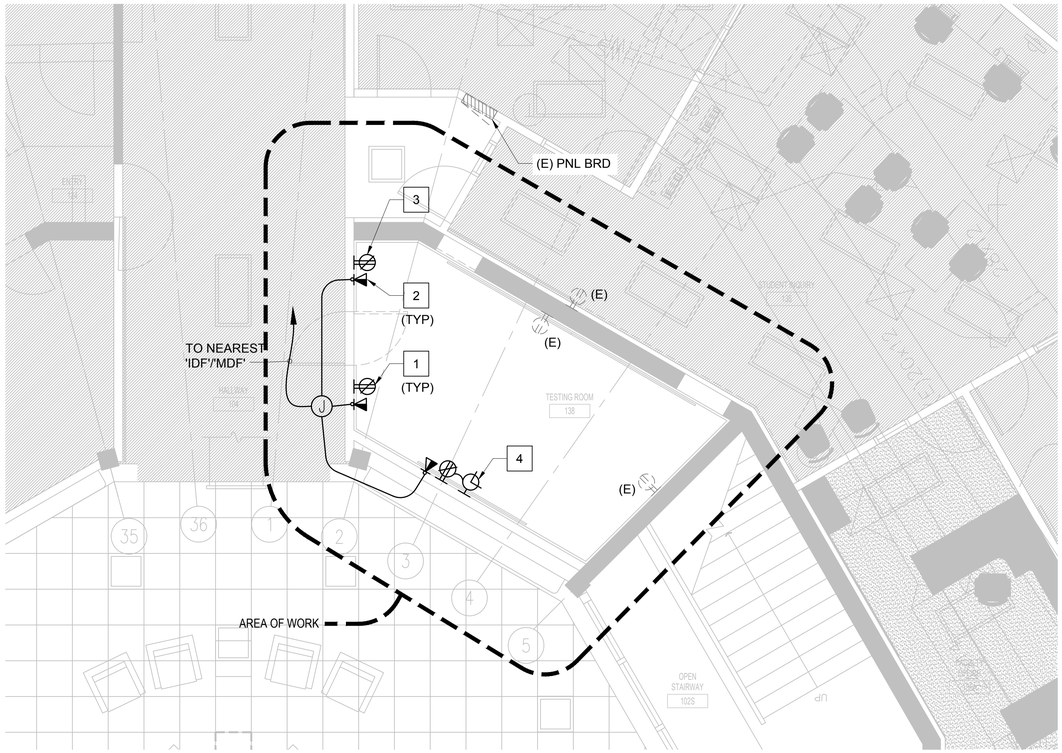
DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506

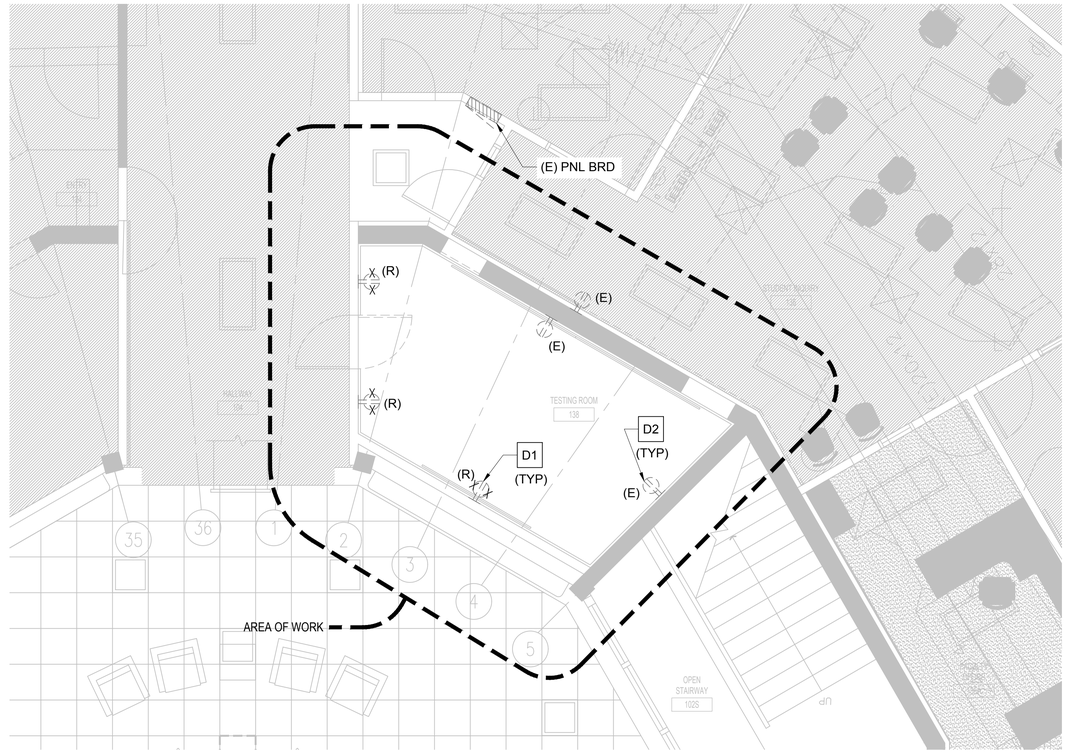
SHEET NO:

E- 11



2 NEW ELECTRICAL PLAN

SCALE : 1/4" = 1'-0"



1 DEMOLITION ELECTRICAL PLAN

SCALE : 1/4" = 1'-0"

NEW PLAN KEY NOTES:

1. PROVIDE (N) RECEPT REPLACING (E). EXTEND WIRING AS NECESSARY; EXTENSION TO MATCH (E). MOUNT 15" MIN AFF. TO BOTTOM OF OUTLET BOX.
2. PROVIDE (N) DATA OUTLET AS SHOWN AND PROVIDE CAT6A CABLE TO NEAREST IDF/MDF. COORDINATE WITH OWNER.
3. OUTLET WITH USB PORT AS MANUF BY LEGRAN OR EQUAL. MOUNT 15" MIN AFF. TO BOTTOM OF OUTLET BOX.
4. PROVIDE (N) CLOCK WITH TYPE AND FINISH TO MATCH (E).

GENERAL DEMO NOTES:

D1. COORDINATE FIXTURE COUNTS WITH OWNER PRIOR TO DEMOLITION. FIXTURES TO BE REMOVED ARE NOTED WITH "(R)" AND/OR CROSS MARKS.

D2. (E) FIXTURES TO BE REMOVED SHALL BE CAREFULLY DISCONNECTED FROM SOURCE & STORED TO LOCATION AS DIRECTED BY OWNER.

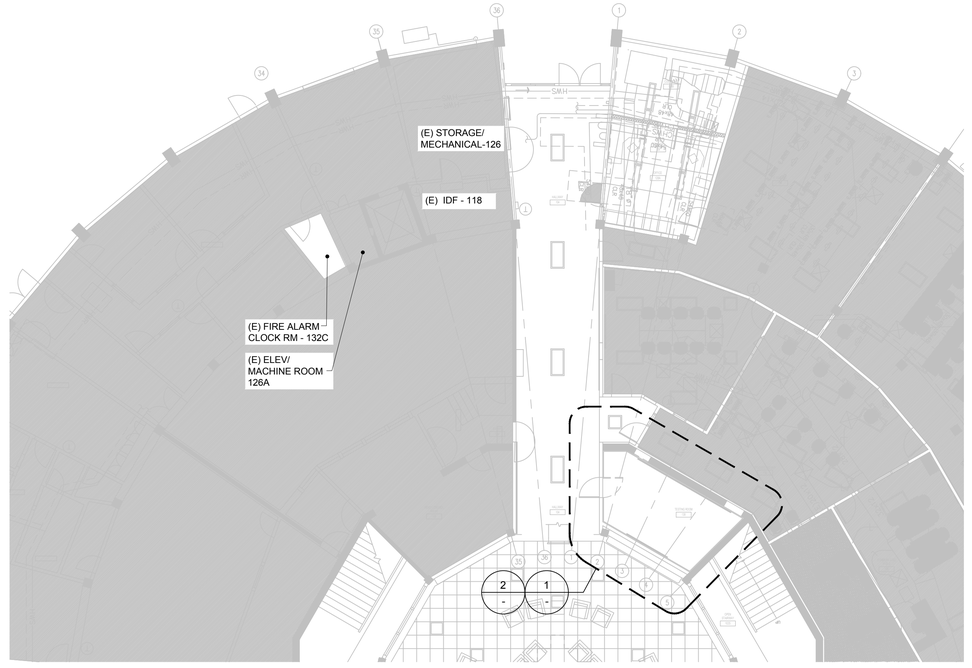
D3. ASSOCIATED CONTROLS & WIRING SHALL BE REMOVED UON, TYP.

D4. FOR REMAINING FIXTURES SHARING SAME CKTS WITH UNITS TO BE DEMO'ED PROVIDE CONTINUITY & RECONNECT TO AVAILABLE CKTS IN PANEL.

DEMO PLAN KEY NOTES:

D1. REMOVE OUTLET TO BE REPLACED WITH (N) AND AT NEW MOUNTING HEIGHT PER LEGEND SHEET.

D2. (E) OUTLET TO REMAIN, UON.



1 VICINITY PLAN

SCALE : 1/4" = 1'-0"

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4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER ANTONIO QUIJOBO MORALES No. E 18720 Exp. 09/30/20 ELECTRICAL STATE OF CALIFORNIA

CONSULTANT:

MPE
METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:
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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

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2 NEW LIGHTING PLAN

SCALE : 1/4" = 1'-0"

1 DEMOLITION LIGHTING PLAN

SCALE : 1/4" = 1'-0"

GENERAL NOTES:

1. RE-USE (E) BRANCH CKT FOR (N) FIXTURES & EXTEND WIRING AS NECESSARY. EXTENSION TYPE TO MATCH (E).
2. UPDATE/PROVIDE TYPE WRITTEN LOAD SCHEDULE IN PANELBOARD.
3. LIGHTING CONTROL EQUIPMENT AND OR DEVICES ARE PROPRIETARY TO LIGHTING FIXTURES SPECIFIED HEREIN.

NEW PLAN KEY NOTES:

1	(N) LIGHT FIXTURE, TYPE. SEE SCHEDULE THIS SHEET.
2	UTILIZE (E) JBOX & CONNECT (N) FIXTURE AS REQUIRED.
3	(N) DIM SWITCHES REPLACING OLD SWITCH.
4	PROVIDE DUAL TECH OCCUPANCY SENSOR OR EQUAL.
5	UNIT WITH INTEGRAL EMERGENCY POWER PACK.

GENERAL DEMO NOTES:

D1. COORDINATE FIXTURE COUNTS WITH OWNER PRIOR TO DEMOLITION. FIXTURES TO BE REMOVED ARE NOTED WITH "(R)" AND/OR CROSS MARKS.

D2. (E) FIXTURES TO BE REMOVED SHALL BE CAREFULLY DISCONNECTED FROM SOURCE & STORED TO LOCATION AS DIRECTED BY OWNER.

D3. ASSOCIATED CONTROLS & WIRING SHALL BE REMOVED UON, TYP.

D4. FOR REMAINING FIXTURES SHARING SAME CKTS WITH UNITS TO BE DEMO'ED PROVIDE CONTINUITY & RECONNECT TO AVAILABLE CKTS IN PANEL.

DEMO PLAN KEY NOTES:

D1	REMOVE LIGHT FIXTURES, SALVAGE TO OWNER.
D2	REMOVE OLD OCCUPANCY SENSOR.
D3	(E) SURFACE RACEWAY TO REMAIN.

LIGHTING FIXTURE SCHEDULE (1)

TAG	SYMBOL	DESCRIPTION	MANUFACTURER	VOLTAGE	WATTAGE	QTY & LAMP TYPE	MOUNT	REMARKS
A		SURFACE WARPAROUND, SHALLOW HOUSING, 0-10V DIM, ACRYLIC LENS, WHITE FINISH	RAB LIGHTING GUS.4.36.YN.W.D10	MVOLT	36W	LED 3500K	SURFACE	
AE		SAME AS ABOVE EXCEPT WITH EMERG BATTERY PACK UNIT, SELF DIAGNOSTIC	RAB LIGHTING GUS.4.36.YN.W.D10	MVOLT	36W	LED 3500K	SURFACE	PROVIDE 'E2' OPTION

(1) NOTES: 1. SHADED FIXTURE INDICATES UNIT WITH EMERGENCY BATTERY POWER PACK, BODINE OR APPROVED EQUAL.

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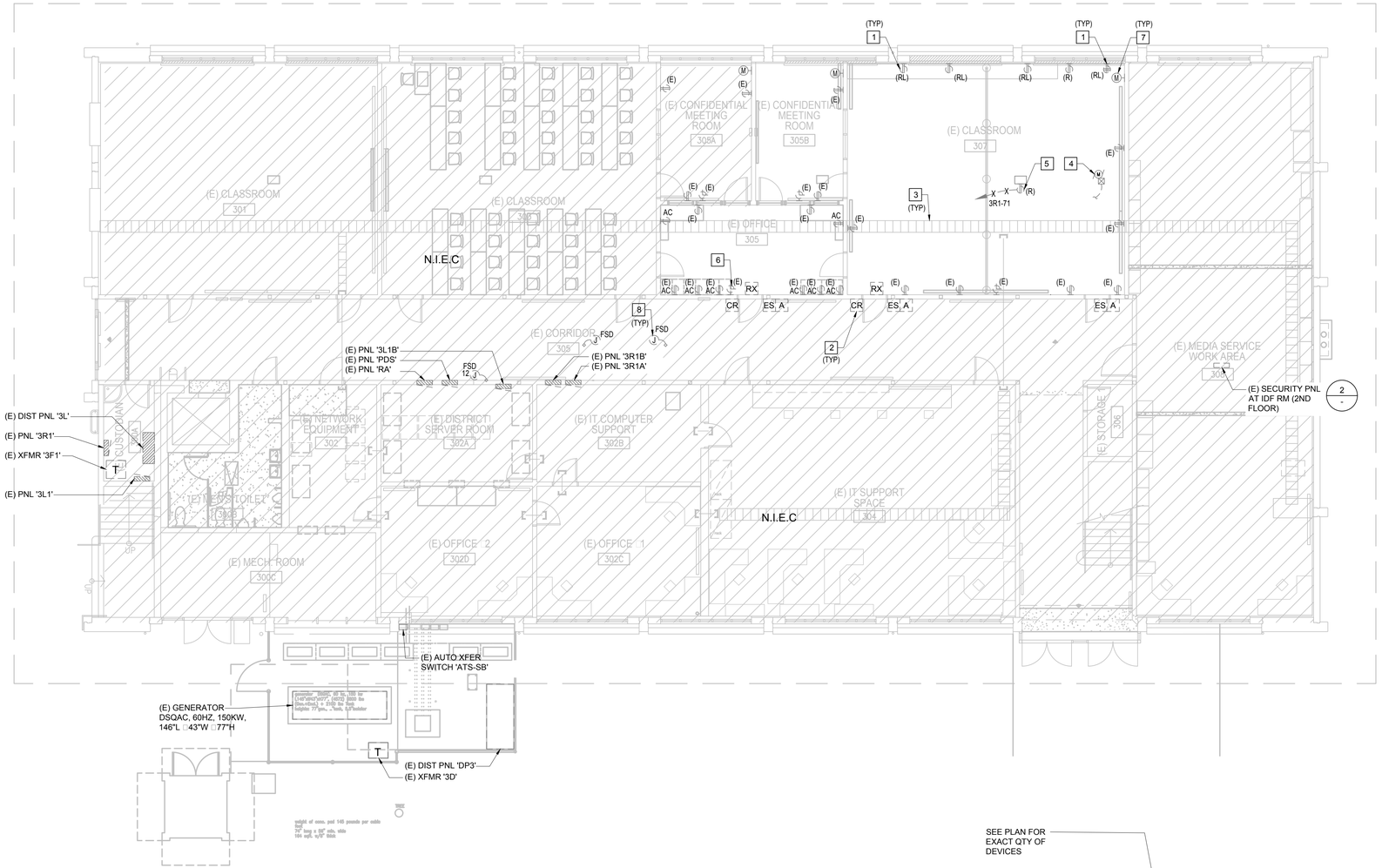
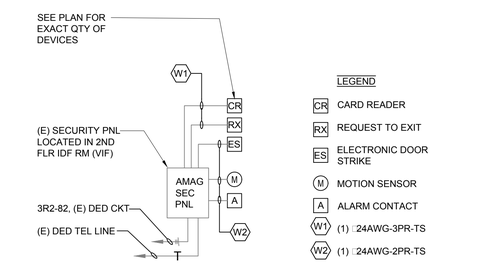


1 LEVEL 1-PART POWER & SIGNAL SCALE : 1/16" = 1'-0"



2 (E) SECURITY RISER DIAGRAM SCALE : NTS

GENERAL NOTES:

1. CIRCUIT TRACE WIRING PRIOR TO REMOVAL OF OUTLETS NO LONGER NEEDED OR AS AFFECTED BY THE MODIFICATION. CAP OFF AS REQUIRED.
2. MAINTAIN CIRCUITRY OF THE REMAINING OUTLETS, UON.
3. WHERE SHOWN RELOCATED, CAREFULLY REMOVE OUTLET AND PROVIDE EXTENSION TO MATCH (E).

KEY NOTES:

1. REMOVE AND RELOCATE RECEPTACLE OUTLET OVER (N) PLYWOOD PANELING. EXTEND WIRING AS NECESSARY, TYP WHERE OCCURS. MOUNT 15" MIN AFF TO BOTTOM OF OUTLET BOX.
2. (E) PROGRAMMABLE DOOR LOCK/CARD READER TO REMAIN, UON.
3. (E) CABLE TRAY TO REMAIN, UON.
4. CAREFULLY REMOVE MOTORIZED SCREEN AND ASSOCIATED WIRING AND CONTROL AND STORE TO LOCATION AS DIRECTED BY OWNER.
5. REMOVE DEDICATED OUTLET FOR PROJECTOR AND MAKE AS SPARE FOR FUTURE USE.
6. (E) SYSTEM CLOCK TO REMAIN, UON.
7. (E) SECURITY MOTION SENSOR DEVICE TO REMAIN, UON.
8. (E) FIRE SMOKE DAMPER TO REMAIN, UON.

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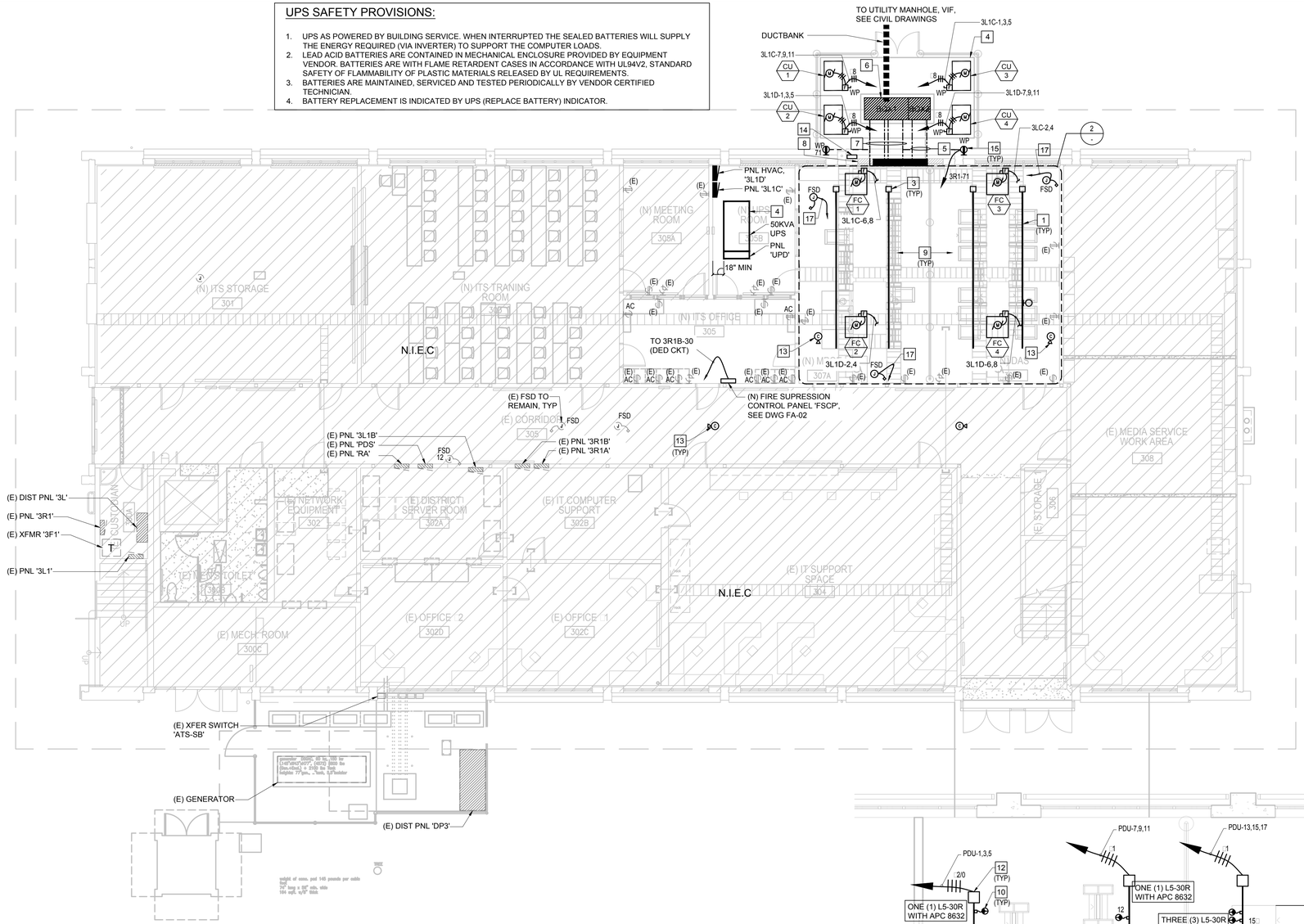
UPS SAFETY PROVISIONS:

1. UPS AS POWERED BY BUILDING SERVICE. WHEN INTERRUPTED THE SEALED BATTERIES WILL SUPPLY THE ENERGY REQUIRED (VIA INVERTER) TO SUPPORT THE COMPUTER LOADS.
2. LEAD ACID BATTERIES ARE CONTAINED IN MECHANICAL ENCLOSURE PROVIDED BY EQUIPMENT VENDOR. BATTERIES ARE WITH FLAME RETARDENT CASES IN ACCORDANCE WITH UL94V2, STANDARD SAFETY OF FLAMMABILITY OF PLASTIC MATERIALS RELEASED BY UL REQUIREMENTS.
3. BATTERIES ARE MAINTAINED, SERVICED AND TESTED PERIODICALLY BY VENDOR CERTIFIED TECHNICIAN.
4. BATTERY REPLACEMENT IS INDICATED BY UPS (REPLACE BATTERY) INDICATOR.

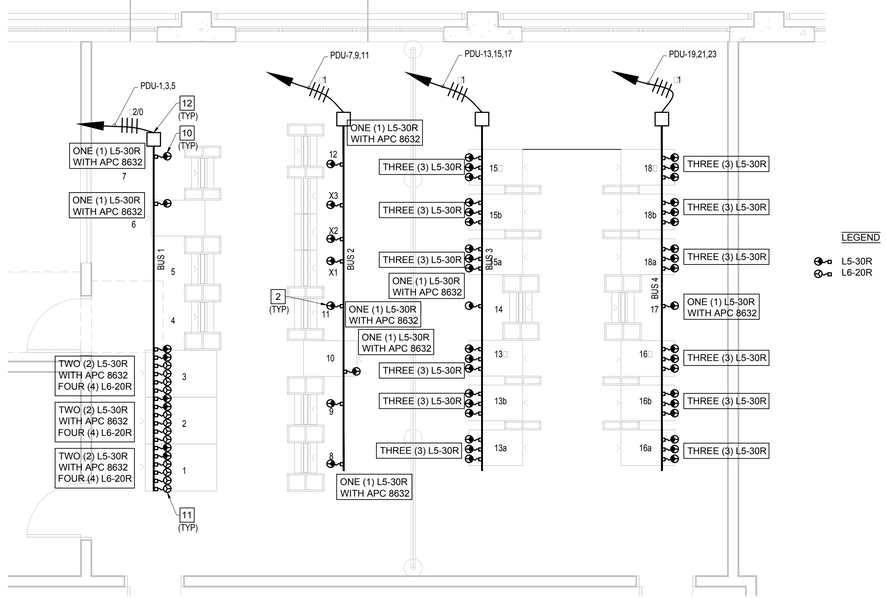


1 LEVEL 1- POWER & SIGNAL SCALE : 1/8" = 1'-0"

MISCELLANEOUS EQUIPMENT SCHEDULE

TAG	DESCRIPTION	LOAD	VOLT ø	CONTROL	STARTER	Disc. @ Motor DISC.	Disc. @ Motor TD @ FUSE	REMARKS
CU 1	CONDENSING UNIT 1	32 MCA	460/3	BY MECH	INTEG	60/3	50	SEE MECH FOR CONTROL
CU 2	CONDENSING UNIT 2	32 MCA	460/3	BY MECH	INTEG	60/3	50	SEE MECH FOR CONTROL
CU 3	CONDENSING UNIT 3	32 MCA	460/3	BY MECH	INTEG	60/3	50	SEE MECH FOR CONTROL
CU 4	CONDENSING UNIT 4	32 MCA	460/3	BY MECH	INTEG	60/3	50	SEE MECH FOR CONTROL
FC 1	FAN COIL UNIT 1	8.2 MCA	460/1	BY MECH	INTEG	30/2	15	SEE MECH FOR CONTROL
FC 2	FAN COIL UNIT 2	8.2 MCA	460/1	BY MECH	INTEG	30/2	15	SEE MECH FOR CONTROL
FC 3	FAN COIL UNIT 3	8.2 MCA	460/1	BY MECH	INTEG	30/2	15	SEE MECH FOR CONTROL
FC 4	FAN COIL UNIT 4	8.2 MCA	460/1	BY MECH	INTEG	30/2	15	SEE MECH FOR CONTROL

ⓓ VERIFY FUSE SIZE WITH EQUIPMENT MANUF PRIOR TO INSTALLATION.



2 ENLARGED POWER PLAN SCALE : 1/4" = 1'-0"

GENERAL NOTES:

1. COORDINATE LOCATION OF WIRING DEVICES AND POWER BUS FEEDER FOR THE MPOE/DAS EQUIPMENT WITH OWNER PRIOR TO ROUGH-IN.
2. NEW UPS, MAIN BYPASS, INTEGRAL K13 RATED TRANSFORMER, BATTERY CAB AND ACCESSORIES, AS MANUFACTURED BY EATON 93PM (LATEST MODEL). SEE SPECIFICATIONS FOR RELATED SUPPORT AND IMMEDIATE ASSISTANCE INCLUDING TURNKEY SOLUTIONS.
3. PROVIDE NEW CABLE TRAY AS SHOWN. COORDINATE MOUNTING HEIGHT OF ELECTRICAL FIXTURES AND WIRING ASSOCIATED WITH POWER CONDUIT. MAINTAIN CLEAR SEPARATION AS DIRECTED BY IT GROUP.
4. SEE DWG T-012 FOR BONDING OF IT EQPT.

KEY NOTES:

1. PROVIDE OVERHEAD STARLINE PLUG IN BUS DUCT WITH DROP DOWN OUTLET ASSEMBLY. PRODUCT AS MANUF BY 'STARLINE' □225T3 SYSTEM. PLUG IN RACEWAY, TYP, UON. LOCATE AS DIRECTED BY ITS GROUP. SEE PART POWER PLAN DETAIL 2 BELOW.
2. SPECIAL OUTLET AS SHOWN. COORDINATE LOCATION WITH ITS GROUP.
3. TERMINAL BOX FOR POWER BUS, SEE DETAIL 7/E-500. (UF 225T3C4S-LTL2000CSTD6.M43R.LLY)
4. PROVIDE 4" THK CONCRETE HOUSEKEEPING PAD (SSD).
5. PROVIDE 30"W X 72"L X 6"H WIRING GUTTER NEMA 4 BY HOFFMAN □63072G4WT.
6. ELEC ENCLOSURE, NEMA 3R. 90"H□76"W□36"D AS MANUF BY HOFFMAN. (SINGLE DOOR ENCLOSURE IS 90"H□36"W□36"D). COORDINATE WITH VENDOR, (925)-557-30000.
7. SAME AS NOTE 5 EXCEPT (2) SECTIONS.
8. BLOCKOUT FOR COMBINED WIRE THROUGH ENTRY, VIF. SEAL AS REQUIRED.
9. SEE ENLARGED PLAN THIS SHEET FOR REQUIRED POWER OUTLETS SERVING DATA EQUIPMENT.
10. SPECIAL NEMA OUTLET L5-30R WITH APC 8632, TYP, UON.
11. SAME AS ABOVE EXCEPT L6-20R,TYP, UON.
12. STARLINE PLUG IN BUS DUCT (US 225T3C4S-2000C.STD.0), SEE SPECS, TYP.
13. PROVIDE CEILING MOUNTED IP CAMERA, TYP. LOCATION AND ANGLE PER OWNER. PRODUCT AS MANUF. BY AXIS □P3375 LV NETWORK CAMERA. PROVIDE 2D CONNECTORS AS REQUIRED.
14. 8" SQ X 8" LOCKABLE NEMA 3R GPS ANTENNA BOX WITH 2"C TO ROOF. CAP/TAG AS REQUIRED. EXACT LOCATION BY OWNER.
15. PROVIDE WP HEAVY DUTY LOCKABLE METALLIC COVER AS MANUF BY HUBBELL OR APPROVED EQUAL.
16. NOT USED.
17. CONNECT TO (E) FSD CKT □12 IN PNL 3R1B. FIELD VERIFY EXACT LOCATION.

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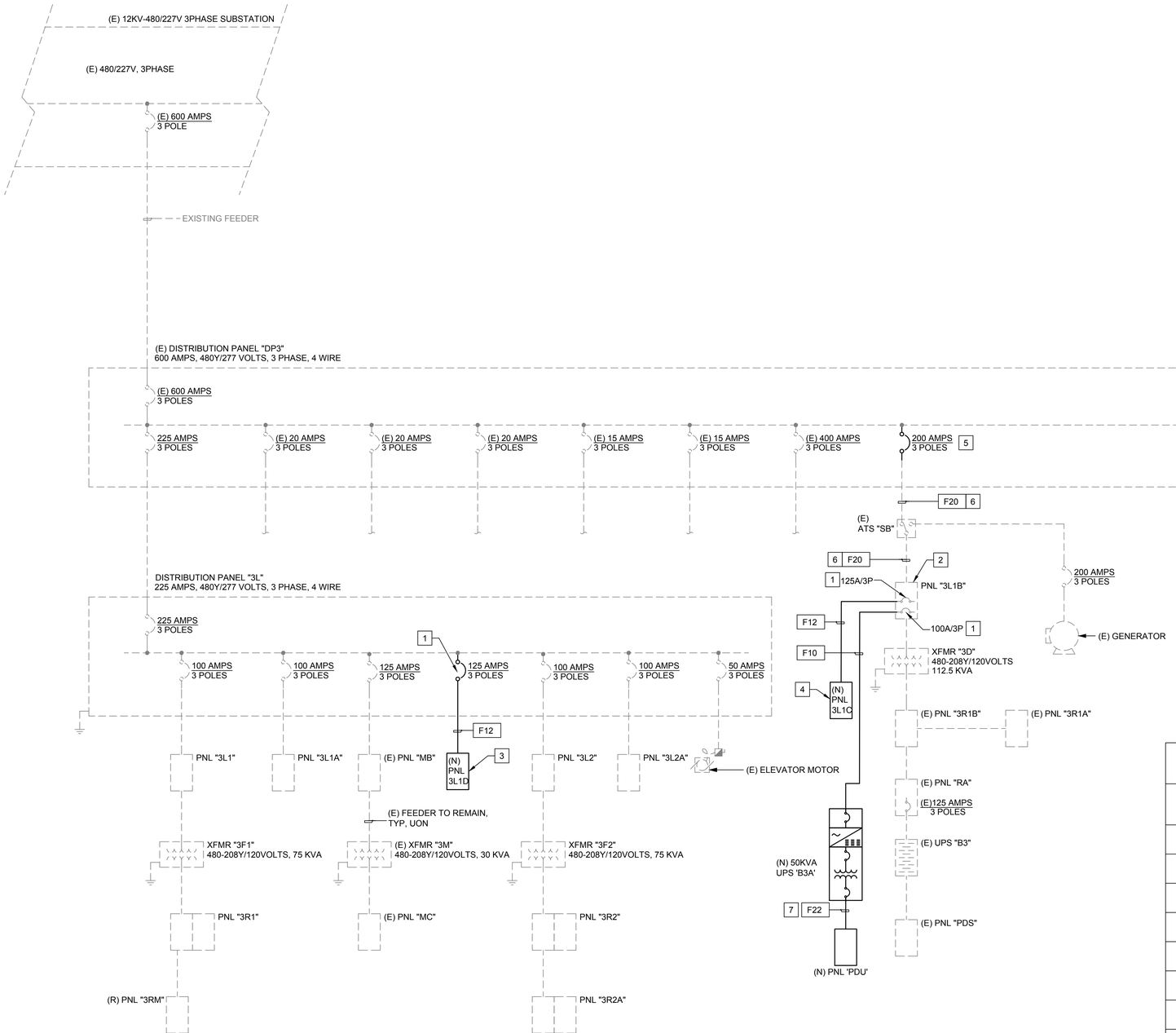

□□ILDING □□□
SINGLE LINE DIAGRAM

1 NOT TO SCALE

KEY NOTES

1. PROVIDE (N) CIRCUIT PROTECTION AS SHOWN WITH TYPE/KAIC RATING TO MATCH (E).
2. SEE SCHEDULE OF AFFECTED PANELBOARDS. THIS PANEL TO REPLACE (E) MAIN CB WITH (N) AS SCHEDULED.
3. PROVIDE (N) NORMAL POWER PANEL FOR HVAC UNITS CU-2 & 4, FC-2 & 4, UON.
4. PROVIDE (N) STANDBY POWER PANEL FOR HVAC UNITS CU-1 & 3, FC-1 & 3, UON.
5. REMOVE/REPLACE CB WITH (N) AS SHOWN. TYPE & KAIC RATING TO MATCH (E).
6. REMOVE/REPLACE FEEDER CONDUCTORS WITH (N) USING (E) CONDUIT.
7. PROVIDE 200□ NEUTRAL CONDUCTOR.

FEEDER SCHEDULE

AMPS NOM.	TAG	3-PHASE 3W CONDUCTOR	3-PHASE 4W CONDUCTOR	EQUIPMENT GROUND
20	F02	1/2"C(3)□12 AWG	1/2"C(4)□12 AWG	□12
30	F03	1/2"C(3)□10 AWG	1/2"C(4)□10 AWG	□10
40	F04	3/4"C(3)□8 AWG	3/4"C(3)□8 AWG	□10
50	F05	3/4"C(3)□6 AWG	1"C(4)□6 AWG	□10
70	F07	1"C(3)□4 AWG	1-1/4"C(4)□4 AWG	□6
90	F09	1-1/4"C(3)□3 AWG	1-1/4"C(4)□3 AWG	□6
100	F10	1-1/4"C(3)□2 AWG	1-1/4"C(4)□2 AWG	□6
125	F12	1-1/2"C(3)□1 AWG	1-1/2"C(4)□1 AWG	□6
150	F15	1-1/2"C(3)□1/0 AWG	2"C(4)□1/0 AWG	□6
175	F17	2"C(3)□2/0 AWG	2"C(4)□2/0 AWG	□6
200	F20	2"C(3)□3/0 AWG	2"C(4)□3/0 AWG	□6
225	F22	2"C(3)□4/0 AWG	2-1/2"C(5)□4/0 AWG	□4
250	F25	2-1/2"C(3)□250 KCMIL	2-1/2"C(4)□250 KCMIL	□4
300	F30	2-1/2"C(3)□350 KCMIL	3"C(4)□350 KCMIL	□4
400	F40	3-1/2"C(3)□500 KCMIL	4"C(4)□500 AWG	□3

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□L□ □00 SIN□LE LINE □IA□RAM

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TYPE: BOLT-ON | **MAIN: 225A**
SERVICE: 120/208Y, 3PH, 4W | **PANEL 'PDU'** | **MTG: SURFACE**
BUS: 225A | LOCATION UPS RM 305B | **AIC: 10KAIC**

			BREAKER						BREAKER			
LOAD SERVED	**LCL**	**KVA**	**TRIP**	**POLE**	**NO.**	**PHASE**	**NO**	**POLE**	**TRIP**	**KVA**	**LCL**	**LOAD SERVED**
NEW POWER BUS 1	X	8.0	150	3	1	A	2	1	20			SPARE
----- @MPOE	X	8.0			3	B	4	1	20			SPARE
-----	X	8.0			5	C	6	1	20			SPARE
NEW POWER BUS 2	X	5.0	125	3	7	A	8	1				SPACE
----- @MPOE	X	5.0			9	B	10	1				SPACE
-----	X	5.0			11	C	12	1				SPACE
NEW POWER BUS 3	X	8.0	150	3	13	A	14	1				SPACE
----- @DAS	X	8.0			15	B	16	1				SPACE
-----	X	8.0			17	C	18	1				SPACE
NEW POWER BUS 4	X	5.0	125	3	19	A	20	1				SPACE
----- @DAS	X	5.0			21	B	22	1				SPACE
-----	X	5.0			23	C	24	1				SPACE
					1	25	A	26	1			
					1	27	B	28	1			
					1	29	C	30	1			
					1	31	A	32	1			
					1	33	B	34	1			
					1	35	C	36	1			
					1	37	A	38	1			
					1	39	B	40	1			
					1	41	C	42	1			

SUB TOTAL CONN. LOAD KVA

		TOTAL CONN. LOAD=		78.0	
PHASE A	26.0				
PHASE B	26.0	**25% LCL =.25(**	63.0	**KVA):**	15.75
PHASE C	26.0	**TOTAL:**	93.8	**KVA**	225.9 **AMPS ***

*WITHOUT DEMAND; 30KVA WITH DEMAND APPLIED (83.3A)

TYPE: BOLT-ON | **MAIN: (N)200A/3P**
SERVICE: 277/480V, 3PH, 4W | PANEL: (E)'3L1B' | **MTG: RECESSED**
BUS: 225 A | LOCATION: CORRIDOR 305 | **AIC: 35 KAIC**

			BREAKER						BREAKER			
LOAD SERVED	**LCL**	**KVA**	**TRIP**	**POLE**	**NO.**	**PHASE**	**NO**	**POLE**	**TRIP**	**KVA**	**LCL**	**LOAD SERVED**
EXIST'G EMERG LTG		1.9	20	1	1	A	2	3	175	37.5		EXIST XFMR '3D'
SPACE				1	3	B	4			37.5		-----
SPACE				1	5	C	6			37.5		-----
SPACE				1	7	A	8	3	125	19.6		(N) PNL '3LIC'
SPACE				1	9	B	10			17.8		----- (HVAC)
SPACE				1	11	C	12			17.8		-----
SPACE				1	13	A	14	3	100	16.0		(N) UPS 'B3A' / 'UPD'
SPACE				1	15	B	16			16.0		-----
SPACE				1	17	C	18			16.0		-----
SPARE			20	1	19	A	20	1				SPACE
SPARE			20	1	21	B	22	1				SPACE
SPARE			20	1	23	C	24	1				SPACE
				1	25	A	26					
				1	27	B	28					
				1	29	C	30					
				1	31	A	32					
				1	33	B	34					
				1	35	C	36					
				1	37	A	38					
				1	39	B	40					
				1	41	C	42					

SUB TOTAL CONN. LOAD KVA

		TOTAL CONN. LOAD=		217.6	
PHASE A	75.0				
PHASE B	71.3	**25% LCL =.25(**	100.0	**KVA):**	25
PHASE C	71.3	**TOTAL:**	242.6	**KVA**	291 **AMPS ***

* WITHOUT DEMAND; 142.3KVA WITH DEMAND APPLIED (170.8A)

TYPE: BOLT-ON | **MAIN: MLO**
SERVICE: 277/480V, 3PH, 4W | PANEL: (N)'3L1C' | **MTG: SURFACE**
BUS: 225 A | LOCATION: (N) UPS RM 305B | **AIC: 22 KAIC**

			BREAKER						BREAKER			
LOAD SERVED	**LCL**	**KVA**	**TRIP**	**POLE**	**NO.**	**PHASE**	**NO**	**POLE**	**TRIP**	**KVA**	**LCL**	**LOAD SERVED**
(N) CONDENSER UNIT 1		8.0	50	3	1	A	2	2	20	1.8		(N) FAN COIL 1
-----		8.0	/	/	3	B	4	/	/	1.8		-----
-----		8.0	/	/	5	C	6	2	20	1.8		(N) FAN COIL 3
(N) CONDENSER UNIT 3		8.0	50	3	7	A	8	/	/	1.8		-----
-----		8.0	/	/	9	B	10	1				SPACE
-----		8.0	/	/	11	C	12	1				SPACE
SPACE				1	13	A	14	1				SPACE
SPACE				1	15	B	16	1				SPACE
SPACE				1	17	C	18	1				SPACE
SPACE				1	19	A	20	1				SPACE
SPACE				1	21	B	22	1				SPACE
SPACE				1	23	C	24	1				SPACE
				1	25	A	26	1				
				1	27	B	28	1				
				1	29	C	30	1				
				1	31	A	32	1				
				1	33	B	34	1				
				1	35	C	36	1				
				1	37	A	38	1				
				1	39	B	40	1				
				1	41	C	42	1				

SUB TOTAL CONN. LOAD KVA

		TOTAL CONN. LOAD=		55.2	
PHASE A	19.6				
PHASE B	17.8	**25% LCL =.25(**		**KVA):**	0
PHASE C	17.8	**TOTAL:**	55.2	**KVA**	66.2 **AMPS**

SIMILAR LOADING FOR PNL '3L1D' EXCEPT FOR NON-STANDBY LOADS; CU-2 & 4, FC-2 & 4

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DATE: 12/19/2019

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3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER
ANTONIO QUTOBO MORENO
No. E 167239
Exp. 09/30/20
ELECTRICAL
STATE OF CALIFORNIA

CONSULTANT:

MPE
METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

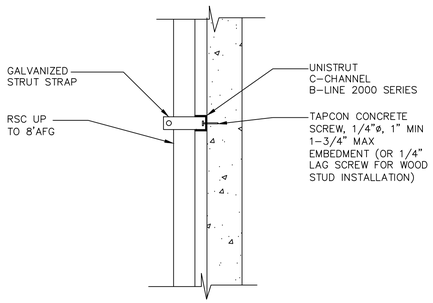
MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

PANEL BOARD SCHEDULES

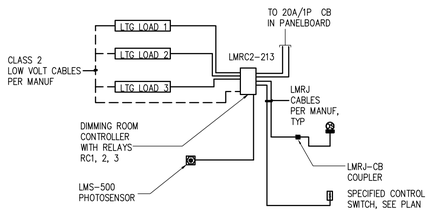
DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506
SHEET NO:	

E-01



8 CONDUIT WALL ANCHOR DETAIL

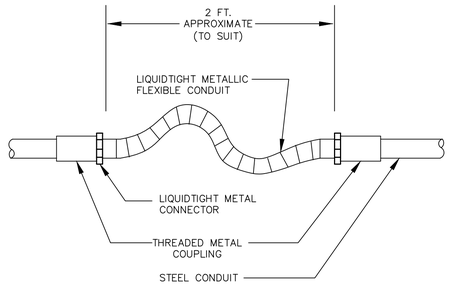
N.T.S.



5 WATTSTOPPER DIGITAL LIGHTING MANAGEMENT (DLM)

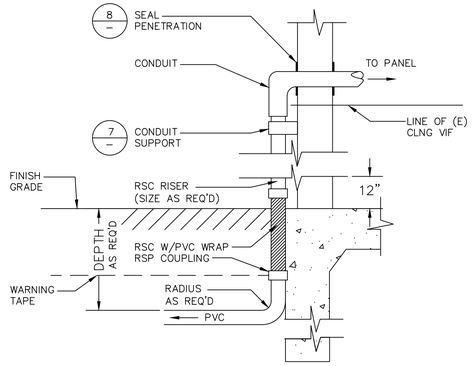
PHOTOSENSOR CONTROL

N.T.S.



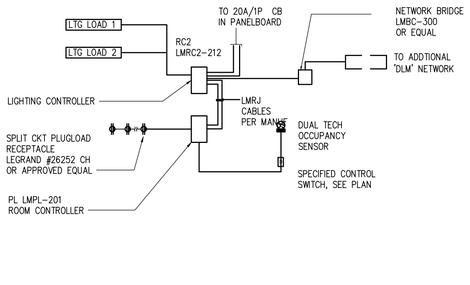
3 FLEXIBLE CONDUIT/EXPANSION SECTION

N.T.S.



9 CONDUIT PENETRATING DETAIL

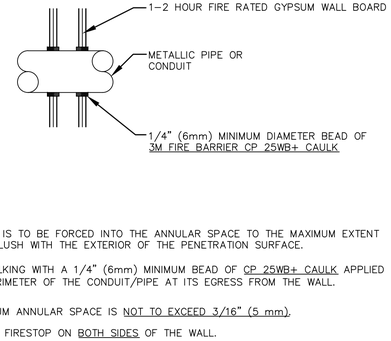
N.T.S.



6 WATTSTOPPER DIGITAL LIGHTING MANAGEMENT (DLM)

SPLIT CKT PLUGLOAD RECEPTACLE

N.T.S.

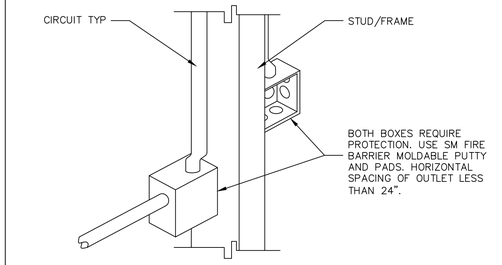


1. THE CAULK IS TO BE FORCED INTO THE ANNULAR SPACE TO THE MAXIMUM EXTENT POSSIBLE FLUSH WITH THE EXTERIOR OF THE PENETRATION SURFACE.
2. FINISH CAULKING WITH A 1/4" (6mm) MINIMUM BEAD OF CP 25WB+ CAULK APPLIED TO THE PERIMETER OF THE CONDUIT/PIPE AT ITS EGRESS FROM THE WALL.
3. THE MAXIMUM ANNULAR SPACE IS NOT TO EXCEED 3/16" (5 mm).
4. INSTALL 3M FIRESTOP ON BOTH SIDES OF THE WALL.
5. THESE RECOMMENDATIONS ARE BASED ON PRODUCT PERFORMANCE PER ASTM E-814 (UL 1479) FIRE TEST AND UL THROUGH-PENETRATION FIRESTOP SYSTEM #WL1001.

4 FIRESTOP PENETRATION DETAIL

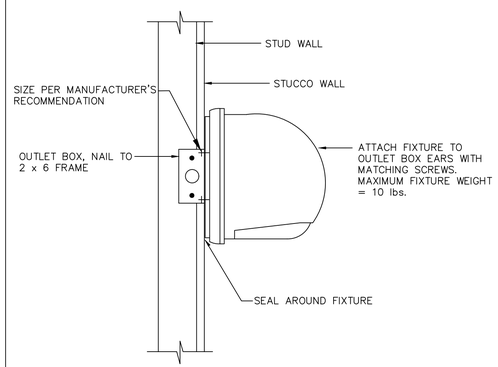
EL320.DWG

N.T.S.



2 FIRE RATED WALL – OUTLET <24" HORIZONTAL SPACING

N.T.S.



10 WALL MOUNTED EXTERIOR FIXTURE

N.T.S.

7 SAMPLE PLUG-IN BUSWAY

N.T.S.

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RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD HAYWARD, CA 94545

ELECTRICAL DETAILS

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506
SHEET NO:	

E-00

INSTALLATION

Mount Details

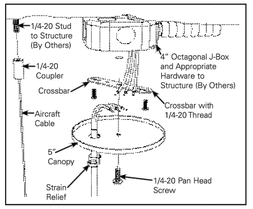


Figure 1. Power

Connection at Ceiling

1. Layout mounting locations. (Figure 1.)
2. Ensure that power feed is at the UL end of the fixture.

Note: Power feed: to be installed to local/national electrical codes by a Certified Electrician.

3. Secure junction box and 1/4-20 stud to structure.
4. Secure crossbar to junction box.
5. Feed power cables through canopy and install strain relief.
6. Connect power cable in junction box, ensuring all connections are properly matched.
7. Place canopy over junction box & fasten with 1/4-20 pan head screw.
8. Install 1/4-20 coupler with aircraft cable to 1/4-20 stud.

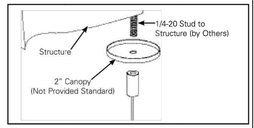


Figure 2. Non-Power

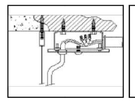


Figure 3. Power (2-D)

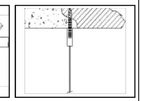


Figure 4. Non-Power (2-D)

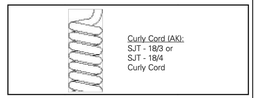


Figure 5. Options

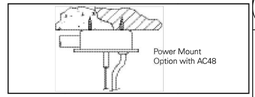


Figure 6.

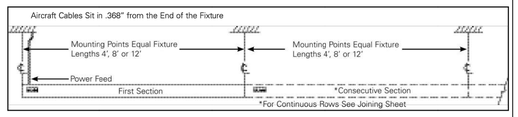
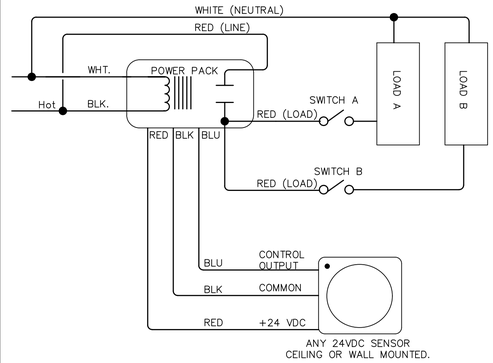


Figure 7. Mounts Locations

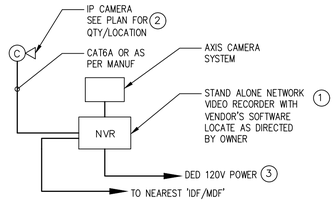


1 OCCUPANCY SENSOR WITH A/B SWITCHING N.T.S.

NOTE: AIRCRAFT CABLE MOUNTS ARE ABLE TO ACCEPT LOADS UP TO 850 LBS.
-RECOMMENDED FOR USE IN A SEISMIC/CBC INSTALLATION.
-CANOPY DIAMETER OF 5¼" X ¾"
-CABLE: 1 X 7 STAINLESS STEEL AIRCRAFT CABLE FACTORY CRIMPED
-MOUNTABLE ON 0 TO 15 DEGREE SLOPE CEILING
-J-BOX: 4" OCTAGONAL BOX
-FULLY VERTICALLY ADJUSTABLE AT FIXTURE

3 J-BOX STRUCTURE INTERFACE (CONNECTION AT CEILING) AIRCRAFT CABLE N.T.S.

2 SEISMIC RESTRAINT FOR PENDANT FIXTURE N.T.S.



(#) DETAIL NOTES

1. SUBMIT SHOP DRAWINGS FROM OWNER SELECTED VENDOR SUCH AS AMAG.COM.
2. IP CAMERA SHALL BE HIGH RESOLUTION TYPE AS MANUF BY AXIS.COM, #P3375 INCLUDING BACK BOX & PENDANT MOUNTING KIT, BLACK CASING & MICROPHONE.
3. PROVIDE UL LISTED LOCK-ON DEVICE.

4 SEC. SURVEILLANCE WIRING DIAGRAM N.T.S.

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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

L 00
ELECTRICAL
ETAILS

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506
SHEET NO:	

E- 01

GENERAL NOTES

1. ALL REQUIRED MATERIALS AND WORK SHALL COMPLY WITH ALL ADOPTED APPLICABLE CODES AND STANDARDS AS WELL AS WITH FEDERAL, STATE, LOCAL WIRING CODES AT THE TIME OF THE PERMIT SUBMITTAL, AND CUSTOMER CONTRACT SPECIFICATIONS.
2. ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF OSHA, CAL - OSHA, CUSTOMER AND COMPANY SAFETY REQUIREMENTS.
3. ALL SYSTEM-INSTALLED DEVICES SHALL NOT BE CONCEALED OR OBSTRUCTED IN ANY WAY AS TO IMPEDE THE PROPER FUNCTION OF THE DEVICE.
4. INSTALLATION OF DEVICES SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. POWER LIMITED AND NON-POWER LIMITED FIELD WIRING MUST BE INSTALLED WITHIN THE FACU ENCLOSURE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND THE ELECTRICAL CODE.
5. WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALE ON THE DRAWINGS.
6. INSTALLER TO VERIFY ALL DIMENSIONS AND CONDITIONS AT THE JOB SITE BEFORE COMMENCING WORK AND TO REPORT ANY DISCREPANCIES TO THE FIRE ALARM PROJECT MANAGER.
7. INPUT POWER TO ALARM PANELS TO BE 120 VAC, ON A DEDICATED CIRCUIT THAT DOES NOT DE-ENERGIZE UPON SYSTEM ALARM OR EPO (EMERGENCY POWER OUT) ACTIVATION. THE ON-SITE ELECTRICAL CONTRACTOR PROVIDES WIRING AND TERMINATION OF THIS INPUT POWER. NO OTHER LOADS ARE PERMITTED ON THIS CIRCUIT.
8. THE CIRCUIT DISCONNECTING MEANS SHALL HAVE A RED MAR ING, SHALL BE ACCESSIBLE ONLY TO AUTHORIZED PERSONNEL, AND SHALL BE IDENTIFIED AS FIRE ALARM CIRCUIT .
9. A SEPARATE EARTH GROUND MUST BE INSTALLED. PANEL NEUTRAL OR CONDUIT GROUND IS NOT ACCEPTABLE. THE ON-SITE ELECTRICAL CONTRACTOR PROVIDES WIRING AND TERMINATION OF THIS EARTH GROUND. ENCLOSURES SHALL BE GROUNDED UTILIZING PROVIDED ENCLOSURE GROUNDING STUDS.
10. ALL VAC (VOLT, ALTERNATING, CURRENT), WIRING IS TO BE KEPT SEPARATE FROM ALL 24 VDC (VOLT, DIRECT, CURRENT) WIRING.
11. ALL VISUAL, AUDIBLE/VISUAL DEVICES ARE TO BE MOUNTED AT THE HEIGHT SPECIFIED IN THE PROJECT PLANS AND NOT CONCEALED OR OBSTRUCTED.
12. ALL CABLING SHALL MEET THE REQUIREMENTS OF THE PANEL MANUFACTURER.
13. ALL EQUIPMENT ELEVATIONS SHALL BE PER THE PROJECT PLANS AND DETAILS.
14. "T" TAPPING OF SLC CIRCUITS IS ALLOWED.
15. "T" TAPPING OF NOTIFICATION APPLIANCE CIRCUITS IS NOT ALLOWED.
16. STAR TAPS SHALL NOT BE PERMITTED.
17. CONDUIT IS TO BE "EMT" TYPE. ALL CONDUIT ROUTING AND SIZES SHALL COMPLY WITH CURRENT ELECTRICAL CODES AND DETERMINED BY THE INSTALLING CONTRACTOR. THE INSTALLING CONTRACTOR SHALL INDICATE THE CONDUIT ROUTING AND SIZE ON THE AS-BUILT DRAWINGS.
18. ALL JUNCTION BOX BLAN COVERS SHALL BE LABELED FA WITH A PERMANENT NON-REMOVABLE MAR ER.
19. PROVIDE A PLASTIC INSULATING BUSHING ANYWHERE A CONDUIT ENTERS A JUNCTION BOX, FITTING OR OTHER ENCLOSURE UNLESS THE DESIGN OF THE ENCLOSURE PROVIDES EQUIVALENT PROTECTION.
20. EXACT LOCATION OF DETECTORS AND CONTROL EQUIPMENT SHALL BE DETERMINED IN THE FIELD. OTHER ELECTRICAL FIXTURES, DUCTS, CABLE TRAYS, ETC. MAY SUPERSEDE EXACT PLACEMENT. DETECTORS SHALL BE LOCATED A MINIMUM OF 3' FROM ALL AIR SUPPLY AND RETURN DIFFUSERS AND A MINIMUM OF 4 FROM A SIDEWALL TO THE NEAR EDGE OF THE DETECTOR.
21. POLARITY SHOULD BE OBSERVED ON ALL DEVICES
22. ANY WIRING THAT IS REQUIRED FOR MONITORING OF THE ALARM PANEL SUCH AS LIFE SAFETY EQUIPMENT OR OFF-SITE MONITORING IS TO BE PROVIDED BY THE ON-SITE ELECTRICAL CONTRACTOR.
23. ANY WIRING AND/OR INTERPOSING RELAYS THAT ARE REQUIRED FOR EQUIPMENT CONTROLS SUCH AS HVAC SHUTDOWNS, DAMPER CONTROL AND EPO SYSTEMS ETC., IS PROVIDED BY OTHERS, AND IS NOT TO BE RUN IN THE SAME CONDUIT AS ALARM CONTROL UNIT DEVICES.
24. E.O.L. (END OF LINE) RESISTORS SHALL NOT BE PERMANENTLY SPLICED TO FIELD WIRING.
25. CHECK FOR WIRE TO WIRE SHORTS AND SHORTS TO GROUND THROUGHOUT THE INSTALLATION. SHORTS AND GROUNDS ARE NOT ACCEPTABLE.
26. ALL SHIELDS SHALL BE TREATED AS A THIRD CONDUCTOR. CONTINUITY MUST BE MAINTAINED ALONG EACH COMPLETE CIRCUIT. SHIELDS MUST BE FREE OF ALL GROUNDING EXCEPT WHERE TERMINATED AT THE CONTROL UNIT PER PROJECT PLANS.
27. ALL ALARM DEVICES AND PANEL WIRING SHALL BE LABELED ACCORDING TO THE PROJECT PLANS WITH AN APPROPRIATE MARKING SYSTEM. THE MARKING SHALL BE LEGIBLE AND NON REMOVABLE.
28. ALL ALARM DEVICES TO BE LABELED AS SHOWN ON THE PROJECT DRAWINGS INCLUDING THE EOL IDENTIFICATION.
29. FIRE ALARM BACKUP BATTERIES SHALL SUPPLY 24 HOURS OF STANDBY AND 5 MINUTES OF ALARM FOR NON-VOICE SYSTEMS AND 24 HOURS OF STANDBY AND 15 MINUTES OF ALARM FOR VOICE SYSTEMS.
30. THE FIRE ALARM SYSTEM AUDIBLE SIGNAL SHALL BE THREE-PULSE TEMPORAL PATTERN. VOICE EVACUATION SHALL BE MORSE U PATTERN.
31. PENETRATIONS OF WALLS AND WALL MEMBRANES REQUIRED TO HAVE PROTECTED OPENINGS SHALL BE PROTECTED WITH THROUGH-PENETRATION FIRE STOPS SUITABLE FOR THE METHOD OF PENETRATION. THROUGH-PENETRATION FIRE STOPS SHALL CONFORM TO ASTM E 814 OR UL1479.
32. UPON COMPLETION OF THE INSTALLATION OF THE FIRE ALARM SYSTEM, A SATISFACTORY TEST OF THE SYSTEM SHALL BE MADE IN THE PRESENCE OF THE AUTHORITY HAVING JURISDICTION.
33. PRIOR TO REQUESTING FINAL APPROVAL OF THE INSTALLATION, THE INSTALLING CONTRACTOR SHALL FURNISH A WRITTEN STATEMENT TO THE AUTHORITY HAVING JURISDICTION TO THE EFFECT THAT THE SYSTEM HAS BEEN INSTALLED AND COMPLETELY TESTED.
34. WIRE NUTS SHALL NOT BE ALLOWED. WIRE TO WIRE CONNECTIONS SHALL UTILIZE TERMINAL STRIPS.
35. AS-BUILT DRAWINGS ACCURATELY REFLECTING THE SYSTEM INSTALLED IN ITS COMPLETED AND FINAL CONDITION ALONG WITH ANY APPROVALS OR TESTING RESULTS SHALL BE MAINTAINED ON SITE.

REFERENCED STANDARDS

1) CALIFORNIA BUILDING CODE, (CBC) 2016 EDITION

2) CALIFORNIA FIRE CODE, (CFC) 2016 EDITION

3) CALIFORNIA ELECTRICAL CODE, (CEC) 2016 EDITION

4) NATIONAL FIRE PROTECTION ASSOCIATION CODES AND STANDARDS 72, 2016 EDITION

5) CALIFORNIA STATE FIRE MARSHAL LISTING

6) UNDERWRITERS LABORATORIES (UL)

7) NFPA 2001, STANDARD ON CLEAN AGENT FIRE EXTINGUISHING SYSTEMS, 2018 EDITION

CLEAN AGENT EXTINGUISHING SYSTEM

CHABOT COLLEGE, B300 MPOE

25555 HESPERIAN BLVD.

HAYWARD, CA 94545

FIRE ALARM SYMBOLS & EQUIPMENT LIST

QTY	SYMBOL	DESCRIPTION	PART NO.	CSFM NO.	MANUFACTURER
1		AGENT RELEASING PANEL	GF506R	7165-1703:0171	GAMEWELL FCI
2	FSCP	AGENT CONTROL PANEL BATTERIES	SLA1156		POWER PATROL
1		RELAY EXPANSION CARD	GFANN-RLY	7165-1703:0171	GAMEWELL FCI
4	A CA	AGENT ABORT BUTTON	UB-1	N/A	STI
4	F	AGENT MANUAL RELEASE STATION	MS-7LR	7150-1703:0170	GAMEWELL FCI
2		AGENT HORN STROBE	P2WL	7135-1653:0503	SYSTEM SENSOR
4		AGENT STROBE	SWL	7135-1653:0504	SYSTEM SENSOR
2		AGENT BELL	SSMV-6	7135-1653:0217	SYSTEM SENSOR
9		I3 SERIES 2 WIRE SMOKE DETECTOR	2WB	7272-1653:0152	SYSTEM SENSOR
1		NOVEC 1230 CLEAN AGENT TANK	FTF000227	7086-1726:0103	FIRETRACE
1		NOVEC 1230 - 90 DEGREE SIDEWALL DISCHARGE NOZZLE	FTF664100	7086-1726:0103	FIRETRACE

WIRE LEGEND (NON PLENUM)

ID	TYPE OF CKT	CIRCUIT DESCRIPTION	MINIMUM SIZE AND TYPE OF WIRE	MAXIMUM FEET	MANUFACTURER & WIRE MODEL P/N
A	ABORT	RELEASE ABORT CIRCUIT	2 □ 16 AWG SOLID BC TYPE FPLR		GENERAL CABLE CORP. P/N E1512S
N	NAC	INDICATING APPLIANCE CKT (NOTIFICATION)	2 □ 14 AWG SOLID BC TYPE FPLR	CALCULATIONS	GENERAL CABLE CORP. P/N E1522S
D	IDC	INITIATING DEVICE CKT (NOTIFICATION)	2 □ 16 AWG SOLID BC TYPE FPLR	CALCULATIONS	GENERAL CABLE CORP. P/N E1512S
R	NAC	MANUAL RELEASE CIRCUIT (NOTIFICATION)	2 □ 16 AWG SOLID BC TYPE FPLR		GENERAL CABLE CORP. P/N E1512S
M	CONTROL	AHU SHUTDOWN CKT (NOTIFICATION)	2 □ 16 AWG SOLID BC TYPE FPLR		GENERAL CABLE CORP. P/N E1512S

CONDUIT FILL CHART

CONDUIT FILL RATIO - BASED ON 40□ FILL					
CONDUIT SIZE		1/2"	3/4"	1"	1 1/4"
INTERNAL DIAMETER		0.622	0.824	1.049	1.38
WIRE TYPE	AWG				
CABLE	16	5	8	14	25
	14	3	6	10	18
	12	2	5	8	12

VICINITY MAP

AREA OF WORK

SEQUENCE OF OPERATION

A. ACTIVATION OF ANY SINGLE DETECTOR IN ANY DETECTION ZONE SHALL:
1. CAUSE A FIRST-STAGE ALARM.
2. ENERGIZE A LAMP ON THE ACTIVATED DETECTOR AND CONTROL PANEL.

B. ACTIVATION OF A DETECTOR ON THE SECOND ZONE SHALL:
1. TRANSMIT AN ALARM SIGNAL TO REMOTE MONITORING OR BUILDING ALARM PANEL.
2. CAUSE A SECOND-STAGE (PRE-DISCHARGE) ALARM TO OPERATE.
3. OPERATE AUXILIARY CONTACTS FOR AIR CONDITIONING SHUTDOWNS AND AUTOMATIC DAMPERS.
4. INITIATE A PROGRAMMABLE TIME DELAY (CLEAN AGENT RELEASE).

C. UPON COMPLETION OF THE TIME DELAY THE CLEAN AGENT SYSTEM SHALL:
1. CAUSE A DISCHARGE ALARM TO BE ACTIVATED.
2. OPERATE AUXILIARY CONTACTS FOR EMERGENCY POWER OFF OF ALL ELECTRICAL EQUIPMENT (EXCLUDING LIGHTING AND EMERGENCY CIRCUITS FOR LIFE SAFETY).
3. ACTIVATE VISUAL ALARMS (STROBE) AT PROTECTED AREA ENTRANCE.
4. ENERGIZE CONTROL SOLENOID FOR CLEAN AGENT CYLINDER RELEASING GASEOUS AGENT INTO THE PROTECTED AREA.

BATTALION ONE
FIRE PROTECTION
14577 CATALINA ST.
SAN LEANDRO, CA 94577
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CSLB □: 919683

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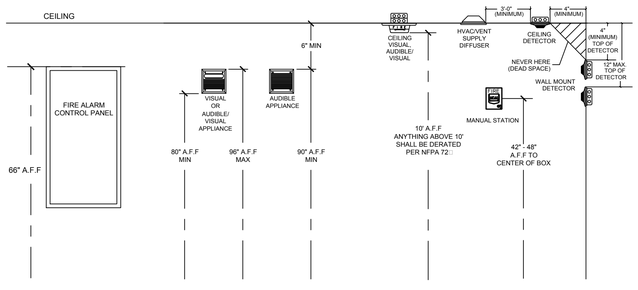
MOUNTING HEIGHTS



ABBREVIATIONS

EPO	EMERGENCY POWER OFF	CKT	CIRCUIT	CD	CANDELA
EP	EXPLOSION PROOF	ELEV	ELEVATOR	DEMO	DEMOLISH
CA	CLEAN AGENT	EOL	END OF LINE RESISTOR	DET	DETECTOR
FA	FIRE ALARM	EOLR	END OF LINE RELAY	DISP	DISPLAY
FACP	FIRE ALARM CONTROL PANEL	EMO	EMERGENCY MACHINE OFF SWITCH	ECP	EXTINGUISHING CONTROL PANEL
(E)	EXISTING	FACP	FIRE ALARM CONTROL PANEL	NTS	NOT TO SCALE
(N)	NEW	FARP	FIRE ALARM REMOTE PANEL	PRNT	PRINTER
(R)	RELOCATED	FBO	FURNISHED BY OTHERS	QTY	QUANTITY
(RC)	REMOVE AND COVER	FFOP	FIREFIGHTERS OVERRIDE PANEL	S	SURFACE MOUNTED
(RD)	DEVICE TO BE RELOCATED	HT	HEIGHT	SMK	SMOKE
(RR)	REMOVE AND REPLACE	HVAC	HEATING, VENTILATION, AIR CONDITION	SPRV	SUPERVISORY
ACP	ACCESS CONTROL PANEL	IDC	INITIATING DEVICE CIRCUIT	TBD	TO BE DETERMINED
ADDR	ADDRESS	LA	LOW AIR	TI	TENANT IMPROVEMENT
AFF	ABOVE FINISHED FLOOR	MAX	MAXIMUM	TRBL	TROUBLE
ALRM	ALARM	MIN	MINIMUM	TYP	TYPICAL
AWG	AMERICAN WIRE GAUGE	N/A	NOT APPLICABLE	UF	UNDER FLOOR
BATT	BATTERY	N/C	NORMALLY CLOSED	UND	UNDERGROUND
BLDG	BUILDING	N/O	NORMALLY OPEN	UON	UNLESS OTHERWISE NOTED
BPM	BEATS PER MINUTE	NAC	NOTIFICATION APPLIANCE CIRCUIT	VT	VALVE TAMPER
BPS	BOOSTER POWER SUPPLY	NIC	NOT IN CONTRACT	WF	WATER FLOW
BOM	BILL OF MATERIALS	NOC	NETWORK OPERATION CENTER	WP	WEATHERPROOF

WARNING SIGNS / PLACARDS

WARNING AND INSTRUCTION SIGNS MUST BE PROPERLY LOCATED AT ALL ENTRANCES TO, AND INSIDE OF, PROTECTED AREAS.

WARNING
LEAVE AREA IMMEDIATELY WHEN ALARM SOUNDS
DO NOT RE-ENTER AREA AFTER THE SYSTEM IS DISCHARGED UNLESS VENTILATED
THIS AREA PROTECTED BY A CLEAN AGENT FIRE SUPPRESSION SYSTEM

WARNING SIGN INSIDE PROTECTED AREA

WARNING
DO NOT ENTER AREA
WHEN ALARM IS SOUNDING
THIS AREA IS PROTECTED A CLEAN AGENT FIRE SUPPRESSION SYSTEM
AREA MUST BE VENTILATED PRIOR TO RE-ENTRY

WARNING SIGN OUTSIDE PROTECTED AREA

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4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER ANTONIO QUIJORO MORENO No. E 16720 Exp. 09/30/20 ELECTRICAL STATE OF CALIFORNIA

CONSULTANT:

MPE
METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

□ L□ □00 □IRE ALARM NOTES□ S□ M□ OLS □ E□ □ I□ LIST

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1 SITE PLAN
1" = 160'-0"

2 SITE PLAN - ENLARGED
1" = 40'-0"

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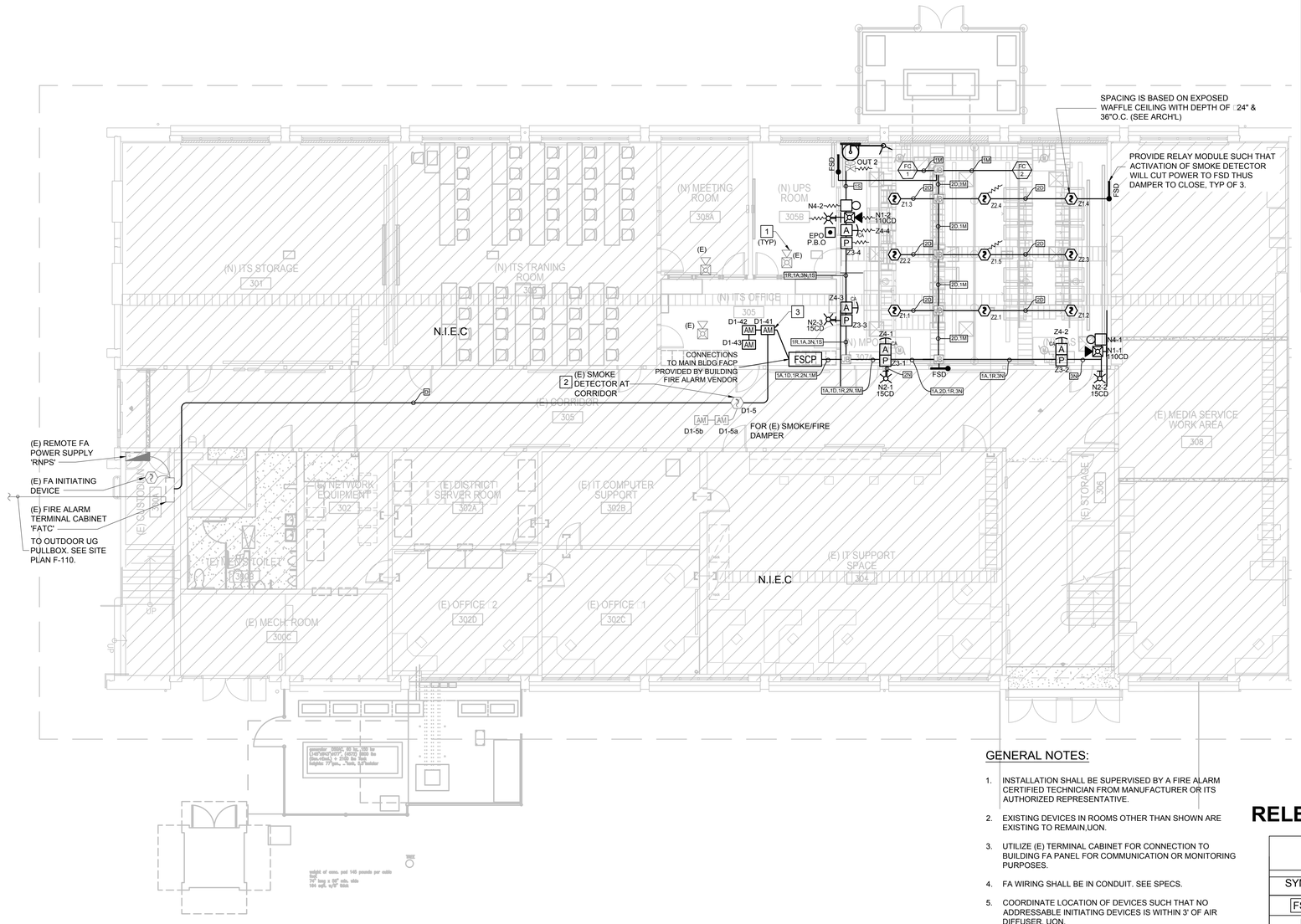


1 LEVEL 1

SCALE : 1/16" = 1'-0"

NFPA 17.7.3.2.4.2 (2):

FOR CEILINGS WITH BEAM DEPTHS EQUAL TO OR GREATER THAN 10 PERCENT OF THE CEILING HEIGHT (0.1 H), THE FOLLOWING SHALL APPLY:

(a) WHERE BEAM SPACING IS EQUAL TO OR GREATER THAN 40 PERCENT OF THE CEILING HEIGHT (0.4 H), SPOT-TYPE DETECTORS SHALL BE LOCATED ON THE CEILING IN EACH BEAM POCKET.

(b) WHERE BEAM SPACING IS LESS THAN 40 PERCENT OF THE CEILING HEIGHT (0.4 H), THE FOLLOWING SHALL BE PERMITTED FOR SPOT DETECTORS:
- i. SMOOTH CEILING SPACING IN THE DIRECTION PARALLEL TO THE BEAMS AND AT ONE-HALF SMOOTH CEILING SPACING IN THE DIRECTION PERPENDICULAR TO THE BEAMS.
- ii. LOCATION OF DETECTORS EITHER ON THE CEILING OR ON THE BOTTOM OF THE BEAMS.

GENERAL NOTES:

1. INSTALLATION SHALL BE SUPERVISED BY A FIRE ALARM CERTIFIED TECHNICIAN FROM MANUFACTURER OR ITS AUTHORIZED REPRESENTATIVE.
2. EXISTING DEVICES IN ROOMS OTHER THAN SHOWN ARE EXISTING TO REMAIN,UON.
3. UTILIZE (E) TERMINAL CABINET FOR CONNECTION TO BUILDING FA PANEL FOR COMMUNICATION OR MONITORING PURPOSES.
4. FA WIRING SHALL BE IN CONDUIT. SEE SPECS.
5. COORDINATE LOCATION OF DEVICES SUCH THAT NO ADDRESSABLE INITIATING DEVICES IS WITHIN 3' OF AIR DIFFUSER, UON.
6. ALL FA INITIATING DEVICES ARE ADDRESSABLE, TYP, UON.
7. (N) FA EQUIPMENT AND DEVICES SHOWN ARE EXCLUSIVE FOR CLEAN AGENT SYSTEM ONLY, UON. SYSTEM MONITORING FOR ALARM/TROUBLE & SUPERVISORY SHALL BE BY BLDG FIRE ALARM CONTRACTOR. COORDINATE INSTALLATION AS REQUIRED.

KEY NOTES:

1 (E) FA INDICATING DEVICE TO REMAIN, UON.

2 (E) FA INITIATING DEVICE TO REMAIN, UON.

3 ADDRESSABLE MONITOR DEVICES SHALL BE PROVIDED BY BLDG FIRE ALARM CONTRACTOR. SEE GENERAL NOTE 7 ABOVE.

SPACING CRITERIA:

DEPTH OF JOIST/BEAM □ 16" (OR 1'-8" TO TOP OF 2ND FLR SLAB FROM BOTTOM OF JOIST BELOW).

JOIST SPACING □ 36" O.C.

VERTICAL HEIGHT; FLOOR TO BOTTOM OF BEAM - 11'-4"
FLOOR TO CEILING (SLAB) □ 11'-4" □ 1'-8" □ 12'-8" (OR 152")

(DIRECTION PERPENDICULAR TO THE BEAM) AND MOUNTED AT SOFFIT OF BEAM.

RATIO OF BEAM SPACING
WIDTH TO CEILING HEIGHT
1'-4" 16"
12'-8" □ 152" □0.105 □ 0.4; DEVICE □ BOTTOM OF BEAM

System Current Draw

GF506R Fire Alarm Control Panel

	Total Standby		0.155 A	Total Alarm		1.566 A
	Standby Current			Alarm Current		
Device	Qty	Draw	Standby	Qty	Draw	Alarm
1. System						
Main Circuit Board	1 x	0.09500	0.09500	1 x	0.22100	0.22100
2. Annunciators						
GFANN-RLY	1 x	0.01500	0.01500	1 x	0.07500	0.07500
3. Resettable Power						
Number of IDC's Used Minus 1	4			4 x	0.04000	0.16000
I3 series 2 Wire Smoke Detector	9 x	0.00500	0.04500			
4. NAC #1						
P2W15	2 x	0.00000	0.00000	2 x	0.09100	0.18200
NAC #1 Totals (Max 3.0 Amps):			0.00000			0.18200
5. NAC #2						
Novec 1230 Solonoid	1 x	0.00000	0.00000	1 x	0.50000	0.50000
NAC #2 Totals (Max 3.0 Amps):			0.00000			0.50000
6. NAC #3						
SW15	4 x	0.00000	0.00000	4 x	0.06600	0.26400
NAC #3 Totals (Max 3.0 Amps):			0.00000			0.26400
7. NAC #4						
SSM24-6	2 x	0.00000	0.00000	2 x	0.08200	0.16400
NAC #4 Totals (Max 3.0 Amps):			0.00000			0.16400
TB9 (Non)Resettable Power (Term 1+2)	0 x	0.00000		0 x	0.00000	
TB9 Resettable Power(Term 3+4)	0 x	0.00000		0 x	0.00000	
		Total Standby Load:	0.155 A		Total Alarm Load:	1.566 A

System Power Requirements

GF506R Fire Alarm Control Panel

Secondary Load Requirements 4.93 Amp Hours

Total Secondary Load from the calculation table below.

Current Draw		Time (hours)	Total (AH)
Secondary Standby Load 0.155 A	x	Required Standby Time 24 hours	3.72
Secondary Alarm Load 1.566 A	x	Required Alarm Time 0.250 hours	0.39
		Total Secondary Load	4.11
		Derating factor	x 1.20
		Secondary Load Requirements	4.93 AH

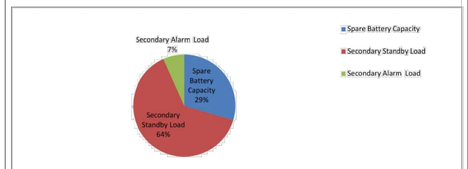
Battery Selection 7.00 Amp Hours

Select batteries from the list below.

7.0 AH BAT-1270 Battery (12 volt)

Battery Distribution Chart

Shows amp-hour distribution of your selections.



Spare Battery Capacity	2.07 Amp Hours
Secondary Standby Load	4.46 Amp Hours
Secondary Alarm Load	0.47 Amp Hours

Notes:
1. Batteries will fit in the FACP cabinet.
2. Selected battery size meets secondary load requirements.

RELEASING PANEL BATTERY CALCULATION

SYMBOL LEGEND

SYMBOL	DESCRIPTION
FSCP	FIRE SUPPRESSION CONTROL PANEL
F	MANUAL RELEASE STATION
?	TWO WIRE SMOKE DETECTOR WITH BASE
A CA	CLEAN AGENT ABORT SWITCH
	CLEAN AGENT HORN STROBE - WALL MOUNT
	CLEAN AGENT STROBE - WALL MOUNT
	CLEAN AGENT 6" BELL - WALL MOUNT
	EMERGENCY POWER OFF SWITCH (EPO) PROVIDED BY OTHERS
	NOVEC 1230 CLEAN AGENT SUPPRESSION TANK
	NOVEC 1230 - 90 DEGREE SIDEWALL DISCHARGE NOZZLE
	FIRE SMOKE DAMPER - PBO

SEE WIRING SCHEDULE ON F-000.

BATTALION ONE FIRE PROTECTION
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SAN LEANDRO, CA 94577
510-653-8075
CSLB □: 919683
Gamewell FCI FIRE CONTROL INSTRUMENTS
Authori□ed Distributor

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CONSULTANT:

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TEL: 510. 275. 3000 FAX: 510. 275. 3002

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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

□ L□ □ □00 □ IRE ALARM □ LAN

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SHEET NO:	

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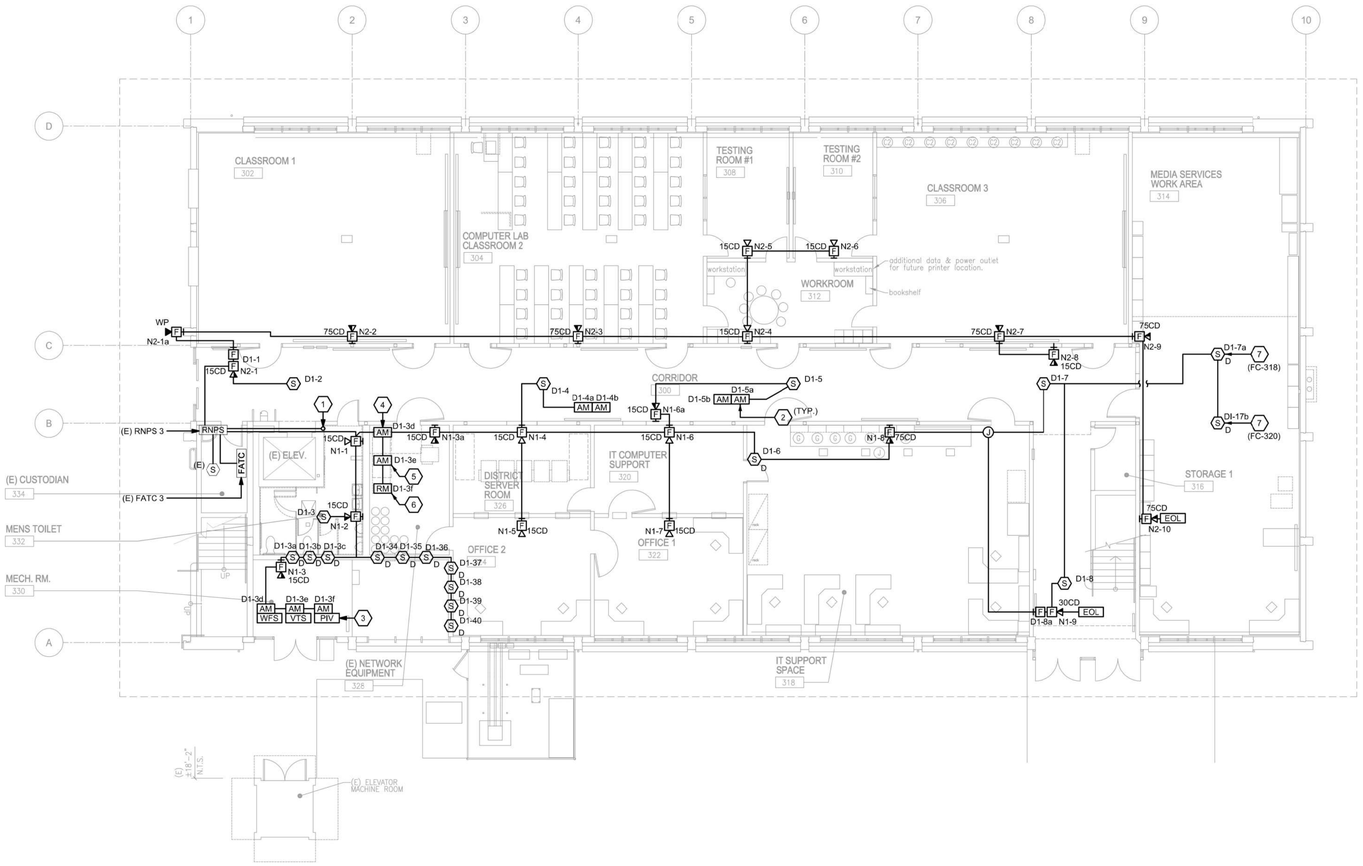
GENERAL NOTES

1. CONNECT REMOTE NOTIFICATION POWER SUPPLIES TO FIRE ALARM CONTROL PANEL WITH TWO (2) #14 AWG, UNLESS OTHERWISE NOTED.
2. ALL DETECTION CIRCUITS SHALL USE TWO (2) #16AWG, UNLESS OTHERWISE NOTED.
3. SEE VOLTAGE DROP CALCULATIONS FOR NOTIFICATION CIRCUIT CABLE QUANTITY AND SIZE.
4. IN FINISHED INTERIOR AREAS, RUN ALL CONDUITS CONCEALED, UNLESS OTHERWISE NOTED. PAINT ALL EXPOSED CONDUITS AND ELECTRICAL EQUIPMENT. REFER TO ARCHITECTS PAINTING SECTION FOR REQUIREMENTS.
5. FOR RACEWAY IN NON-ACCESSIBLE LOCATIONS, USE EXPOSED WIREMOLD V700 SERIES SURFACED MOUNTED RACEWAYS.
6. ALL INTERIOR FIRE ALARM CONDUIT SHALL BE 3/4", UNLESS OTHERWISE NOTED.
7. SEE DETAILS FOR MOUNTING REQUIREMENTS OF FIRE ALARM DEVICES.
8. MAINTAIN ALL SPACING AND PENETRATION REQUIREMENTS THROUGH FIRE RATED OR AREA SEPARATION WALLS. VERIFY EXACT LOCATIONS OF THESE WALLS WITH ARCHITECTURAL DRAWINGS.
9. REFER TO E2.0 FOR DEMILITION SCOPE OF WORK.

SHEET NOTES

1. ROUTE CONDUIT UP CONCEALED IN WALL TO SECOND FLOOR FIRE ALARM DEVICES.
2. PROGRAM ADDRESSABLE MODULE TO CLOSE DAMPER UPON ACTIVATION OF ANY SMOKE DETECTOR WITHIN CORRIDOR (TOTAL AREA COVERAGE PRESENT IN CORRIDOR). REFER TO 4/M4.1 FOR MORE INFORMATION.
3. PROVIDE WIRING TO PIV TAMPER SWITCH. CONNECT PIV TO FIRE ALARM SYSTEM VIA ADDRESSABLE MONITORING MODULE. COORDINATE EXACT LOCATION OF (E) PIV ON SITE PRIOR TO INSTALLATION. CONTRACTOR MAY REUSE (E) CONDUIT CONNECTING PIV AND MECHANICAL ROOM.
4. CONNECT MODULE TO (E) FIRE SUPPRESSION SYSTEM WITHIN DATA ROOM. MODULE TO REPORT ACTIVATION OF FIRE SUPPRESSION SYSTEM TO FACP.
5. CONNECT MODULE TO (E) FIRE SUPPRESSION SYSTEM WITHIN DATA ROOM. MODULE TO REPORT TROUBLE SIGNAL OF FIRE SUPPRESSION SYSTEM TO FACP.
6. PROVIDE ADDRESSABLE RELAY MODULE TO CUT POWER TO (7) FIRE/SMOKE DAMPERS ALONG MECH. ROOM WALL UPON ACTIVATION OF (E) FIRE SUPPRESSION SYSTEM.
7. PROVIDE DUCT SMOKE DETECTOR IN SUPPLY SIDE DUCT OF MECHANICAL EQUIPMENT. INSTALL PER MANUFACTURER'S RECOMMENDATIONS. PROVIDE ACCESS DOORS WHERE REQUIRED TO ALLOW ACCESS TO DUCT SMOKE DETECTOR FOR MAINTENANCE. SEE MECHANICAL DRAWINGS FOR CONNECTIONS TO MECHANICAL EQUIPMENT. PROGRAM DETECTOR TO SHUT DOWN ASSOCIATED MECHANICAL UNIT (OVER 2000 CFM).



BUILDING 300 FIRST FLOOR FIRE ALARM PLAN

1 — 1/8" = 1'-0"

RE ERENCE AS- ILT RECOR RA IN

HMC ARCH
Architecture Interiors Planning
1570 The Al
SAN JOSE, C
Telephone:
Fax:

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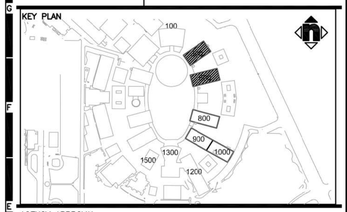
KEY PLAN



AGENCY APPROVAL

FILE NO. 1 – C2
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DIV. OF THE STATE ARCHITECT
APPL 01-109151
AC ____ FLS ____ SS
DATE ____

PROJECT TITLE
CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT
Chabot College
Modernization of Buildings 300 & 500
25555 Hesperian Blvd., Hayward, CA, 94545

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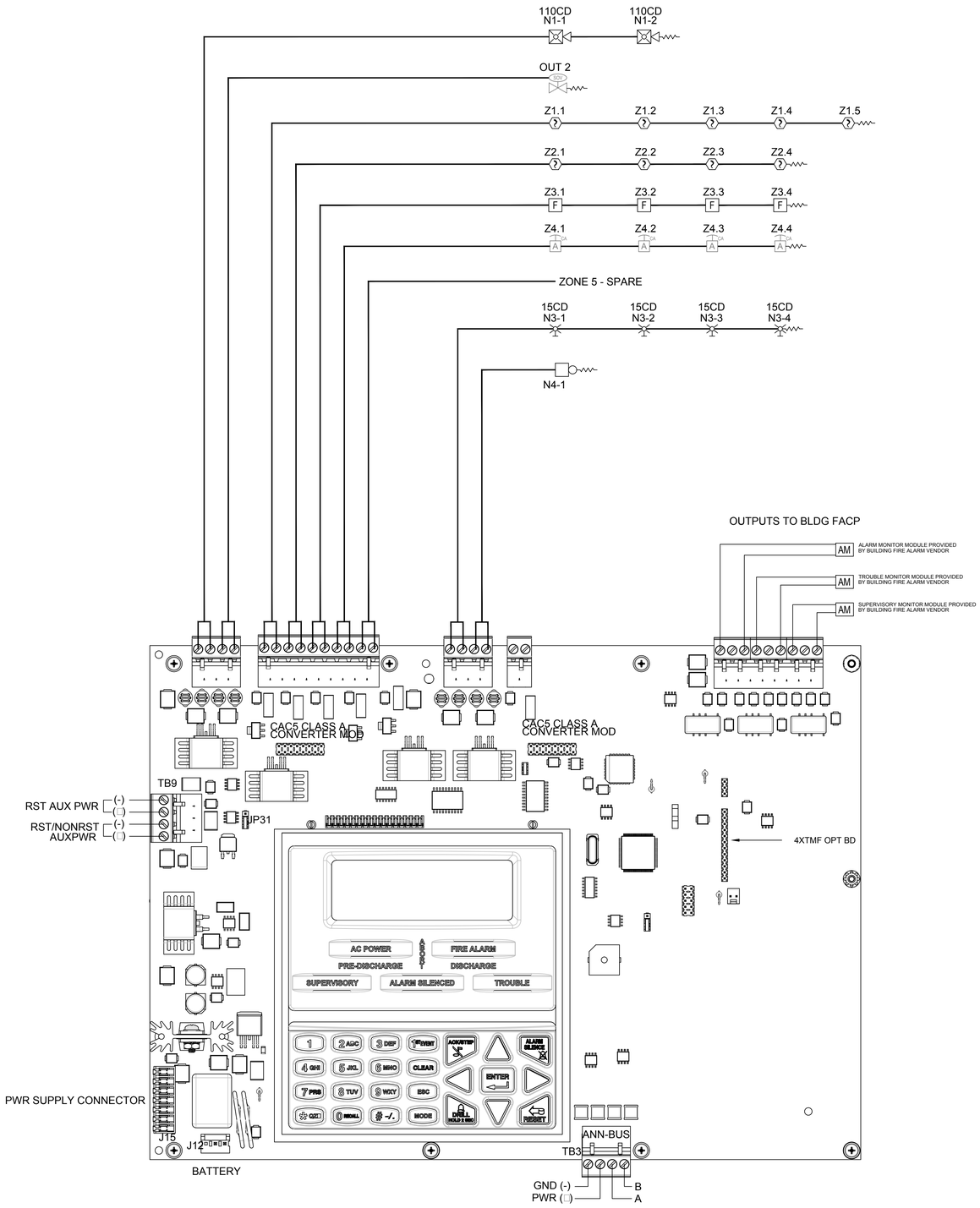
NO.	REVISIONS	DATE	NO.	REVISIONS	DATE
AD9	ADDENDUM	10.01.2010			
AD13	ADDENDUM	11.15.2010			

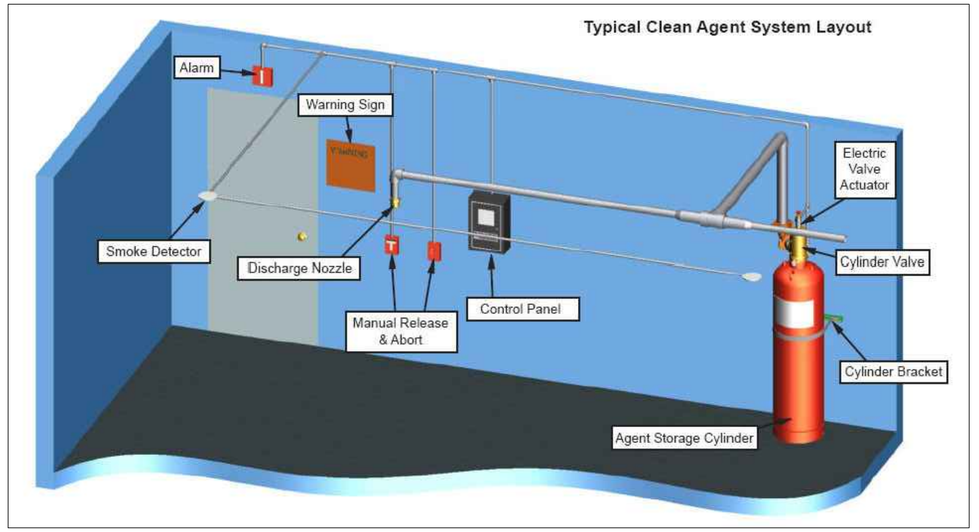
DRAWING TITLE
BUILDING 300 FIRST FLOOR FIRE ALARM PLAN

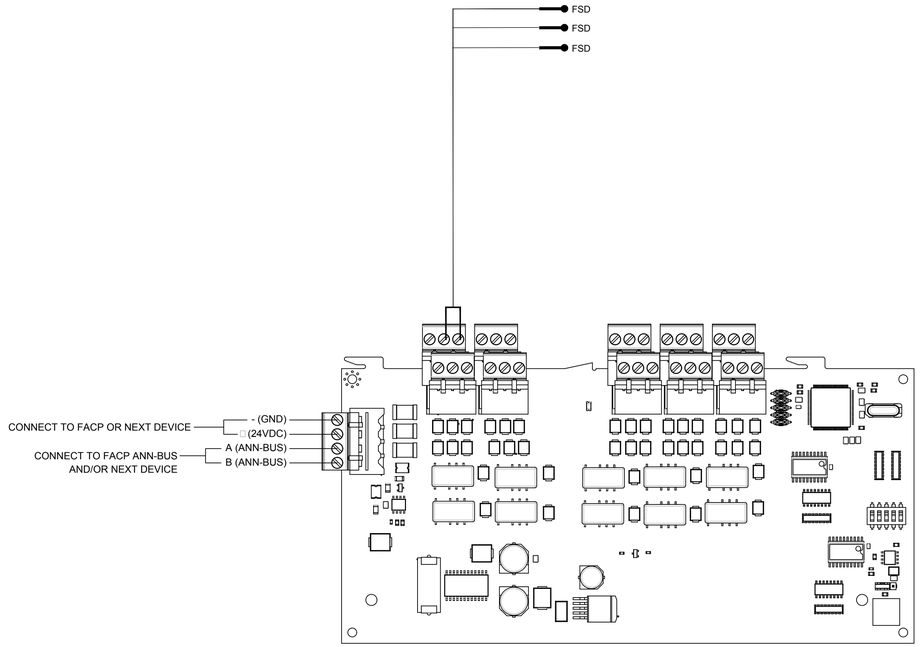
ARCHITECT SEAL

DESIGNED: MM	PROJECT NO.: 3342002
DRAWN: EM	SCALE: AS NOTED
CHECKED: SMF	DRAWING NO.: F2.0
DATE: October 1, 2010	OF --

FILE LOCATION: P:\Projects\HMC Chabot Bldg. 300 Redesign 06051.03\04_Drawings\06051.03F20.dwg
LAST SAVED ON: 2/13/12 at 3:32pm, PLOTTED ON: 2/13/12 at 4:44pm







SYMBOL LEGEND

SYMBOL	DESCRIPTION
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	TWO WIRE SMOKE DETECTOR WITH BASE
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	NOVEC 1230 CLEAN AGENT SUPPRESSION TANK
	NOVEC 1230 - 90 DEGREE SIDEWALL DISCHARGE NOZZLE
	FIRE SMOKE DAMPER - PBO

RELEASING SYSTEM RISER & CONNECTIONS

SCALE: NONE

BATTALION ONE
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Gamewell FCI FIRE CONTROL INSTRUMENTS
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TESTING RELOCATION

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HAYWARD, CA 94545

□ L□ □ 00 □ IRE ALARM RISER □ IA□ RAM

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SHEET NO:	

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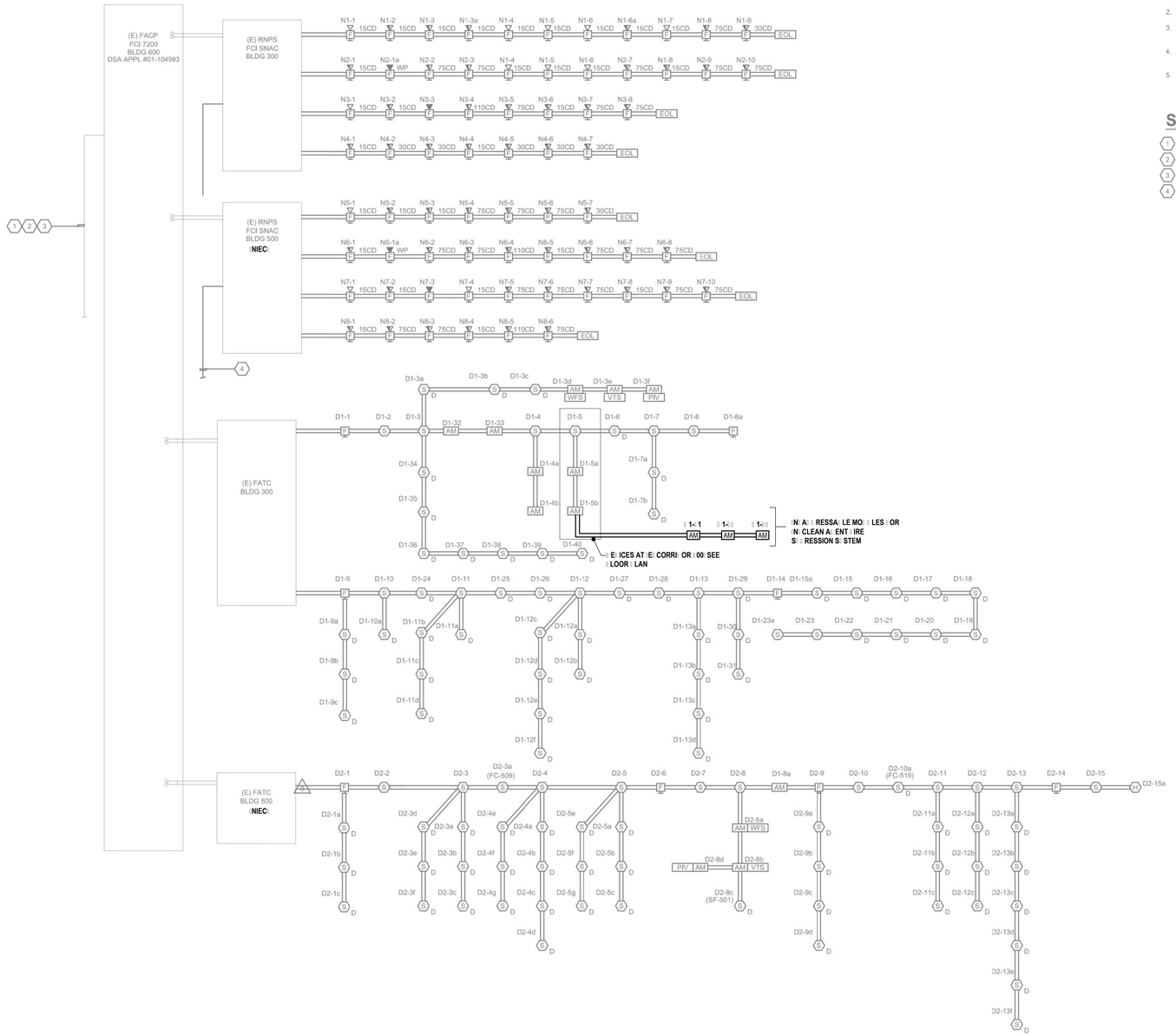


GENERAL NOTES

1. CONNECT REMOTE NOTIFICATION POWER SUPPLIES TO FIRE ALARM CONTROL PANEL WITH TWO (2) #14 AWG, UNLESS OTHERWISE NOTED.
2. ALL DETECTION CIRCUITS SHALL USE TWO (2) #14 AWG, UNLESS OTHERWISE NOTED.
3. ALL DETECTION CIRCUITS SHALL USE TWO (2) #14 AWG, UNLESS OTHERWISE NOTED. SEE VOLTAGE DROP CALCULATIONS FOR NOTIFICATION CIRCUIT CABLE QUANTITY AND SIZE.
4. THE PROJECT INSPECTOR SHALL VERIFY CANDELA SETTINGS, AFTER INSTALLATION, OF ALL MULTI-CANDELA VISUAL NOTIFICATION DEVICES DUE TO FIELD ADJUSTABILITY.
5. THE CONTRACTOR SHALL HAND WRITE THE DATE OF INSTALLATION ON ALL FIRE ALARM BATTERIES IN A LOCATION VISIBLE TO SERVICE PERSONNEL.

SHEET NOTES

1. CIRCUIT BREAKER SHALL BE MARKED AND IDENTIFIED PER NFPA 72.
2. (E) DEDICATED CIRCUIT.
3. (E) DEDICATED PHONE LINE TO SUPERVISORY STATION.
4. PROVIDE ONE (1) UNSWITCHED 120 VOLT, 20 AMP, 1 POLE DEDICATED CIRCUIT AND CIRCUIT BREAKER IN LOCAL PANELBOARD. CIRCUIT BREAKER SHALL BE MARKED AND IDENTIFIED PER NFPA 72.

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER ANTONIO QUIJOBO MORALES No. E 16720 Exp. 09/30/20 ELECTRICAL STATE OF CALIFORNIA

CONSULTANT:

MPE
METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

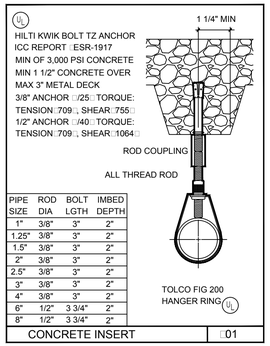
MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

IL IN 00
A RISER IA RAM

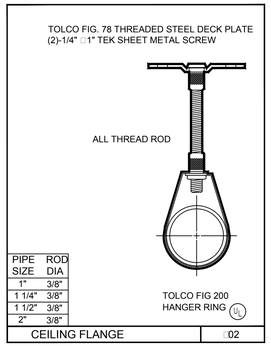
DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506
SHEET NO:	

-01



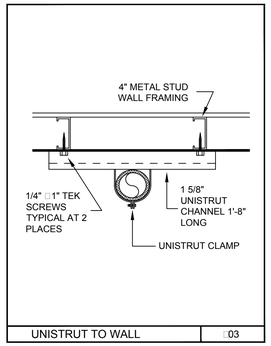
PIPE SIZE	ROD DIA	BOLT LGTH	IMBED DEPTH
1"	3/8"	3"	2"
1.25"	3/8"	3"	2"
1.5"	3/8"	3"	2"
2"	3/8"	3"	2"
2.5"	3/8"	3"	2"
3"	3/8"	3"	2"
4"	3/8"	3"	2"
6"	1/2"	3 3/4"	2"
8"	1/2"	3 3/4"	2"

CONCRETE INSERT □01



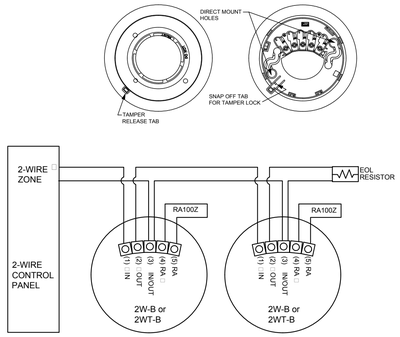
PIPE SIZE	ROD DIA
1"	3/8"
1 1/4"	3/8"
1 1/2"	3/8"
2"	3/8"

CEILING FLANGE □02

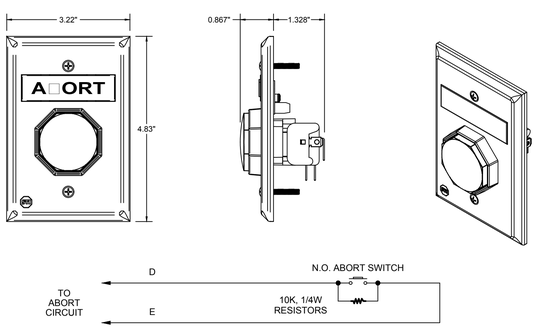


UNISTRUT TO WALL □03

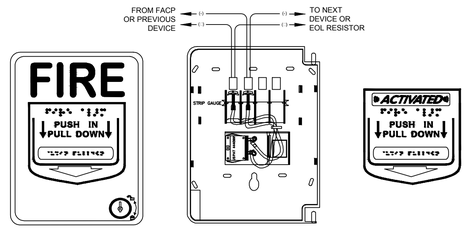
2WB SMOKE DETECTOR



UB-1 ABORT BUTTON



MANUAL RELEASE STATION



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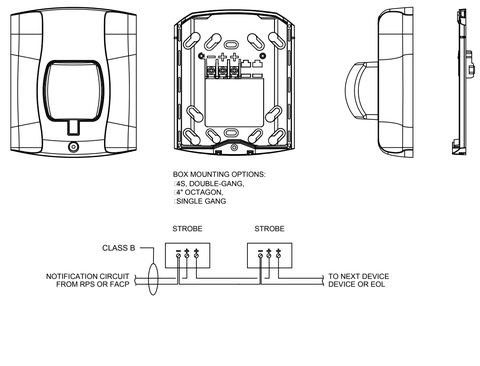

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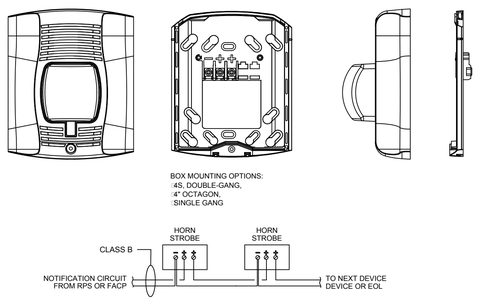

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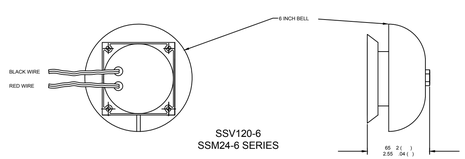


ROOM SEALING REQUIREMENTS

ANY ENCLOSURE MUST BE SEALED TO INSURE THAT LEAKAGE OF THE AGENT DOES NOT OCCUR DURING DISCHARGE AND THE REQUIRED CONCENTRATION LEVELS CAN BE MAINTAINED FOR THE ENTIRE HOLDING PERIOD. UNDER MOST CIRCUMSTANCES, THE AGENT WILL SUPPRESS ALL FLAMES AND FIRE CONDITIONS VERY QUICKLY. HOWEVER, WHEN LEAKAGE DOES EXIST, IT CAN SOMETIMES MAKE IT DIFFICULT FOR THE SOURCE OF IGNITION TO BE EXTINGUISHED. WHEN A ROOM OPENING DOES EXIST, ADDING MORE AGENT WITHIN THE ROOM USUALLY INCREASES THE RATE OF LOSS DUE TO THE ADDITIONAL PRESSURE CREATED BY THE ADDITIONAL AGENT.
EVERY EFFORT SHOULD BE MADE TO INSURE THE TIGHTNESS OF THE ROOM. TO ACCOMPLISH THIS, THE FOLLOWING AREAS SHOULD BE INSPECTED:

A. WALLS: ALL WALLS SHOULD BE CAULKED AND INSPECTED TO INSURE THAT THEY EXTEND SLAB TO SLAB. BULKHEADS SHOULD BE INSTALLED IN THOSE AREAS WHERE WALLS DO NOT EXTEND SLAB TO SLAB.
B. DUCTWORK: ALL DUCTWORK LEADING OUT OR INTO THE AREA SHOULD CONTAIN DAMPERS WITH SMOKE SEALS. THEIR DESIGN SHOULD PROVIDE 100□ AIR SHUTOFF.
C. DOORS: ALL DOORS SHOULD BE WEATHER STRIPPED AROUND JAMS AND SEALED AT THE BOTTOM. EXTRA PRECAUTION AND CARE SHOULD BE TAKEN WITH DOUBLE DOORS. ANY DOOR THAT IS REQUIRED TO REMAIN OPEN SHOULD HAVE SOME TYPE OF DOOR HOLDER DESIGNED TO BE RELEASED DURING SYSTEM ALARM.
D. AIR HANDLING: ALL AIR HANDLING UNITS SHOULD BE SHUT DOWN UPON ALARM TO PREVENT AGENT LOSS OR SMOKE SPREAD INTO OTHER AREAS. IF THE UNIT CANNOT BE SHUT DOWN, THE UNIT SHOULD BE OF THE RECIRCULATING TYPE, OR ADDITIONAL LOSS OF AGENT SHOULD BE CONSIDERED.
E. PENETRATIONS: ALL CRACKS, HOLES, OR PENETRATIONS OF THE PROTECTED AREA MUST BE SEALED, INCLUDING PIPE CHASES AND ANY WIRE TRAYS. FLOOR DRAINS SHOULD ALSO HAVE TRAPS FILLED WITH WATER.
F. BLOCK TYPE WALLS: ANY POROUS WALLS SHOULD BE SEALED, WHICH CAN BE ACCOMPLISHED WITH TWO OR THREE COATS OF PAINT.

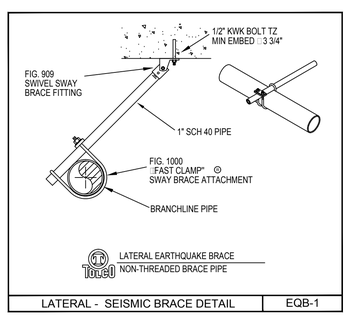
TO DETERMINE THE TIGHTNESS OF ANY ENCLOSURE, A ROOM INTEGRITY TEST SHOULD BE PERFORMED. NFPA 2001 CONTAINS INFORMATION REGARDING INTEGRITY TESTING OF ENCLOSURES.

WORKMANSHIP AND FABRICATION

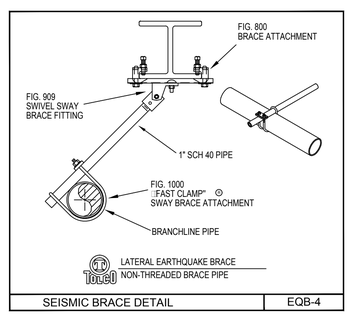
A. THE CONTRACTOR MUST PROVIDE THE NECESSARY TOOLS AND MATERIALS THAT WILL ALLOW HIM TO COMPLETE THE INSTALLATION WITHOUT DELAY AND IN CONFORMANCE WITH THE MANUFACTURER SPECIFICATION.
B. PIPE TEES SUPPLYING BRANCH LINES ARE TO BE INSTALLED WITH BOTH OUTLETS DISCHARGING HORIZONTALLY. THIS DOES NOT APPLY TO MANIFOLD PIPING FOR GROUPS OF CYLINDERS.
C. SCREWED PIPE AND FITTINGS SHOULD HAVE CLEAN CUT AND FULL LENGTH THREADS.
D. SCREWED PIPE JOINTS SHOULD CONFORM TO ANSI B-2.1 AND SHOULD BE TREATED WITH TEFLON TAPE, TEFLON PIPE DOPE, OR EQUAL. WHEN APPLYING TAPE OR PIPE DOPE, DO NOT APPLY TO FIRST TWO THREADS FROM END.
E. WHERE USED, ALL WELDED JOINTS MUST PERMIT FULL FLOW. MITER WELD FITTINGS ARE NOT ACCEPTABLE.
F. PIPING AND TUBING SHOULD BE REAMED FREE OF BURRS AND RIDGES.
G. EACH PIPE SECTION SHALL BE CLEANED INTERNALLY AFTER PREPARATION AND BEFORE ASSEMBLY BY MEANS OF SWABBING, UTILIZING A SUITABLE NONFLAMMABLE CLEANER. THE PIPE NETWORK SHALL BE FREE OF PARTICULATE MATTER AND OIL RESIDUE BEFORE INSTALLATION OF NOZZLES OR DISCHARGE DEVICES.

SYSTEM PIPING NOTES

1. ALL PIPING MUST BE SECURELY ANCHORED TO RIGID SUPPORT. PIPE SUPPORTS AND PARTS SHALL BE STEEL AND ADEQUATE TO SUPPORT THE PIPE IN A SUB-COLD CONDITION, AND TO ALLOW FOR FREE AND AMPLE MOVEMENT FOR CONTRACTION EXCEPT WHERE ANCHORED, THEREBY PREVENTING EXCESSIVE STRESS. PIPE SHALL BE SUPPORTED AND ANCHORED AS THE PIPING SYSTEM REQUIRES.
2. ALL PARTS OF THE SUPPORTING EQUIPMENT MUST BE FABRICATED AND INSTALLED SO THAT THEY WILL NOT BE DISENGAGED OR DISTORTED BY MOVEMENT OF THE SUPPORTED PIPE. A PIPE LINE MUST NOT BE SUPPORTED FROM ANOTHER PIPE LINE.
3. ALL PIPE SUPPORTS SHALL BE INSTALLED TO AVOID INTERFERENCE WITH OTHER PIPING, HANGERS, ELECTRICAL CONDUIT, AND SUPPORTS OR BUILDING STRUCTURE AND EQUIPMENT.
4. PIPE HANGERS AND BRACING SHOULD BE INSTALLED IN ACCORDANCE WITH GOOD COMMERCIAL PRACTICE, STATE, LOCAL CODES AND STANDARDS.
5. PIPE FITTINGS SHALL BE BLACK FOR NORMAL ATMOSPHERES AND GALVANIZED FOR MOIST OR CORROSIVE ATMOSPHERES. REDUCTION MUST BE MADE WITH REDUCING FITTINGS, CONCENTRIC REDUCERS, AND REDUCING COUPLINGS. FLUSH BUSHINGS MUST NOT BE USED.
6. CLASS 150 LB AND CAST IRON FITTINGS MAY NOT BE USED.
7. A. FITTINGS MUST HAVE A MINIMUM WORKING PRESSURE EQUAL TO OR GREATER THAN THE MINIMUM PIPING DESIGN PRESSURE OF 402 PSIG (2 2 PA) AT 0 F (21.1 C), AS INDICATED IN NFPA 2001.
   B. CLASS 300 LB MALLEABLE OR DUCTILE IRON FITTINGS IN SIZES 3 INCH (76 MM) AND SMALLER OR 1000 LB. DUCTILE IRON OR FORGED STEEL FITTINGS IN SIZES GREATER THAN 3 INCH (76 MM) ARE TO BE USED. CLASS 300 LB FLANGED JOINTS ARE ACCEPTABLE FOR USE IN ALL SIZES.
   C. BUTT-WELD WELDING FITTINGS SHOULD BE OF SCHEDULE TO MATCH THE PIPING.
   D. GROOVED FITTINGS WITH COMPANION GASKETED COUPLINGS MUST BE UNDERWRITERS LABORATORIES LISTED OR FACTORY MUTUAL RESEARCH CORPORATION APPROVED FOR EXTINGUISHING SYSTEMS.
8. THE ABOVE LISTED MATERIALS DO NOT PRECLUDE THE USE OF OTHER MATERIALS WHICH WOULD SATISFY THE REQUIREMENTS SET FORTH IN NFPA 2001.
9. DUCTILE IRON FITTINGS MUST BE UL LISTED, OF THE APPROPRIATE WEIGHT, AND BEAR IDENTIFYING MARKS.
10. ALL UNIONS SHOULD BE OF THE GROUND JOINT TYPE WITH BOTH SEATING SURFACES MATCHED.
11. PIPE LENGTHS GIVEN ARE FROM CENTER TO CENTER OF FITTINGS.
12. PIPE SHALL BE SEALED WITH TFE TAPE. START WRAP AT SECOND THREAD, BUT DO NOT OVERHANG THE FIRST THREAD.
13. BULL HEAD TEES MUST HAVE BOTH OUTLETS IN THE HORIZONTAL PLANE. THE INLET TO A BULLHEAD TEE MAY APPROACH IN A HORIZONTAL, VERTICALLY UP OR VERTICALLY DOWN DIRECTION.
14. ALL NOZZLES ARE EQUIPPED WITH FEMALE PIPE THREADS AND MUST BE INSTALLED IN A VERTICAL (PENDANT) POSITION POINTING DOWN.
15. ALL NOZZLES DROPS AND CHANGES IN DIRECTION OF PIPING SHALL BE BRACED TO PREVENT ANY VERTICAL OR HORIZONTAL MOVEMENT DURING DISCHARGE.
16. PIPING SHALL BE PNEUMATICALLY TESTED PER NFPA 2001 □ 40 P.S.I.G. FOR A PERIOD OF 10 MINUTES. AT THE END OF TEN MINUTES, THE PRESSURE DROP SHALL NOT EXCEED 20□ (8 P.S.I.) OF THE TEST PRESSURE. THIS TEST MAY BE OMITTED IF THERE IS NO MORE THAN ONE CHANGE IN DIRECTION FITTING AND THE PIPE IS PHYSICALLY CHECKED FOR TIGHTNESS.
17. THE PIPE NETWORK SHALL BE PUFF TESTED PER NFPA 2001 TO VERIFY THAT THE PIPING IS UNOBSTRUCTED.
18. ANY DEVIATIONS FROM THE DESIGN DRAWINGS SHALL REQUIRE PRIOR APPROVAL BY THE DESIGN ENGINEER.
19. AS-BUILT DRAWINGS SHALL BE TURNED OVER TO BATTALION ONE FIRE PROTECTION UPON COMPLETION OF INSTALLATION.



LATERAL - SEISMIC BRACE DETAIL EQB-1



SEISMIC BRACE DETAIL EQB-4

BATTALION ONE
FIRE PROTECTION
14577 CATALINA ST.
SAN LEANDRO, CA 94577
510-653-8075
CSLB □: 919683

Game□ell FIRE CONTROL INSTRUMENTS
Authori□ed Distributor

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
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PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER
ANTONIO QUIJOBO MORALES
No. E 16720
Exp. 09/30/20
ELECTRICAL
STATE OF CALIFORNIA

CONSULTANT:

METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

□L□ □00□IRE ALARM□ETAILS

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506
SHEET NO:	

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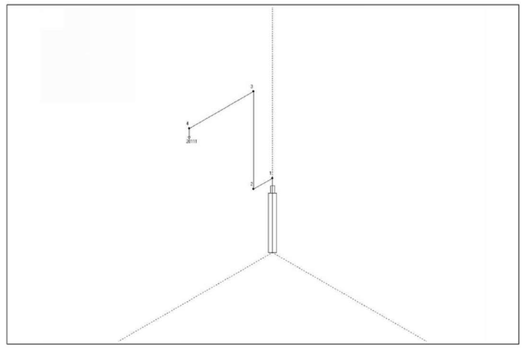
Project:
Project-No: 19-06-150
Building:
Object: Server Room
Contractor: Battalion One Fire Protection
Owner: Jeff Gregory
Project engineer:
Date: 6/21/2019
Altitude above sealevel: 0 m
Regulation rule for calculation of FK-5-1-12 quantities: NFPA 2001 (edition 2000)

Pipe catalogue: FT Pipe - Schedule 40 - 1.0.0.rkl
Component catalogue: FT Components 1.0.1.arm
Nozzle catalogue: FT Nozzles - 1.0.2.noz



Pipesystem data:

Section-No:	Starting-node	Endnode	Length [m]	Height [m]	Pipetype	Diameter [mm] **	Fitting *	Component code	Component coefficient	Nb of containers FK-5-1-12 quantity
1	0	1	1.372	1.372	10	62.7	C	150	6.500	1.0
2	1	2	0.400	0.000	11	62.7	E	-	-	0.0
3	2	3	1.800	1.800	11	62.7	E	-	-	0.0
4	3	4	5.500	0.000	11	62.7	E	-	-	0.0
5	4	20111	0.100	-0.100	11	62.7	E	-	-	0.0

* C=Component, B=Bend, T=T-Piece, E=Elbow
** If a pipe diameter is equal zero see the extra table of the calculated diameters

Legend of pipetypes

Type	Pipeclass	Pipe roughness
10	Schedule 40 - 1/4" to 6" Diameter	smooth
11	Schedule 40 - 1/4" to 6" Diameter	galvanized

Legend of components

Code	Type	Resistance coefficient
150	600LB [227L Valve 2.5"] Fill 55.0-272.5kg, Outlet 1372mm	6.500

Nozzle data:

No.	Calculation zone	Diameter [mm]
20111	Server Room	40.0

Legend of nozzles:

Type	Number of orifices	C1	C2	C3	C4	C5	C6
2 180° Sidewall	1	0.10652	0.26900	0.00000	-0.18900	0.00000	0.00000

Calculation zone data:

Calculation of design quantity:

Zone	Total volume [m3]	Volume of building parts [m3]	Calculated volume [m3]	Total surface [m2]	Max. Over-pressure [mbar]	Design temp. [°C]	Extinguish-conc. [% Vol]	Design factor	Design conc. [% Vol]	Design quantity [kg]
1 Server Room	336.4	0.0	336.4	0.0	1.000	20.0	3.5	1.29	4.5	221.35

Regulation rule for calculation of FK-5-1-12 quantities: NFPA 2001 (edition 2000)
Altitude above sealevel: 0.0 m

FK-5-1-12 storage input data:

Container volume:	227.0 l
Filling ratio:	1.000 kg/l
Filling pressure:	34.5 bar abs
Storage temperature:	15.0 °C
Supplement factor:	1.00
Minimum storage quantity:	221.35 kg
Number of containers:	1

Discharge time (input value): 10.0 s

Further information:
Design with included gas discharge time
Design with predetermined orifice diameters

Calculation results:

FK-5-1-12 storage data:

Design quantity:	221.4 kg
Supplement factor:	1.00
Minimum storage quantity:	221.4 kg
Container volume:	227.0 l
Filling ratio:	0.98 kg/l
Filling pressure:	34.5 bar abs
FK-5-1-12 -mass per container:	221.4 kg
Number of containers:	1
Actual storage quantity:	221.4 kg
Storage temperature:	15.0 °C
Starting container pressure:	33.8 bar abs

Discharge time:

Discharge time air:	0.1 s
Total gas discharge time:	0.1 s
Two-phase discharge time:	8.8 s
Total discharge time:	8.9 s

System information:

Container working pressure:	16.6 bar abs
Container working temperature:	15.0 °C
Total network volume:	27.8 l
Medium pipe content:	38.6 kg FK-5-1-12
Filling portion in pipe system:	0.17 kg FK-5-1-12 /kg FK-5-1-12 -storage

Pipe system:

Section-No:	Starting-node	Endnode	Pressure [bar abs]	Flowrate [kg/s]	Pipedimension Di [mm]	DN
1	0	1	14.99	23.81	62.7 *	2 1/2"
2	1	2	14.59	23.91	62.7 *	2 1/2"
3	2	3	13.86	23.91	62.7 *	2 1/2"
4	3	4	13.20	23.91	62.7 *	2 1/2"
5	4	20111	12.76	23.91	62.7 *	2 1/2"

* Attention! This pipe dimension is not in the pipe catalogue!

Nozzle data:

Calculation-zone no:	Nozzle no.	Nozzle type	Number of orifices	Pipeconnection Di [mm]	DN	Orifice [mm]	FK-5-1-12 output [kg]
1	20111	2	1	62.7	2 1/2"	40.0	222.3

Two-phase discharge time: 8.8 s

Calculation-zone no:	Nozzle no.	Outlet velocity [m/s]	Transport time [s]	Jetdistance [m]	Evaporation distance [m]
1	20111	15.1	1.60	14.46	4.90

Concentrations:

Calculation-zone no:	Gascomposition after discharge [%] O2	FK-5-1-12	N2
1	20.0	4.5	74.6

Pressure relief opening:

Calculation-zone no:	Recommended area against overpressure Area [m²]	Overpressure [mbar]	Max. flow [kg/s]
1	0.227	1.0	23.9

Component list:

Component	Number	Code	Coefficient
600LB [227L Valve 2.	1	150	6.500

Nozzle-type	Number	C1	C2	C3	C4	C5	C6
2	1	0.10650	0.26900	0.00000	-0.18900	0.00000	0.00000

Pipe-type	Di [mm]	DN	Length [m]
10	62.70	2 1/2"	1.400
11	62.70	2 1/2"	7.800

Number of bends (+) and elbows (-)

Bend-type	Di [mm]	DN	Number
-90	62.70	2 1/2"	4

Number of T-distributors (in- and outdiameter)

Number	Input	90-out	90-out	0-out

BATTALION ONE
FIRE PROTECTION
14577 CATALINA ST.
SAN LEANDRO, CA 94577
510-653-8075
CSLB □: 919683

Game□ell FCI FIRE CONTROL INSTRUMENTS
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CONSULTANT:

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METRO POWER ENGINEERS, INC.
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RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

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KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
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□L□ □00
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CALC□LATIONS

DRAWN BY:	CHECKED BY:
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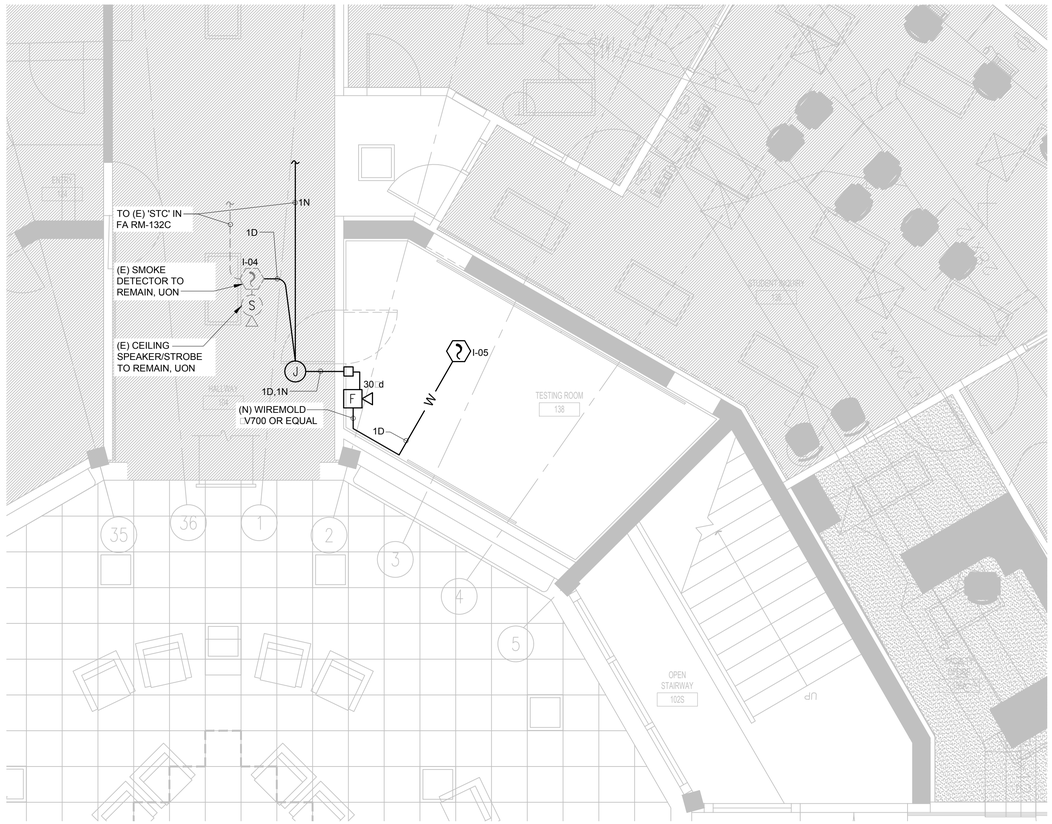
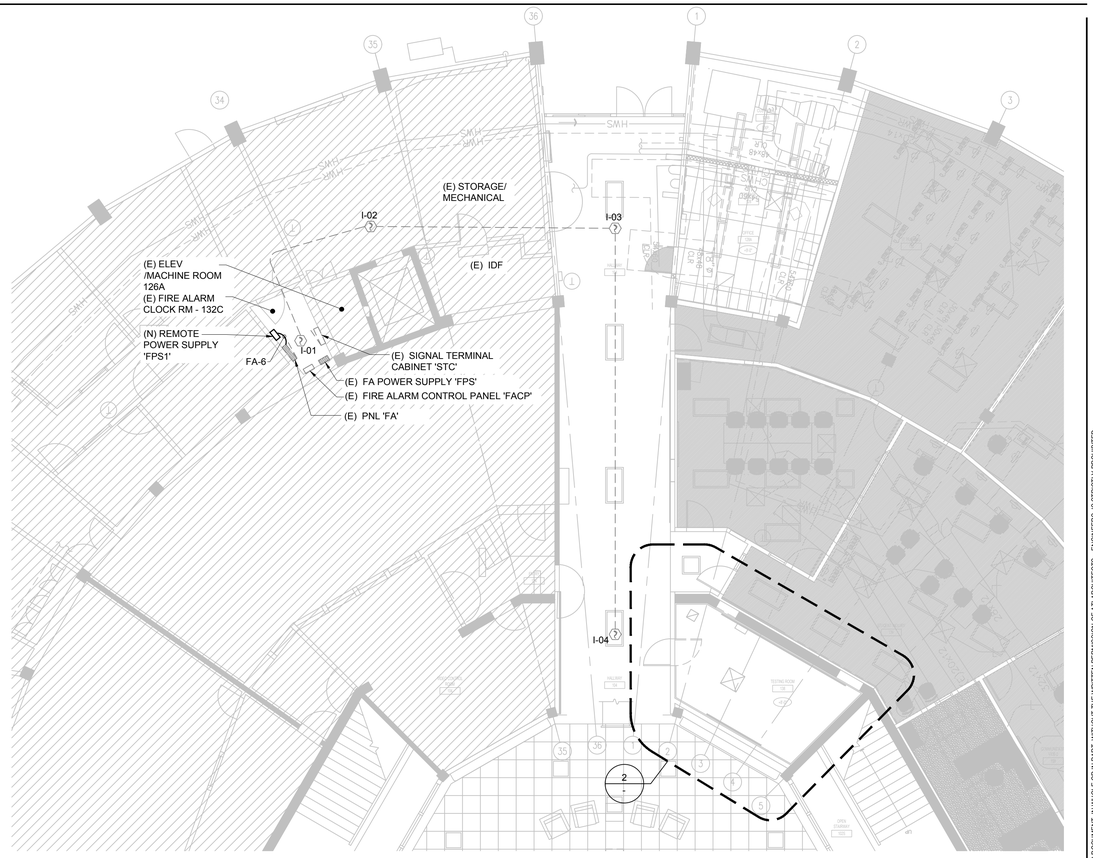


2 NEW FLOOR PLAN

SCALE : 1/4" = 1'-0"



1 VICINITY MAP - FIRE ALARM

SCALE : 1/8" = 1'-0"

BATTERY SIZE CALCULATIONS

PROJECT: Chabot College- Bldg 100 EQPT: FA Power Supply FPS1

ITEM DESCRIPTION	QUANTITY	STAND BY CURRENT EACH	STAND BY CURRENT TOTAL	ALARM CURRENT (AMP) EACH	ALARM CURRENT (AMP) TOTAL
(N) FIRE ALARM PANEL & ASSOCIATED MODULES	1	0.14	0.14	0.25	0.25
(N) ADDRESSABLE HEAT DETECTOR		0.00055		0.00055	
(N) CONTROL MODULE	1	0.0004	0.0028		
(N)ADDRESS INPUT MOD	1	0.0001	0.0001	0.0003	0.0003
(N)STROBE, 15cd	0			0.069	0
(N) MONITOR MODULE	1	0.000375	0.000375	0.0051	0.0051
(N) Horn / STROBE30 cd	1			0.065	0.065
TOTAL			0.143275		0.3204

BATTERY SIZE= 1.2 X (24 X 0.143275 + 0.083 0.3204) = 4.152913

NEW BATTERY 7.0 AMP - HOUR TEST SYSTEM BY SHUTTING OFF A.C. POWER AND RUNNING SYSTEM ON BATTERY ONLY (IN THE ALARM MODE).

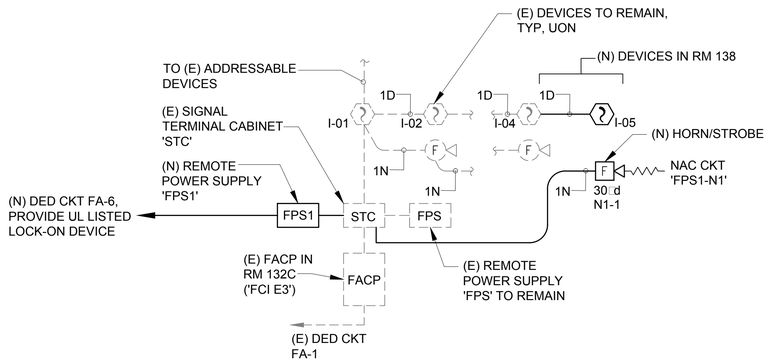
NOTE: 1.) Battery on 24 hour standby current and 5 minutes of alarm current NFPA.
2.) Additional multiplier to compensate for the higher discharge rate alarm.

VOLTAGE DROP CALCULATIONS- SIGNAL CIRCUIT FPS1

PROJECT: Chabot College - Bldg 100 SEE RISER DIAGRAM

DEVICE #	AMP/DEVICE	AMP ADDED	DISTANCE	WIRE GA	OHMS/1000'	VOLT DROP	TAL VOLT DROP	REMARKS
N1-1	0.065	0.065	120	12	1.6	0.04		
TOTAL VOLT DROP :						0.04	0.17	% @ 24V
							0.20	% @ 20V

NOTES:
1 Voltage Drop (VD) = 2 x Amp x Distance x Ohms/1k'
2 Ohmic value of conductor per 1000' of run are as follows:
1.0 for #10; 1.6 for #12; 2.6 for #14, 4.1 for #16, 6.5 for #18



3 FA-PART RISER DIAGRAM

SCALE : NTS

SCOPE:

1. ADD NEW ADDRESSABLE DEVICE TO MATCH (E) AND A COMBO SPEAKER/STROBE AS SHOWN. PRODUCT SHALL MATCH ONGOING FA MODERNIZATION BY OWNER.
2. PROVIDE DEVICES PROPRIETARY TO FIRE ALARM PANEL.
3. PROVIDE TESTING AND PROGRAMMING FOR THE ADDED DEVICES AS REQUIRED.

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER ANTONIO QUIJOBO MORALES No. E 16720 Exp. 09/30/20 ELECTRICAL STATE OF CALIFORNIA

CONSULTANT:

METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:
A	-	XX/XX/XX

KEY PLAN:

CHABOT COLLEGE

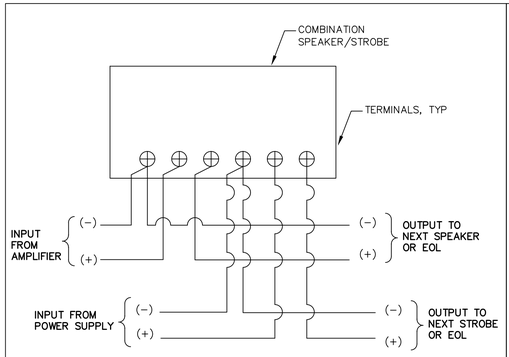
MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

L 100 IRE ALARM LANS

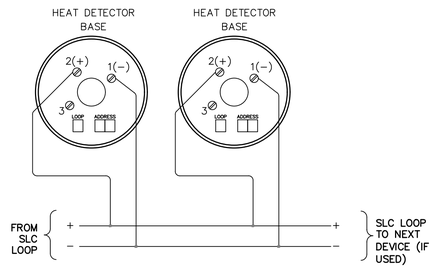
DRAWN BY: NF CHECKED BY: AW
DATE: 04/30/2019 PROJECT NO: C9506
SHEET NO:

-1



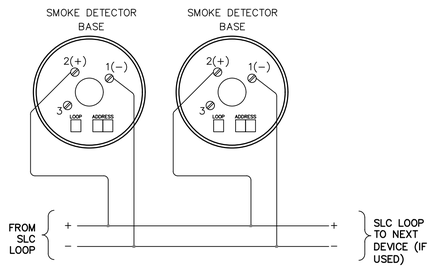
10 SPEAKER/STROBE WIRING DIAGRAM

N.T.S.



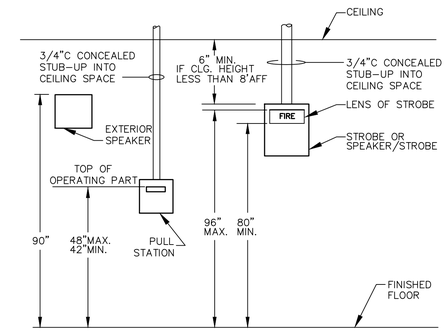
7 HEAT DETECTOR BASE WIRING DIAGRAM

EF–035.DWG N.T.S.



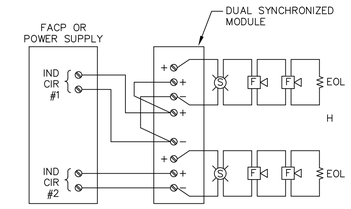
4 SMOKE DETECTOR BASE WIRING DIAGRAM

EF–035.DWG N.T.S.



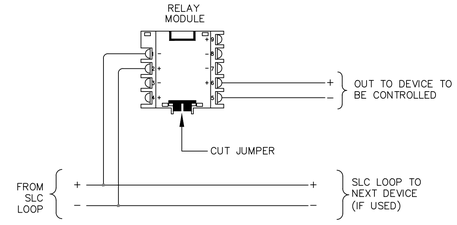
1 ELEVATION - FIRE ALARM DEVICES

EF–020.DWG N.T.S.



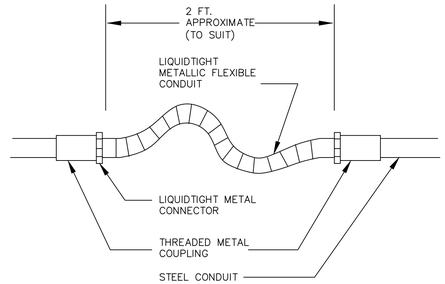
8 TYP. SPEAKER/STROBE WIRING DIAGRAM

EF–043.DWG N.T.S.



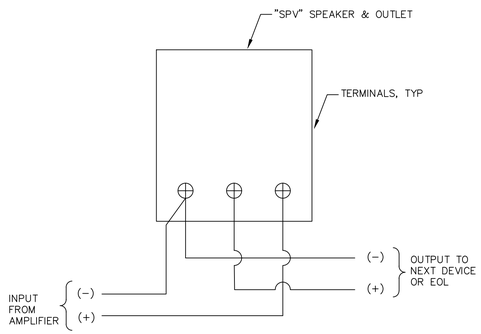
5 CONTROL RELAY MODULE WIRING DIAGRAM

EF–036.DWG N.T.S.



2 FLEXIBLE CONDUIT/EXPANSION SECTION

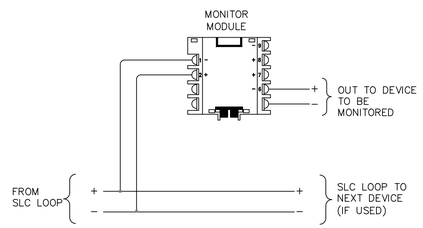
N.T.S.



1. DO NOT LOOP ELECT WIRING UNDER TERMINAL SCREWS
2. INPUT POWER OF 2W, TYP, UON.
3. NEMA 4X FOR OUTDOOR APPLICATION

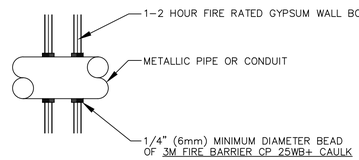
9 SPEAKER WIRING DIAGRAM

N.T.S.



6 MONITOR MODULE WIRING DIAGRAM

EF–034.DWG N.T.S.



1. THE CAULK IS TO BE FORCED INTO THE ANNULAR SPACE TO THE MAXIMUM EXTENT POSSIBLE FLUSH WITH THE EXTERIOR OF THE PENETRATION SURFACE.
2. FINISH CAULKING WITH A 1/4" (6mm) MINIMUM BEAD OF CP 25WB+ CAULK APPLIED TO THE PERIMETER OF THE CONDUIT/PIPE AT ITS EGRESS FROM THE WALL.
3. THE MAXIMUM ANNULAR SPACE IS NOT TO EXCEED 3/16" (5 mm).
4. INSTALL 3M FIRESTOP ON BOTH SIDES OF THE WALL.
5. THESE RECOMMENDATIONS ARE BASED ON PRODUCT PERFORMANCE PER ASTM E–814 (UL 1479) FIRE TEST AND UL THROUGH–PENETRATION FIRESTOP SYSTEM #WL1001.

3 FIRE STOP PENETRATION DETAIL

EL320.DWG N.T.S.

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

A R C H I T E C T S + E N G I N E E R S
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER ANTHONY GUTIERREZ No. E 18720 Exp. 09/30/20 ELECTRICAL STATE OF CALIFORNIA

CONSULTANT:

MPE
METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

▯ L▯ ▯ ▯00 ▯IRE ALARM ▯ ETAILS

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506
SHEET NO:	

▯ -▯ 00

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 1 of 6)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

A. General Information

Climate Zone: 3	Conditioned Floor Area: 1050 SF Unconditioned Floor Area:					
Building Type:	☒	Nonresidential	☐	High-Rise Residential	☐	Hotel/Motel
☐ Schools	☐	Relocatable Public Schools	☒	Conditioned Spaces	☐	Unconditioned Spaces
Phase of Construction:	☐	New Construction	☐	Addition	☒	Alteration
Method of Compliance:	☐	Complete Building	☒	Area Category	☐	Tailored

Project Address: 25555 HESPERIAN BLVD, HAYWARD CA 94545

B. Lighting Compliance Documents (select yes for each document included)

For detailed instructions on the use of this and all Energy Efficiency Standards compliance documents, refer to the Nonresidential Manual published by the California Energy Commission.

YES	NO	COMP. DOC.	TITLE
☒	☐	NRCC-LTI-01-E	Certificate of Compliance. All Pages required on plans for all submittals.
☒	☐	NRCC-LTI-02-E	Lighting Controls, Certificate of Compliance, and PAF Calculation. All Pages required on plans for all submittals.
☒	☐	NRCC-LTI-03-E	Indoor Lighting Power Allowance
☐	☒	NRCC-LTI-04-E	Tailored Method Worksheets
☐	☒	NRCC-LTI-05-E	Line Voltage Track Lighting Worksheets
☐	☒	NRCC-LTI-06-E	Indoor Lighting Existing Conditions

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 2 of 6)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

C. Summary of Allowed Lighting Power

Conditioned and Unconditioned space Lighting must not be combined for compliance

	Indoor Lighting Power for Conditioned Spaces		Watts	Indoor Lighting Power for Unconditioned Spaces		Watts
01	**Installed** Lighting NRCC-LTI-01-E, Table H, page 5	+	1101	**Installed** Lighting NRCC-LTI-01-E, Table H, page 5	+	
02	Portable Only for Offices NRCC-LTI-01-E, Table G, page 4	+				
03	Minus Lighting Control Credits NRCC-LTI-02-E, page 2	-	220	Minus Lighting Control Credits NRCC-LTI-02-E, page 2	-	
04	Adjusted **Installed** Lighting Power (row 1 plus row 2 minus row 3)	=	881	Adjusted **Installed** Lighting Power (row 1 minus row 3)	=	
	Complies ONLY if **Installed** ≤ **Allowed** (Box 04 < Box 05)			Complies ONLY if **Installed** ≤ **Allowed** (Box 04 < Box 05)		
05	**Allowed** Lighting Power Conditioned NRCC-LTI-03-E, page 1 Alterations with replacement luminaires that have at least 50/35% lower power compared to the original existing luminaires, may instead use the allowed wattage from NRCC-LTI-06, page 2		1260	**Allowed** Lighting Power Unconditioned NRCC-LTI-03-E, page 1 Alterations with replacement luminaires that have at least 50/35% lower power compared to the original existing luminaires, may instead use the allowed wattage from NRCC-LTI-06, page 2		

D. Declaration of Required Certificates of Installation

Declare by selecting yes for all of the Certificates that will be submitted. (Retain copies and verify forms are completed and signed.)

YES	NO	Compliance Document/Title	
☒	☐	NRCI-LTI-01-E - Must be submitted for all buildings	☐ Field Inspector
☒	☐	NRCI-LTI-02-E - Must be submitted for a lighting control system, or for an Energy Management Control System (EMCS), to be recognized for compliance.	☐ Field Inspector
☐	☒	NRCI-LTI-03-E - Must be submitted for a line-voltage track lighting integral current limiter, or for a supplementary overcurrent protection panel used to energize only line-voltage track lighting, to be recognized for compliance.	☐ Field Inspector
☐	☒	NRCI-LTI-04-E - Must be submitted for two interlocked systems serving an auditorium, a convention center, a conference room, a multipurpose room, or a theater to be recognized for compliance.	☐ Field Inspector
☒	☐	NRCI-LTI-05-E - Must be submitted for a Power Adjustment Factor (PAF) to be recognized for compliance.	☐ Field Inspector
☐	☒	NRCI-LTI-06-E - Must be submitted for additional wattage installed in a video conferencing studio to be recognized for compliance.	☐ Field Inspector

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 3 of 6)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

E. Declaration of Required Certificates of Acceptance

Declare by selecting yes for all of the Certificates that will be submitted. (Retain copies and verify forms are completed and signed.)

YES	NO	Compliance Document/Title	
☒	☐	NRCA-LTI-02-A - Must be submitted for occupancy sensors and automatic time switch controls.	☐ Field Inspector
☐	☒	NRCA-LTI-03-A - Must be submitted for automatic daylight controls.	☐ Field Inspector
☐	☒	NRCA-LTI-04-A - Must be submitted for demand responsive lighting controls.	☐ Field Inspector
☒	☐	NRCA-LTI-05-A – Must be submitted for institutional tuning power adjustment factor (PAF).	☐ Field Inspector

A Separate Lighting Schedule Must Be Filled Out for Conditioned and Unconditioned Spaces. Installed Lighting Power listed on this Lighting Schedule is only for:

☒ **CONDITIONED SPACE** ☐ **UNCONDITIONED SPACE**

F. Indoor Lighting Schedule and Field Inspection Energy Checklist

☐ The actual indoor lighting power listed on the next 2 pages includes all installed permanent and planned portable lighting systems.
☐ When Complete Building Method is used for compliance, list each different type of luminaire on separate lines.
☒ When Area Category Method or Tailored Method is used for compliance, list each different type of luminaire by each different function area on separate lines
☐ Also include track lighting in schedule, and submit the track lighting compliance document (NRCC-LTI-05-E) when line-voltage track lighting is installed.

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 4 of 6)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

G. Installed Portable Luminaires in Offices – Exception to Section 140.6(a)

☐ This section shall be filled out ONLY for portable luminaires in offices (As defined in §100.1). All other planned portable luminaires shall be documented on next page of this compliance document.
☐ This section is used to determine if greater than 0.3 watts of portable lighting is planned for any office
☐ Fill out a separate line for each different office. Small offices that are typical (having the same general and portable lighting) may be grouped together. This allowance shall not be traded between offices having different lighting systems.

Office Portable Luminaire Schedule	Office Installed Portable Luminaire W/ft²							Office Location	Field Inspector	
1	2	3	4	5	6	7	8	9	10	
Complete Luminaire Description (i.e., LED, under cabinet, furniture mounted direct/indirect)	Watts per Luminaire	Number of Luminaires	Installed portable luminaire watts in this office (G02 x G03)	Square feet of this office	Watts per square foot (G04 / G05)	If G06 ≤ 0.3, enter zero; if G06 > 0.3, (G06-0.3)	(G05 x G07)	Identify Office area in which these portable luminaires are installed	Pass	Fail
N/A									☐	☐
									☐	☐
									☐	☐
									☐	☐
									☐	☐
Total installed portable luminaire watts that are greater than 0.3 W/ft² per office:								Enter sum total of all pages into NRCC-LTI-01-E; Page 1		

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 5 of 6)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

A Separate Lighting Schedule Must Be Filled Out for Conditioned and Unconditioned Spaces. Installed Lighting Power listed on this Lighting Schedule is only for:

☒ **CONDITIONED SPACE** ☐ **UNCONDITIONED SPACE**

H. Indoor Lighting Schedule and Field Inspection Energy Checklist

Luminaire Schedule		Installed Watts				Location	Field Inspector [1]	
01	02	03	04		05	06	07	08	
Name or Item Tag	Complete Luminaire Description (i.e, 3 lamp fluorescent troffer, F32T8, one dimmable electronic ballast)	Watts per Luminaire	How wattage was determined: CEC-Default from NA8	How wattage was determined: According to §130.0(c)	Number Luminaires	Total Installed Watts in this area (H03 x H05)	Primary Function area in which these luminaires are installed	Pass	Fail
A	LED LINEAR (8.6W/LF)	8.6W/LF	☐	☒	128LF	1101	GENERAL	☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
INSTALLED WATTS PAGE TOTAL:		1101	Enter sum total of all pages into NRCC-LTI-01-E; Page 2						

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 6 of 6)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: TONY Q. MORTERA, PE	Documentation Author Signature:
Company: METRO POWER ENGINEERS, INC	Signature Date: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	CEA Certification Identification (if applicable):
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:
1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name: TONY Q. MORTERA, PE	Responsible Designer Signature:
Company: METRO POWER ENGINEERS, INC	Date Signed: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	License: E16739
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

STATE OF CALIFORNIA
INDOOR LIGHTING – LIGHTING CONTROLS
CEC-NRCC-LTI-02-E (Revised 01/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-02-E
Indoor Lighting - Lighting Controls	(Page 1 of 3)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

A. Mandatory Lighting Control Declaration Statements (Indicate if the measure applies by checking yes or no below.)

YES	NO	Control Requirements
☒	☐	Lighting shall be controlled by self-contained lighting control devices which are certified to the Energy Commission according to the Title 20 Appliance Efficiency Regulations in accordance with Section 110.9.
☒	☐	Lighting shall be controlled by a lighting control system or energy management control system in accordance with §110.9. An Installation Certificate shall be submitted in accordance with Section 130.4(b).
☐	☒	One or more Track Lighting Integral Current Limiters shall be installed which have been certified to the Energy Commission in accordance with §110.9 and §130.0. Additionally, an Installation Certificate shall be submitted in accordance with Section 130.4(b).
☐	☒	A Track Lighting Supplementary Overcurrent Protection Panel shall be installed in accordance with Section 110.9 and Section 130.0. Additionally, an Installation Certificate shall be installed in accordance with Section 130.4(b).
☒	☐	All lighting controls and equipment shall comply with the applicable requirements in §110.9 and shall be installed in accordance with the manufacturer's instructions in accordance with Section 130.1.
☒	☐	All luminaires shall be functionally controlled with manually switched ON and OFF lighting controls in accordance with Section 130.1(a).
☒	☐	General lighting shall be separately controlled from all other lighting systems in an area. Floor and wall display, window display, case display, ornamental, and special effects lighting shall each be separately controlled on circuits that are 20 amps or less. When track lighting is used, general, display, ornamental, and special effects lighting shall each be separately controlled; in accordance with Section 130.1(a)4.
☒	☐	The general lighting of any enclosed area 100 square feet or larger, with a connected lighting load that exceeds 0.5 watts per square foot shall meet the multi-level lighting control requirements in accordance with Section 130.1(b).
☒	☐	All installed indoor lighting shall be equipped with controls that meet the applicable Shut-OFF control requirements in Section 130.1(c).
☐	☒	Lighting in all Daylit Zones shall be controlled in accordance with the requirements in Section 130.1(d) and daylit zones are shown on the plans.
☐	☒	Lighting power in buildings larger than 10,000 square feet shall be capable of being automatically reduced in response to a Demand Responsive Signal in accordance with Section 130.1(e).
☒	☐	Before an occupancy permit is granted for a newly constructed building or area, or a new lighting system serving a building, area, or site is operated for normal use, indoor lighting controls serving the building, area, or site shall be certified as meeting the Acceptance Requirements for Code Compliance in accordance with Section 130.4.(a). The controls required to meet the Acceptance Requirements include automatic daylight controls, automatic shut-OFF controls, and demand responsive controls.

STATE OF CALIFORNIA
INDOOR LIGHTING – LIGHTING CONTROLS
CEC-NRCC-LTI-02-E (Revised 01/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-02-E
Indoor Lighting - Lighting Controls	(Page 2 of 3)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

A separate document must be filled out for Conditioned and Unconditioned Spaces. This page is used only for the following:
☒ CONDITIONED SPACES ☐ UNCONDITIONED SPACES

B. Mandatory and Prescriptive Indoor Lighting Control Schedule, PAF Calculation, and Field Inspection Checklist

Lighting Control Schedule			Standards Complying With [1] (✓ all that apply, or enter 'E' if Exempted)							PAF Credit Calculation [2]				Field Inspector	
										Watts of Controlled Lighting	PAF	Control Credit (K x L)	✓ if Acceptance Test Required		
01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	
Location in Building	Type/Description of Lighting Control (i.e.: occupancy sensor, automatic time switch, dimmer, automatic daylight, etc...)	# of Units	§130.1(a)	§130.0(b)	§130.1(c)	§130.1(e)	§140.6(a)2	§140.6(d)						Pass	Fail
GROUND FLOOR	OCC SENSOR	2	☒	☒	☒	☐	☐	☐	☐	1101	0.2	220		☐	☐
			☐	☐	☐	☐	☐	☐	☐					☐	☐
			☐	☐	☐	☐	☐	☐	☐					☐	☐
			☐	☐	☐	☐	☐	☐	☐					☐	☐
			☐	☐	☐	☐	☐	☐	☐					☐	☐
			☐	☐	☐	☐	☐	☐	☐					☐	☐
Control Credit PAGE TOTAL (Sum of Column 13):												220			
IF MULTIPLE PAGES ARE USED, ENTER SUM TOTAL OF Control Credit for all pages HERE (Sum of all Column 13):															
													Enter Control Credit total into NRCC-LTI-01-E; Page 1.		

1. §130.1(a) = Manual area controls; §130.0(b) = Multi Level; §130.1(c) = Auto Shut-Off; §130.1(d) = Mandatory Daylight; §130.1(e) = Demand Responsive; §140.6(d) = Additional lighting controls installed to earn a PAF; §140.6(d) = Prescriptive Secondary Sidelit Daylight Controls.
2. Check Table 140.6-A for correct Factor. PAFs shall not be traded between conditioned and unconditioned spaces. As a condition to earn a PAF, an Installation Certificate is also required to be filled out, signed, and submitted.

STATE OF CALIFORNIA
INDOOR LIGHTING – LIGHTING CONTROLS
CEC-NRCC-LTI-02-E (Revised 01/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-02-E
Indoor Lighting - Lighting Controls	(Page 3 of 3)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: TONY Q. MORTERA, PE	Documentation Author Signature:
Company: METRO POWER ENGINEERS, INC	Signature Date: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	CEA Certification Identification (if applicable):
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:
1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name: TONY Q. MORTERA, PE	Responsible Designer Signature:
Company: METRO POWER ENGINEERS, INC	Date Signed: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	License: E16739
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER ANTONIO QUIJORO MORTERA No. E 16739 Exp. 09/30/20 ELECTRICAL STATE OF CALIFORNIA

CONSULTANT:

METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

L 00
TITLE
COM LIANCE

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506
SHEET NO:	

EN-100

STATE OF CALIFORNIA
INDOOR LIGHTING POWER ALLOWANCE
CEC-NRCC-LTI-03-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE		NRCC-LTI-03-E
Certificate of Compliance - Indoor Lighting Power Allowance		(Page 1 of 4)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared:	06.21.19

A separate page must be filled out for Conditioned and Unconditioned Spaces. This page is only for:
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A. SUMMARY TOTALS OF LIGHTING POWER ALLOWANCES

☐ If using Complete Building Method for compliance, use only the total in column (a) as total allowed building watts.
☐ If using Area Category Method, Tailored Method, or a combination of Area Category and Tailored Method for compliance, use only the total in column (b) as the total allowed building watts

	(a)		(b)
01 Complete Building Method Allowed Watts. Documented in section B of NRCC-LTI-03-E (below on this page)			
02 Area Category Method Allowed Watts. Documented in section C-1 of NRCC-LTI-03-E (below on this page)	1260		
03 Tailored Method Allowed Watts. Documented in section A of NRCC-LTI-04-E			
TOTAL ALLOWED BUILDING WATTS. Enter number into correct cell on NRCC-LTI-01, Page 2, Row 1			

☐ Check here if building contains both conditioned and unconditioned areas.

B. COMPLETE BUILDING METHOD LIGHTING POWER ALLOWANCE

01	02		03		04
TYPE OF BUILDING (From §140.6 Table 140.6-B)	WATTS PER ft^2	X	COMPLETE BLDG. AREA	=	ALLOWED WATTS
Total Area:					
Total Watts. Enter Total Watts into section A, row 1 (Above on this page)					

C -1 AREA CATEGORY METHOD TOTAL LIGHTING POWER ALLOWANCES	Watts
Total from section C-2.	1260
Total from section C-3.	0
Total Watts. Enter Total Watts into section A, row 2 (Above on this page).	1260
For Alterations Only – Reduced lighting power option (Total Allowed Watts x 0.85). Enter this value into section A, row 2 if using this option.	

STATE OF CALIFORNIA
INDOOR LIGHTING POWER ALLOWANCE
CEC-NRCC-LTI-03-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE		NRCC-LTI-03-E
Certificate of Compliance - Indoor Lighting Power Allowance		(Page 2 of 4)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared:	06.21.19

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C -2 AREA CATEGORY METHOD GENERAL LIGHTING POWER ALLOWANCE

☐ Do not include portable lighting for offices. Portable lighting for offices shall be documented only in Section G of NRCC-LTI-01-E.
☐ Separately list lighting for each primary function area as defined in §100.1 of the Standards.

01		02		03		04
AREA CATEGORY (From §140.6 Table 140.6-C)		WATTS PER ft^2	X	AREA (ft^2)	=	ALLOWED WATTS
Location in Building	Primary Function Area per Table 140.6-C					
GROUND FLOOR	PRECISION WORK	1.2		1050		1260
			TOTALS	1050		
Enter sum total Area Category allowed watts into section C-1 of NRCC-LTI-03-E (this compliance document)						1260
						WATTS

STATE OF CALIFORNIA
INDOOR LIGHTING POWER ALLOWANCE
CEC-NRCC-LTI-03-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE		NRCC-LTI-03-E
Certificate of Compliance - Indoor Lighting Power Allowance		(Page 3 of 4)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared:	

A separate page must be filled out for Conditioned and Unconditioned Spaces. This page is only for:
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C-3 AREA CATEGORY METHOD ADDITIONAL LIGHTING WATTAGE ALLOWANCE (from Table 140.6-C Footnotes)

01	02	03 [2]	04	05	06	07
Primary Function	Sq Ft or Linear ft [1]	Additional Watts Allowed	Wattage Allowance (02 x 03)	Description(s) and Quantity of Special Luminaire Types in each Primary Function Area	Total Design Watts [3]	ALLOWED WATTS Smaller of 04 or 06
N/A						
TOTALS – Enter into TOTAL AREA CATEGORY METHOD ADDITIONAL ALLOWANCES – Section C-1						

1. Use linear feet only for additional allowance for white board or chalk board. All other additional Area Category allowances shall use watts per square foot.
2 . Additional watts are available only when allowed according to the footnotes on bottom of Table 140.6-C, which include: Specialized task work; Ornamental lighting; Precision commercial and industrial work; Per linear foot of white board or chalk board; Accent, display and feature lighting; and Videoconferencing studio lighting..
3. Luminaire classification and wattage shall be determined in accordance with §130.0(c) of the Standards.

STATE OF CALIFORNIA
INDOOR LIGHTING POWER ALLOWANCE
CEC-NRCC-LTI-03-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE		NRCC-LTI-03-E
Certificate of Compliance - Indoor Lighting Power Allowance		(Page 4 of 4)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared:	06.21.19

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: TONY Q. MORTERA, PE	Documentation Author Signature:
Company: METRO POWER ENGINEERS, INC	Signature Date: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	CEA Certification Identification (if applicable):
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:
1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name: TONY Q. MORTERA, PE	Responsible Designer Signature:
Company : METRO POWER ENGINEERS, INC	Date Signed: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	License: E16739
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCI-LTI-01-E (Revised 01/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF INSTALLATION		NRCI-LTI-01-E
Indoor Lighting		(Page 1 of 2)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Enforcement Agency:	Permit Number:
Project Address: 25555 HESPERIAN BLVD	City: HAYWARD	Zip Code: 94545

GENERAL INFORMATION

DATE OF BUILDING PERMIT:	PERMIT #			
BUILDING TYPE	☒ Nonresidential	☐ High-Rise Res (Common Area)	☐ Hotel/Motel (Common Area)	
PHASE OF CONSTRUCTION	☐ New Construction	☐ Addition	☒ Alteration	☐ Unconditioned

SCOPE OF RESPONSIBILITY

Enter the date of approval by enforcement agency of the Certificate of Compliance that provides the specifications for the energy efficiency measures for the scope of responsibility for this Installation Certificate.	Date:

In the table below identify all applicable construction documents that specify the requirements for the scope of responsibility reported by this Installation Certificate (continued).

Document Title or Description	Applicable Sheets or Pages, Tables, Schedules, etc.	Date Approved By the Enforcement Agency
TITLE 24 DOCUMENTATION	EN-100 TO EN-103	

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCI-LTI-01-E (Revised 01/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF INSTALLATION		NRCI-LTI-01-E
Indoor Lighting		(Page 2 of 2)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Enforcement Agency:	Permit Number:
Project Address: 25555 HESPERIAN BLVD	City: HAYWARD	Zip Code: 94545

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Installation documentation is accurate and complete.

Documentation Author Name: TONY Q. MORTERA, PE	Documentation Author Signature:
Documentation Author Company Name: METRO POWER ENGINEERS, INC	Date Signed: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	CEA Certification Identification (If applicable):
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:
1. The information provided on this Certificate of Installation is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation and attest to the declarations in this statement (responsible builder/installer), otherwise I am an authorized representative of the responsible builder/installer.
3. The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations, and the installation conforms to the requirements given on the plans and specifications approved by the enforcement agency.
4. I reviewed a copy of the Certificate of Compliance approved by the enforcement agency that identifies the specific requirements for the scope of construction or installation identified on this Certificate of Installation, and I have ensured that the requirements that apply to the construction or installation have been met.
5. I will ensure that a completed signed copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Builder/Installer Name:	Responsible Builder/Installer Signature:	
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner)	Position With Company (Title):	
Address:	CSLB License:	
City/State/Zip:	Phone	Date Signed:

ELECTRICAL CONTRACTOR SHALL BE COMPLETING AND SIGNING T24 INSTALLATION AND ACCEPTANCE FORMS AT THE COMPLETION OF THE JOB.

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:
REGISTERED PROFESSIONAL ENGINEER
ANTONIO QUIOBO MORTERA
No. E 16739
Exp. 09/30/20
ELECTRICAL
STATE OF CALIFORNIA

CONSULTANT:

MPE
METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

□ L□ □ □00
TITLE □□
COM□ LIANCE

DRAWN BY: CHECKED BY:
DATE: 04/30/2019 PROJECT NO: C9506
SHEET NO:

EN-101

STATE OF CALIFORNIA
OUTDOOR LIGHTING
CEC-NRCC-LTO-01-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-01-E
Outdoor Lighting	(Page 1 of 4)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

A. General Information

Project Address: 25555 HESPERIAN BLVD, HAYWARD CA 94545	Total Illuminated Hardscape Area: 275
Phase of Construction: ☐ New Construction ☐ Addition ☒ Alteration	
Outdoor Lighting Zone (LZ) ☐ LZ-1 ☐ LZ-2 ☒ LZ-3 ☐ LZ-4	

I have confirmed with the AHJ which LZ applies to this site. For default lighting zone designations, see Title 24 Part 6, §10-114

B. Lighting Compliance Documents (check box for each document included)

For detailed instructions on the use of this and all Energy Efficiency Standards compliance documents, refer to the Nonresidential Manual published by the California Energy Commission.

☒	NRCC-LTO-01-E	Certificate of Compliance
☒	NRCC-LTO-02-E	Outdoor Lighting Controls Certificate of Compliance
☒	NRCC-LTO-03-E	Outdoor Lighting Power Allowance Certificate of Compliance
☐	NRCC-LTO-04-E	Outdoor Lighting Existing Conditions Certificate of Compliance

C. Summary of Allowed Outdoor Lighting Power

		Watts
01	**Sum Total ALLOWED** Outdoor Lighting Wattage from NRCC-LTO-03-E, page 1 Alterations with NO increase of connected lighting load may instead use the allowed wattage from NRCC-LTO-04, page 2.	555.15
	Complies ONLY if **Installed** (Box 02) ≤ **Allowed** (Box 01)	
02	**Sum Total INSTALLED** Outdoor Lighting Wattage from NRCC-LTO-01-E, page 3.	40

D. Declaration of Required Installation Certificates

Declare by checking all Installation Certificates that will be submitted. (Retain copies and verify compliance documents are completed and signed.)

☐ NRCI-LTO-01-E - Must be submitted for all buildings	☐ Field Inspector
☐ NRCI-LTO-02-E - Must be submitted for a lighting control system, or for an Energy Management Control System (EMCS), to be recognized for compliance.	☐ Field Inspector

E. Declaration of Required Certificates of Acceptance

Declare by checking all of the Certificates of Acceptance that will be submitted. (Retain copies and verify compliance documents are completed and signed.)

☐ NRCA-LTO-02-A - Must be submitted for outdoor lighting controls.	☐ Field Inspector

F. Schedule of Luminaires Exempt from the Outdoor Lighting Power Requirements in §140.7

01	02
Name or Symbol	Description of exempt luminaire in accordance with the exemptions
N/A	

STATE OF CALIFORNIA
OUTDOOR LIGHTING
CEC-NRCC-LTO-01-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-01-E
Outdoor Lighting	(Page 2 of 4)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

G. Schedule of Luminaires Exempt from the Cutoff Requirements in §130.2(b)

01	02
Name or Symbol	Description of exempt luminaire in accordance with the exemptions
N/A	

H. Schedule of Luminaires Exempt from the Outdoor Lighting Control Requirements in §130.2(c)

01	02
Name or Symbol	Description of exempt luminaire in accordance with the exemptions
N/A	

STATE OF CALIFORNIA
OUTDOOR LIGHTING
CEC-NRCC-LTO-01-E (Revised 02/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-01-E
Outdoor Lighting	(Page 3 of 4)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

I. Outdoor Lighting Schedule and Field Inspection Energy Checklist

Luminaire Schedule		Installed Watts				Location	Cutoff	Field Inspector	
01	02	03	04		05	06	07	08	09	
Name or Item Tag	Complete Luminaire Description	Watts per Luminaire	How wattage was determined: CEC Default from NRE	How wattage was determined: According to §130.4(c)	Number of Luminaires	Total Installed Watts in this area (3 × 5)	Primary Function area in which the luminaires are installed (Outdoor Lighting Zone)	BUG Rating	Pass	Fail
B	EXTERIOR WALL PACK WITH INTEGRAL EMERGENCY BACKUP	20	☐	☒	2	40	EXTERIOR MPOE	UH: UL: FVH: BVH: FH: BH:	☐	☐
			☐	☐				UH: UL: FVH: BVH: FH: BH:	☐	☐
			☐	☐				UH: UL: FVH: BVH: FH: BH:	☐	☐
					INSTALLED WATTS PAGE TOTAL:	40	Enter sum total of all pages (**Sum Total INSTALLED** Outdoor lighting wattage) into NRCC-LTO-01-E, page 1.			

STATE OF CALIFORNIA
OUTDOOR LIGHTING
CEC-NRCC-LTO-01-E (Revised 02/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-01-E
Outdoor Lighting	(Page 4 of 4)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

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Company: METRO POWER ENGINEERS, INC	Signature Date: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	CEA Certification Identification (if applicable):
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

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1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
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Responsible Designer Name: TONY Q. MORTERA, PE	Responsible Designer Signature:
Company: METRO POWER ENGINEERS, INC	Date Signed: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	License: E16739
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

STATE OF CALIFORNIA
OUTDOOR LIGHTING CONTROLS
CEC-NRCC-LTO-02-E (Revised 09/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-02-E
Outdoor Lighting Controls	(Page 1 of 3)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

A. Mandatory Outdoor Lighting Control Declaration Statements

Check all that apply:

- ☒ Lighting shall be controlled by self-contained lighting control devices which are certified to the Energy Commission according to the Title 20 Appliance Efficiency Regulations in accordance with §110.9(a).
- ☒ Lighting shall be controlled by a lighting control system or energy management control system in accordance with §110.9. An Installation Certificate shall be submitted in accordance with §130.4(b).
- ☒ All lighting controls and equipment shall comply with the applicable requirements in §110.9 and shall be installed in accordance with the manufacturer's instructions in accordance with §130.0(d).
- ☐ Part-Night Outdoor Lighting Controls, as defined in Section 100.1(b), shall meet the requirements in Section 110.9(b)5.
- ☐ All outdoor incandescent luminaires rated over 100 watts, determined in accordance with Section 130.0(c), shall be controlled by a motion sensor.
- ☐ All outdoor luminaires rated for use with lamps greater than 150 lamp watts, determined in accordance with Section 130.0(c), shall comply with Uplight and Glare requirements in accordance with Section 130.2(b).
- ☒ All installed outdoor lighting shall be controlled by a photocontrol or outdoor astronomical time-switch control, or other control capable of automatically switching OFF in accordance with Section 130.2(c)1.
- ☒ All installed outdoor lighting shall be independently controlled from other electrical loads by an automatic scheduling control in accordance with Section 130.2(c)2.
- ☒ All installed outdoor lighting, where the bottom of the luminaire is mounted 24 feet or less above the ground, shall be controlled with automatic lighting controls in accordance with Section 130.2(c)3.
- ☐ For Outdoor Sales Frontage, an automatic lighting control shall be installed in accordance with Section 130.2(c)4.
- ☐ For Building Facade, Ornamental Hardscape and Outdoor Dining lighting, an automatic lighting control shall be installed in accordance with Section 130.2(c)5.
- ☒ Before an occupancy permit is granted for the newly constructed building or for the addition, or for any altered outdoor lighting, the outdoor lighting controls shall be certified as meeting the Acceptance Requirements for Code Compliance in accordance with §130.4.(a). Outdoor lighting controls shall comply with the applicable requirements of Section 130.2(c) and Reference Nonresidential Appendix NA7.8.

STATE OF CALIFORNIA
OUTDOOR LIGHTING CONTROLS
CEC-NRCC-LTO-02-E (Revised 09/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-02-E
Outdoor Lighting Controls	(Page 2 of 3)
Project Name: MPOE CHABOT-BLDG 300, RM 307A/B	Date Prepared: 06.21.19

B. Mandatory Outdoor Lighting Control Schedule and Field Inspection Checklist

Outdoor Lighting Control Schedule		Standards Complying With (✓ all that apply, or enter 'E' if Exempted)						✓ If Acceptance Test Required	Field Inspector	
01	02	03	04	05	06	07	08	09	10	11	
Location and Application of Luminaires Being Controlled	Type/ Description of Lighting Control (i.e. outdoor motion sensor, outdoor photocontrol, outdoor astronomical time-switch control, automatic scheduling control, part-night outdoor lighting control)	# of Units	§130.2(a)	§130.2(c)1	§130.2(c)2	§130.2(c)3	§130.2(c)4	§130.2(c)5		Pass	Fail
EXTERIOR MPOE	PHOTOCELL	2	X	X	X	X			☐	☐	☐
									☐	☐	☐
									☐	☐	☐
									☐	☐	☐
									☐	☐	☐
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									☐	☐	☐
									☐	☐	☐

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER ANTONIO QUIJOU MORTERA No. E 16739 Exp. 09/30/20 ELECTRICAL STATE OF CALIFORNIA

CONSULTANT:

MPE
METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

L 00
TITLE
COM LIANCE

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506
SHEET NO:	

EN-10

STATE OF CALIFORNIA
OUTDOOR LIGHTING CONTROLS
CEC-NRCC-LTO-03-E (Revised 09/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-02-E
Outdoor Lighting Controls	(Page 3 of 3)

Project Name: MPOE CHABOT-BLDG 300, RM 307A/B — Date Prepared: 06.21.19

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: TONY Q. MORTERA, PE	Documentation Author Signature:
Company: METRO POWER ENGINEERS, INC	Signature Date: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	CEA Certification Identification (if applicable):
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name: TONY Q. MORTERA, PE	Responsible Designer Signature:
Company: METRO POWER ENGINEERS, INC	Date Signed: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	License: E16739
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

STATE OF CALIFORNIA
OUTDOOR LIGHTING POWER ALLOWANCES
CEC-NRCC-LTO-03-E (Revised 09/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-03-E
Outdoor Lighting Power Allowances	(Page 1 of 4)

Project Name: MPOE CHABOT-BLDG 300, RM 307A/B — Date Prepared: 06.21.19

A. OUTDOOR LIGHTING POWER ALLOWANCE SUMMARY

1. General Hardscape Lighting Power Allowance (Site Total from Section B of NRCC-LTO-03-E)							1.	555.15
2. Additional Specific "use it or lose it" Lighting Power Allowances listed in each of these cells shall be identical to total allowed watts determined in Section C-1 to C-4 of NRCC-LTO-03-E.								
PER APPLICATION from Section C-1	+	PER UNIT LENGTH (SALES FRONTAGE) from Section C-2	+	PER HARDSCAPE AREA (ORNAMENTAL LIGHTING) from Section C-3	+	PER SPECIFIC AREA from Section C-4.	=	2. 0
0	+	0	+	0	+	0	=	
3. **Sum Total ALLOWED** Outdoor Lighting Wattage (add rows 1 and 2)							3.	555.15

B. GENERAL HARDSCAPE LIGHTING POWER ALLOWANCE FROM TABLE 140.7-A

Area Wattage Allowance (AWA)				Linear Wattage Allowance (LWA)			Initial Wattage Allowance (IWA)	Total General Hardscape Lighting Allowance
01	02	03	04	05	06	07	08	09
Name of Area	Illuminated Hardscape Area	AWA Per Square Foot	AWA (B02 x B03)	Perimeter Length of General Hardscape	LPA per Linear Foot	LWA (B05 x B06)	IWA (Watts)	B04 + B07 + B08
EXTERIOR MPOE	275	0.04	11	69	0.35	24.15	520	555.15
							TOTAL	555.15

STATE OF CALIFORNIA
OUTDOOR LIGHTING POWER ALLOWANCES
CEC-NRCC-LTO-03-E (Revised 09/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-03-E
Outdoor Lighting Power Allowances	(Page 2 of 4)

Project Name: MPOE CHABOT-BLDG 300, RM 307A/B — Date Prepared: 06.21.19

C. ADDITIONAL "USE IT OR LOSE IT" OUTDOOR LIGHTING POWER ALLOWANCES FOR SPECIFIC APPLICATIONS

☐ The additional specific outdoor lighting power allowance shall be the smaller of the allowed lighting power or the actual lighting power used.
☐ Use Outdoor Lighting Zone (OLZ) that is documented on page 1 of NRCC-LTO-01-E to calculate the specific wattage allowances.

C-1. WATTAGE ALLOWANCE PER APPLICATION – Table 140.7-B

☐ Available only for qualifying locations, which include Building Entrances or Exits; Primary Entrances to Senior Care Facilities, Police Stations, Hospitals, Fire Stations, and Emergency Vehicle Facilities; Drive Up Windows; Vehicle Service Station Uncovered Fuel Dispenser, ATM Machine Lighting
☐ If more than one luminaire type is used per location, use multiple rows for that location

01	02	03	04	05	06	07	08	09	10
	ALLOTTED WATTS			DESIGN WATTS					
Name of Location for Which Allowance is Claimed	Number of Qualifying Locations	Wattage Allowance per Qualifying Location	Allotted Watts (02 x 03)	Luminaire Code or Symbol	Luminaire Description	Luminaire Quantity	Watts per Luminaire	Design Watts (07 x 08)	Allowed Watts (smaller of 04 or 09)
N/A									
							Sum total allowance per application on this site:		

C-2. WATTAGE ALLOWANCE PER UNIT LENGTH (Sales Frontage) from Table 140.7-B

☐ If more than one luminaire type is used per location, use multiple rows for that location

01	02	03	04	05	06	07	08	09	10
	ALLOTTED WATTS			DESIGN WATTS					
Name of Location for Which Allowance is Claimed	Linear Feet of Sales Frontage	Wattage Allowance per Linear Foot	Allotted Watts (02 x 03)	Luminaire Code or Symbol	Luminaire Description	Luminaire Quantity	Watts per Luminaire	Design Watts (07 x 08)	Allowed Watts (smaller of 04 or 09)
N/A									
							Sum total allowance for sales frontage on the site:		

STATE OF CALIFORNIA
OUTDOOR LIGHTING POWER ALLOWANCES
CEC-NRCC-LTO-03-E (Revised 09/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-03-E
Outdoor Lighting Power Allowances	(Page 3 of 4)

Project Name: MPOE CHABOT-BLDG 300, RM 307A/B — Date Prepared: 06.21.19

C-3. WATTAGE ALLOWANCE PER SQUARE FOOT OF HARDSCAPE AREA (Ornamental Lighting) – Table 140.7-B

☐ Allowance for the total site illuminated hardscape area. Luminaires qualifying for this allowance shall be rated for 100 watts or less as determined in accordance with Section 130.0(c), and shall be post-top luminaires, lanterns, pendant luminaires, or chandeliers.
☐ If more than one luminaire type is used per location, use multiple rows for that location

01	02	03	04	05	06	07	08	09	10
	ALLOTTED WATTS				DESIGN WATTS				
Name of area for which ornamental allowance is claimed	Square Feet of Hardscape	Wattage Allowance per Square Foot	Allotted Watts (02 x 03)	Luminaire Code or Symbol	Luminaire Description	Luminaire Quantity	Watts per Luminaire	Design Watts (07 x 08)	Allowed Watts (smaller of 04 or 09)
N/A									
							Sum total allowance for ornamental lighting on the site.:		

C-4. WATTAGE ALLOWANCE PER SQUARE FOOT OF SPECIFIC AREA - Table 140.7-B

☐ Allowances for Building Facades; Outdoor Sales Lots; Vehicle Service Station Hardscape; Vehicle Service Station Canopies; Sales Canopies; Non-sales Canopies; Tunnels; Guard Stations; Student Pick-up/Drop-off zone; Outdoor Dining; Special Security Lighting for Retail Parking and Pedestrian Hardscape.
☐ If more than one luminaire type is used per location, use multiple rows for that location

01	02	03	04	05	06	07	08	09	10
	ALLOTTED WATTS				DESIGN WATTS				
Name of Location for Which Allowance is Claimed	Illuminated Area of Application	Wattage Allowance per square Foot	Allotted Watts (02 x 03)	Luminaire Code or Symbol	Luminaire Description	Luminaire Quantity	Watts per Luminaire	Design Watts (07 x 08)	Allowed Watts (smaller of 04 or 09)
N/A									
							Sum total allowance for specific area on the site.:		

STATE OF CALIFORNIA
OUTDOOR LIGHTING POWER ALLOWANCES
CEC-NRCC-LTO-03-E (Revised 09/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTO-03-E
Outdoor Lighting Power Allowances	(Page 4 of 4)

Project Name: MPOE CHABOT-BLDG 300, RM 307A/B — Date Prepared: 06.21.19

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: TONY Q. MORTERA, PE	Documentation Author Signature:
Company: METRO POWER ENGINEERS, INC	Signature Date: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	CEA Certification Identification (if applicable):
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name: TONY Q. MORTERA, PE	Responsible Designer Signature:
Company: METRO POWER ENGINEERS, INC	Date Signed: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	License: E16739
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

CONSULTANT:

MPE
METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

L 00
TITLE
COM LIANCE

DRAWN BY: — CHECKED BY:
DATE: 04/30/2019 — PROJECT NO: C9506
SHEET NO:

EN-10

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 1 of 6)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

A. General Information

Climate Zone: 3	Conditioned Floor Area: 212 SF Unconditioned Floor Area:						
Building Type:	☒	Nonresidential	☐	High-Rise Residential	☐	Hotel/Motel	
☐ Schools	☐	Relocatable Public Schools	☒	Conditioned Spaces	☐	Unconditioned Spaces	
Phase of Construction:	☐	New Construction	☐	Addition	☒	Alteration	
Method of Compliance:	☐	Complete Building	☒	Area Category	☐	Tailored	
Project Address: 25555 HESPERIAN BLVD, HAYWARD CA 94545							

B. Lighting Compliance Documents (select yes for each document included)

For detailed instructions on the use of this and all Energy Efficiency Standards compliance documents, refer to the Nonresidential Manual published by the California Energy Commission.

YES	NO	COMP. DOC.	TITLE
☒	☐	NRCC-LTI-01-E	Certificate of Compliance. All Pages required on plans for all submittals.
☒	☐	NRCC-LTI-02-E	Lighting Controls, Certificate of Compliance, and PAF Calculation. All Pages required on plans for all submittals.
☒	☐	NRCC-LTI-03-E	Indoor Lighting Power Allowance
☐	☒	NRCC-LTI-04-E	Tailored Method Worksheets
☐	☒	NRCC-LTI-05-E	Line Voltage Track Lighting Worksheets
☐	☒	NRCC-LTI-06-E	Indoor Lighting Existing Conditions

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 2 of 6)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

C. Summary of Allowed Lighting Power

Conditioned and Unconditioned Space Lighting must not be combined for compliance

	Indoor Lighting Power for Conditioned Spaces		Watts	Indoor Lighting Power for Unconditioned Spaces		Watts
01	**Installed** Lighting NRCC-LTI-01-E, Table H, page 5	+	216	**Installed** Lighting NRCC-LTI-01-E, Table H, page 5	+	
02	Portable Only for Offices NRCC-LTI-01-E, Table G, page 4	+				
03	Minus Lighting Control Credits NRCC-LTI-02-E, page 2	-	43.2	Minus Lighting Control Credits NRCC-LTI-02-E, page 2	-	
04	Adjusted **Installed** Lighting Power (row 1 plus row 2 minus row 3)	=	172.8	Adjusted **Installed** Lighting Power (row 1 minus row 3)	=	
	Complies ONLY if **Installed** ≤ **Allowed** (Box 04 < Box 05)			Complies ONLY if **Installed** ≤ **Allowed** (Box 04 < Box 05)		
05	**Allowed** Lighting Power Conditioned NRCC-LTI-03-E, page 1 Alterations with replacement luminaires that have at least 50/35% lower power compared to the original existing luminaires, may instead use the allowed wattage from NRCC-LTI-06, page 2		254.4	**Allowed** Lighting Power Unconditioned NRCC-LTI-03-E, page 1 Alterations with replacement luminaires that have at least 50/35% lower power compared to the original existing luminaires, may instead use the allowed wattage from NRCC-LTI-06, page 2		

D. Declaration of Required Certificates of Installation

Declare by selecting yes for all of the Certificates that will be submitted. (Retain copies and verify forms are completed and signed.)

YES	NO	Compliance Document/Title	
☒	☐	NRCI-LTI-01-E - Must be submitted for all buildings	☐ Field Inspector
☒	☐	NRCI-LTI-02-E - Must be submitted for a lighting control system, or for an Energy Management Control System (EMCS), to be recognized for compliance.	☐ Field Inspector
☐	☒	NRCI-LTI-03-E - Must be submitted for a line-voltage track lighting integral current limiter, or for a supplementary overcurrent protection panel used to energize only line-voltage track lighting, to be recognized for compliance.	☐ Field Inspector
☐	☒	NRCI-LTI-04-E - Must be submitted for two interlocked systems serving an auditorium, a convention center, a conference room, a multipurpose room, or a theater to be recognized for compliance.	☐ Field Inspector
☒	☐	NRCI-LTI-05-E - Must be submitted for a Power Adjustment Factor (PAF) to be recognized for compliance.	☐ Field Inspector
☐	☒	NRCI-LTI-06-E - Must be submitted for additional wattage installed in a video conferencing studio to be recognized for compliance.	☐ Field Inspector

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 3 of 6)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

E. Declaration of Required Certificates of Acceptance

Declare by selecting yes for all of the Certificates that will be submitted. (Retain copies and verify forms are completed and signed.)

YES	NO	Compliance Document/Title	
☒	☐	NRCA-LTI-02-A - Must be submitted for occupancy sensors and automatic time switch controls.	☐ Field Inspector
☐	☒	NRCA-LTI-03-A - Must be submitted for automatic daylight controls.	☐ Field Inspector
☐	☒	NRCA-LTI-04-A - Must be submitted for demand responsive lighting controls.	☐ Field Inspector
☒	☐	NRCA-LTI-05-A – Must be submitted for institutional tuning power adjustment factor (PAF).	☐ Field Inspector

A Separate Lighting Schedule Must Be Filled Out for Conditioned and Unconditioned Spaces. Installed Lighting Power listed on this Lighting Schedule is only for:

☒ CONDITIONED SPACE ☐ UNCONDITIONED SPACE

F. Indoor Lighting Schedule and Field Inspection Energy Checklist

- ☐ The actual indoor lighting power listed on the next 2 pages includes all installed permanent and planned portable lighting systems.
- ☐ When Complete Building Method is used for compliance, list each different type of luminaire on separate lines.
- ☒ When Area Category Method or Tailored Method is used for compliance, list each different type of luminaire by each different function area on separate lines
- ☐ Also include track lighting in schedule, and submit the track lighting compliance document (NRCC-LTI-05-E) when line-voltage track lighting is installed.

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 4 of 6)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

G. Installed Portable Luminaires in Offices – Exception to Section 140.6(a)

- ☐ This section shall be filled out ONLY for portable luminaires in offices (As defined in §100.1). All other planned portable luminaires shall be documented on next page of this compliance document.
- ☐ This section is used to determine if greater than 0.3 watts of portable lighting is planned for any office
- ☐ Fill out a separate line for each different office. Small offices that are typical (having the same general and portable lighting) may be grouped together. This allowance shall not be traded between offices having different lighting systems.

Office Portable Luminaire Schedule	Office Installed Portable Luminaire W/ft²							Office Location	Field Inspector	
1	2	3	4	5	6	7	8	9	10	
Complete Luminaire Description (i.e., LED, under cabinet, furniture mounted direct/indirect)	Watts per Luminaire	Number of Luminaires	Installed portable luminaire watts in this office (602 x 603)	Square feet of this office	Watts per square foot (604 / 605)	If 606 ≤ 0.3, enter zero; if 606 > 0.3, (606-0.3)	(605 x 607)	Identify Office area in which these portable luminaires are installed	Pass	Fail
N/A									☐	☐
									☐	☐
									☐	☐
									☐	☐
									☐	☐
Total installed portable luminaire watts that are greater than 0.3 W/ft² per office:								Enter sum total of all pages into NRCC-LTI-01-E; Page 1		

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 5 of 6)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

A Separate Lighting Schedule Must Be Filled Out for Conditioned and Unconditioned Spaces. Installed Lighting Power listed on this Lighting Schedule is only for:

☒ CONDITIONED SPACE ☐ UNCONDITIONED SPACE

H. Indoor Lighting Schedule and Field Inspection Energy Checklist

Luminaire Schedule		Installed Watts				Location	Field Inspector [1]	
01	02	03	04	05	06	07	08	
Name or Item Tag	Complete Luminaire Description (i.e, 3 lamp fluorescent troffer, F32T8, one dimmable electronic ballast)	Watts per Luminaire	How wattage was determined: DEER+Path from NA8	How wattage was determined: According to §130.0(c)	Number Luminaires	Total installed Watts in this area (=03 x =05)	Primary Function area in which these luminaires are installed	Pass	Fail
A	LED SURFACE WRAPAROUND	36W	☐	☒	6	216	GENERAL	☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
INSTALLED WATTS PAGE TOTAL:		216					Enter sum total of all pages into NRCC-LTI-01-E; Page 2		

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 6 of 6)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: TONY Q. MORTERA, PE	Documentation Author Signature:
Company: METRO POWER ENGINEERS, INC	Signature Date: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	CEA Certification Identification (if applicable):
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name: TONY Q. MORTERA, PE	Responsible Designer Signature:
Company: METRO POWER ENGINEERS, INC	Date Signed: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	License: E16739
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

STATE OF CALIFORNIA
INDOOR LIGHTING – LIGHTING CONTROLS
CEC-NRCC-LTI-02-E (Revised 01/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-02-E
Indoor Lighting - Lighting Controls	(Page 1 of 3)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

A. Mandatory Lighting Control Declaration Statements (Indicate if the measure applies by checking yes or no below.)

YES	NO	Control Requirements
☒	☐	Lighting shall be controlled by self-contained lighting control devices which are certified to the Energy Commission according to the Title 20 Appliance Efficiency Regulations in accordance with Section 110.9.
☒	☐	Lighting shall be controlled by a lighting control system or energy management control system in accordance with §110.9. An Installation Certificate shall be submitted in accordance with Section 130.4(b).
☐	☒	One or more Track Lighting Integral Current Limiters shall be installed which have been certified to the Energy Commission in accordance with §110.9 and §130.0. Additionally, an Installation Certificate shall be submitted in accordance with Section 130.4(b).
☐	☒	A Track Lighting Supplementary Overcurrent Protection Panel shall be installed in accordance with Section 110.9 and Section 130.0. Additionally, an Installation Certificate shall be installed in accordance with Section 130.4(b).
☒	☐	All lighting controls and equipment shall comply with the applicable requirements in §110.9 and shall be installed in accordance with the manufacturer's instructions in accordance with Section 130.1.
☒	☐	All luminaires shall be functionally controlled with manually switched ON and OFF lighting controls in accordance with Section 130.1(a).
☒	☐	General lighting shall be separately controlled from all other lighting systems in an area. Floor and wall display, window display, case display, ornamental, and special effects lighting shall each be separately controlled on circuits that are 20 amps or less. When track lighting is used, general, display, ornamental, and special effects lighting shall each be separately controlled; in accordance with Section 130.1(a)4.
☒	☐	The general lighting of any enclosed area 100 square feet or larger, with a connected lighting load that exceeds 0.5 watts per square foot shall meet the multi-level lighting control requirements in accordance with Section 130.1(b).
☒	☐	All installed indoor lighting shall be equipped with controls that meet the applicable Shut-OFF control requirements in Section 130.1(c).
☐	☒	Lighting in all Daylit Zones shall be controlled in accordance with the requirements in Section 130.1(d) and daylit zones are shown on the plans.
☐	☒	Lighting power in buildings larger than 10,000 square feet shall be capable of being automatically reduced in response to a Demand Responsive Signal in accordance with Section 130.1(e).
☒	☐	Before an occupancy permit is granted for a newly constructed building or area, or a new lighting system serving a building, area, or site is operated for normal use, indoor lighting controls serving the building, area, or site shall be certified as meeting the Acceptance Requirements for Code Compliance in accordance with Section 130.4.(a). The controls required to meet the Acceptance Requirements include automatic daylight controls, automatic shut-OFF controls, and demand responsive controls.

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CERTIFICATE OF COMPLIANCE	NRCC-LTI-02-E
Indoor Lighting - Lighting Controls	(Page 2 of 3)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

A separate document must be filled out for Conditioned and Unconditioned Spaces. This page is used only for the following:

☒ CONDITIONED SPACES ☐ UNCONDITIONED SPACES

B. Mandatory and Prescriptive Indoor Lighting Control Schedule, PAF Calculation, and Field Inspection Checklist

Lighting Control Schedule			Standards Complying With [1] (✓ all that apply, or enter 'E' if Exempted)							PAF Credit Calculation [2]				Field Inspector	
										Watts of Controlled Lighting	PAF	Control Credit (4 x 12)	✓ if Acceptance Test Required		
01	02	03	04	05	06	07	08	09	10	11	12	13	14	Pass	Fail
Location in Building	Type/Description of Lighting Control (i.e.: occupancy sensor, automatic time switch, dimmer, automatic daylight, etc...)	# of Units	§130.1(a)	§130.0(b)	§130.1(c)	§130.1(d)	§130.1(e)	§140.6(a)2	§140.6(d)						
GROUND FLOOR	OCC SENSOR	1	☒	☒	☒	☐	☐	☐	☐	216	0.2	43.2		☐	☐
			☐	☐	☐	☐	☐	☐	☐					☐	☐
			☐	☐	☐	☐	☐	☐	☐					☐	☐
			☐	☐	☐	☐	☐	☐	☐					☐	☐
			☐	☐	☐	☐	☐	☐	☐					☐	☐
			☐	☐	☐	☐	☐	☐	☐					☐	☐
Control Credit PAGE TOTAL (Sum of Column 13):												43.2			
IF MULTIPLE PAGES ARE USED, ENTER SUM TOTAL OF Control Credit for all pages HERE (Sum of all Column 13):															
													Enter Control Credit total into NRCC-LTI-01-E; Page 1.		

1. §130.1(a) = Manual area controls; §130.0(b) = Multi Level; §130.1(c) = Auto Shut-Off; §130.1(d) = Mandatory Daylight; §130.1(e) = Demand Responsive; §140.6(d) = Additional lighting controls installed to earn a PAF; §140.6(d) = Prescriptive Secondary Sidelit Daylight Controls.

2. Check Table 140.6-A for correct Factor. PAFs shall not be traded between conditioned and unconditioned spaces. As a condition to earn a PAF, an installation Certificate is also required to be filled out, signed, and submitted.

STATE OF CALIFORNIA
INDOOR LIGHTING – LIGHTING CONTROLS
CEC-NRCC-LTI-02-E (Revised 01/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-02-E
Indoor Lighting - Lighting Controls	(Page 3 of 3)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: TONY Q. MORTERA, PE	Documentation Author Signature:
Company: METRO POWER ENGINEERS, INC	Signature Date: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	CEA Certification Identification (if applicable):
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name: TONY Q. MORTERA, PE	Responsible Designer Signature:
Company: METRO POWER ENGINEERS, INC	Date Signed: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	License: E16739
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER — ANTONIO QUIJORO MORTERA — No. E 16720 Exp. 09/30/20 — ELECTRICAL — STATE OF CALIFORNIA

CONSULTANT:

METRO POWER ENGINEERS, INC.
3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

L 100
TITLE
COM LIANCE

DRAWN BY: CHECKED BY:
DATE: 04/30/2019 PROJECT NO: C9506
SHEET NO:

EN-10

STATE OF CALIFORNIA
INDOOR LIGHTING POWER ALLOWANCE
CEC-NRCC-LTI-03-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-03-E
Certificate of Compliance - Indoor Lighting Power Allowance	(Page 1 of 4)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

A separate page must be filled out for Conditioned and Unconditioned Spaces. This page is only for:
☒ CONDITIONED spaces ☐ UNCONDITIONED spaces

A. SUMMARY TOTALS OF LIGHTING POWER ALLOWANCES

☐ If using Complete Building Method for compliance, use only the total in column (a) as total allowed building watts.
☐ If using Area Category Method, Tailored Method, or a combination of Area Category and Tailored Method for compliance, use only the total in column (b) as the total allowed building watts

	(a)		(b)
01 Complete Building Method Allowed Watts. Documented in section B of NRCC-LTI-03-E (below on this page)			
02 Area Category Method Allowed Watts. Documented in section C-1 of NRCC-LTI-03-E (below on this page)	254.4		
03 Tailored Method Allowed Watts. Documented in section A of NRCC-LTI-04-E			
TOTAL ALLOWED BUILDING WATTS. Enter number into correct cell on NRCC-LTI-01, Page 2, Row 1			

☐ Check here if building contains both conditioned and unconditioned areas.

B. COMPLETE BUILDING METHOD LIGHTING POWER ALLOWANCE

01	02		03		04
TYPE OF BUILDING (From §140.6 Table 140.6-B)	WATTS PER ft²	X	COMPLETE BLDG. AREA	=	ALLOWED WATTS
	Total Area:				
Total Watts. Enter Total Watts into section A, row 1 (Above on this page)					

C -1 AREA CATEGORY METHOD TOTAL LIGHTING POWER ALLOWANCES	Watts
Total from section C-2.	254.4
Total from section C-3.	0
Total Watts. Enter Total Watts into section A, row 2 (Above on this page).	254.4
For Alterations Only – Reduced lighting power option (Total Allowed Watts x 0.85). Enter this value into section A, row 2 if using this option.	

STATE OF CALIFORNIA
INDOOR LIGHTING POWER ALLOWANCE
CEC-NRCC-LTI-03-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-03-E
Certificate of Compliance - Indoor Lighting Power Allowance	(Page 2 of 4)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

A separate page must be filled out for Conditioned and Unconditioned Spaces. This page is only for:
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C -2 AREA CATEGORY METHOD GENERAL LIGHTING POWER ALLOWANCE

☐ Do not include portable lighting for offices. Portable lighting for offices shall be documented only in Section G of NRCC-LTI-01-E.
☐ Separately list lighting for each primary function area as defined in §100.1 of the Standards.

01		02		03		04
AREA CATEGORY (From §140.6 Table 140.6-C)		WATTS PER ft²	X	AREA (ft²)	=	ALLOWED WATTS
Location in Building	Primary Function Area per Table 140.6-C					
GROUND FLOOR	CLASSROOM	1.2		212		254.4
			TOTALS	212		
Enter sum total Area Category allowed watts into section C-1 of NRCC-LTI-03-E (this compliance document)						254.4
						WATTS

STATE OF CALIFORNIA
INDOOR LIGHTING POWER ALLOWANCE
CEC-NRCC-LTI-03-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-03-E
Certificate of Compliance - Indoor Lighting Power Allowance	(Page 3 of 4)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared:

A separate page must be filled out for Conditioned and Unconditioned Spaces. This page is only for:
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C-3 AREA CATEGORY METHOD ADDITIONAL LIGHTING WATTAGE ALLOWANCE (from Table 140.6-C Footnotes)

01	02	03 [2]	04	05	06	07
Primary Function	Sq Ft or Linear ft [1]	Additional Watts Allowed	Wattage Allowance (02 x 03)	Description(s) and Quantity of Special Luminaire Types in each Primary Function Area	Total Design Watts [3]	ALLOWED WATTS Smaller of 04 or 06
N/A						
TOTALS – Enter into TOTAL AREA CATEGORY METHOD ADDITIONAL ALLOWANCES – Section C-1						

1. Use linear feet only for additional allowance for white board or chalk board. All other additional Area Category allowances shall use watts per square foot.
2 . Additional watts are available only when allowed according to the footnotes on bottom of Table 140.6-C, which include: Specialized task work; Ornamental lighting; Precision commercial and industrial work; Per linear foot of white board or chalk board; Accent, display and feature lighting; and Videoconferencing studio lighting..
3. Luminaire classification and wattage shall be determined in accordance with §130.0(c) of the Standards.

STATE OF CALIFORNIA
INDOOR LIGHTING POWER ALLOWANCE
CEC-NRCC-LTI-03-E (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-03-E
Certificate of Compliance - Indoor Lighting Power Allowance	(Page 4 of 4)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Date Prepared: 06.21.19

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: TONY Q. MORTERA, PE	Documentation Author Signature:
Company: METRO POWER ENGINEERS, INC	Signature Date: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	CEA Certification Identification (if applicable):
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:
1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name: TONY Q. MORTERA, PE	Responsible Designer Signature:
Company: METRO POWER ENGINEERS, INC	Date Signed: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	License: E16739
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCI-LTI-01-E (Revised 01/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF INSTALLATION		NRCI-LTI-01-E
Indoor Lighting		(Page 1 of 2)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Enforcement Agency:	Permit Number:
Project Address: 25555 HESPERIAN BLVD	City: HAYWARD	Zip Code: 94545

GENERAL INFORMATION

DATE OF BUILDING PERMIT:	PERMIT #
BUILDING TYPE	☒ Nonresidential ☐ High-Rise Res (Common Area) ☐ Hotel/Motel (Common Area)
PHASE OF CONSTRUCTION	☐ New Construction ☐ Addition ☒ Alteration ☐ Unconditioned

SCOPE OF RESPONSIBILITY

Enter the date of approval by enforcement agency of the Certificate of Compliance that provides the specifications for the energy efficiency measures for the scope of responsibility for this Installation Certificate.	Date:

In the table below identify all applicable construction documents that specify the requirements for the scope of responsibility reported by this Installation Certificate (continued).

Document Title or Description	Applicable Sheets or Pages, Tables, Schedules, etc.	Date Approved By the Enforcement Agency
TITLE 24 DOCUMENTATION	EN-104,EN-105	

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCI-LTI-01-E (Revised 01/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF INSTALLATION		NRCI-LTI-01-E
Indoor Lighting		(Page 2 of 2)
Project Name: MPOE CHABOT-BLDG 100, RM 138	Enforcement Agency:	Permit Number:
Project Address: 25555 HESPERIAN BLVD	City: HAYWARD	Zip Code: 94545

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Installation documentation is accurate and complete.

Documentation Author Name: TONY Q. MORTERA, PE	Documentation Author Signature:
Documentation Author Company Name: METRO POWER ENGINEERS, INC	Date Signed: 06.21.19
Address: 3150 HILLTOP MALL ROAD, SUITE 22	CEA Certification Identification (if applicable):
City/State/Zip: RICHMOND, CA 94806	Phone: 510.275.3000

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:
1. The information provided on this Certificate of Installation is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation and attest to the declarations in this statement (responsible builder/installer), otherwise I am an authorized representative of the responsible builder/installer.
3. The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations, and the installation conforms to the requirements given on the plans and specifications approved by the enforcement agency.
4. I reviewed a copy of the Certificate of Compliance approved by the enforcement agency that identifies the specific requirements for the scope of construction or installation identified on this Certificate of Installation, and I have ensured that the requirements that apply to the construction or installation have been met.
5. I will ensure that a completed signed copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Builder/Installer Name:	Responsible Builder/Installer Signature:	
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner)	Position With Company (Title):	
Address:	CSLB License:	
City/State/Zip:	Phone	Date Signed:

ELECTRICAL CONTRACTOR SHALL BE COMPLETING AND SIGNING T24 INSTALLATION AND ACCEPTANCE FORMS AT THE COMPLETION OF THE JOB.

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI
ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER
ANTONIO QUIOBO MORTERA
No. E 16739
Exp. 09/30/20
ELECTRICAL
STATE OF CALIFORNIA

CONSULTANT:

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3150 HILLTOP MALL ROAD, SUITE 22
RICHMOND, CA 94806
TEL: 510. 275. 3000 FAX: 510. 275. 3002

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

▯ L▯ ▯ 100
TITLE ▯▯
COM▯ LIANCE

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506
SHEET NO:	

EN-10▯

FIRE PROTECTION SYMBOL LIST

NOTE: This is a standard symbol list and not all items listed may be used.

Abbreviations

(A)	ABANDON IN PLACE
AFF	ABOVE FINISHED FLOOR
AS	AUTOMATIC SPRINKLER
BOB	BOTTOM OF BEAM
BOD	BOTTOM OF DECK
BOP	BOTTOM OF PIPE
BOR	BOTTOM OF RISER
BV	BUTTERFLY VALVE
C	CENTER LINE
CV	CHECK VALVE
(X)	DEMOLITION
DDCV	DOUBLE DETECTOR CHECK VALVE ASSEMBLY
DN	DROP NIPPLE
EL	ELEVATION
(E)	EXISTING
EC	EXTENDED COVERAGE
F	FAHRENHEIT
FT	FEET
FF	FINISHED FLOOR
FDC	FIRE DEPARTMENT CONNECTION
FHC	FIRE HOSE CABINET
FHS	FIRE HOSE STATION
FFL	FLOOR FLANGE
FS	FLOW SWITCH
(F)	FUTURE
GPM	GALLONS PER MINUTE
GV	GATE VALVE
G	GRADE
H	HANGER
HSW	HORIZONTAL SIDE WALL
HV	HOSE VALVE
IN	INCHES
ID	INSIDE DIAMETER
MAX	MAXIMUM
MIN	MINIMUM
(N)	NEW
N&C	NIPPLE AND CAP
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
NO	NUMBER
OBJ	OPEN BAR JOIST
OD	OUTSIDE DIAMETER
OS & Y	OUTSIDE SCREW & YOKE
PIV	POST INDICATOR VALVE
PRV	PRESSURE REDUCING VALVE
PS	PRESSURE SWITCH
(R)	RELOCATE/RELOCATED LOCATION
RN	RISER NIPPLE
RM	ROOF MANIFOLD
SOV	SHUT OFF VALVE
SF	SQUARE FEET
SSP	STANDARD SPRAY PENDENT
SSU	STANDARD SPRAY UPRIGHT
SP	STANDPIPE
SB	SWAY BRACE
TS	TAMPER SWITCH
TOB	TOP OF BEAM
TOP	TOP OF PIPE
TOR	TOP OF RISER
TOS	TOP OF STEEL
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE

Control

- BELL/GONG
- CONTROL PANEL
- FLOW DETECTION SWITCH
- MONITOR SWITCH
- PRESSURE GAUGE
- TAMPER DETECTOR
- WATER MOTOR ALARM

General

- CONTINUATION
- DETAIL NUMBER AND SHEET LOCATION (X / X)
- EQUIPMENT IDENTIFICATION (XX-X / LOCATION)
- FOOD SERVICE EQUIPMENT / CALCULATION TAG (XX)
- KEYED NOTE (X)
- PIPE OR CONDUIT BELOW GRADE
- POINT OF CONNECTION
- SECTION NUMBER AND SHEET LOCATION (A / AXX)
- DEMOLISH
- DEMOLISH (DASH-DOT)
- EXISTING WORK
- NEW WORK

Miscellaneous

- 2-WAY SWAY BRACE (1)
- 4-WAY SWAY BRACE (1)
- AUXILIARY DRAIN
- BRANCHLINE RESTRAINT (TEXT INDICATES TYPE) (H1)
- COUPLING
- DRY HOSE STATION
- ELEVATION ABOVE FINISHED FLOOR (14'-0")
- FLANGED COUPLING
- FLEXIBLE COUPLING (FLEX)
- GROOVED CAP
- GROOVED COUPLING
- HANGER (TEXT INDICATES TYPE) (H1)
- HYDRAULIC CALCULATION NODE
- RISER
- SCREWED CAP
- SCREWED PLUG
- UNION
- WET HOSE STATION

Valves

- ALARM CHECK VALVE, ELEVATION VIEW
- ALARM CHECK VALVE, PLAN VIEW
- ANGLE VALVE
- CHECK VALVE
- DELUGE VALVE
- DRY VALVE
- INDICATING BUTTERFLY VALVE
- NON-RISING STEM VALVE
- PREACTION VALVE
- SPRINKLER DOUBLE DETECTOR CHECK VALVE ASSEMBLY (DCVA)
- VALVE WITH TAMPER SWITCH

Water Service

- DOUBLE CHECK BACKFLOW PREVENTER
- FIRE DEPARTMENT CONNECTION
- FLOOR CONTROL ASSEMBLY (FCA)
- FREE STANDING F.D. CONNECTION
- O.S.&Y. VALVE
- POST INDICATOR VALVE
- PRIVATE DOUBLE HOSE HYDRANT
- PRIVATE SINGLE HOSE HYDRANT
- PUBLIC DOUBLE HOSE HYDRANT
- PUBLIC DOUBLE HOSE HYDRANT W/ PUMPER
- REDUCED PRESSURE BACKFLOW PREVENTER
- STANDPIPE WITH HOSE CONNECTION
- THRUST BLOCK
- VALVE IN PIT
- WALL HYDRANT

SCOPE OF WORK

THE SCOPE OF WORK IS TO REVOTE A SECTION OF BUILDING, PROVIDING A SINGLE INTERLOCK PRE-ACTION SYSTEM FOR THE DATA ROOM.

FIRE PROTECTION HYDRAULIC NOTES

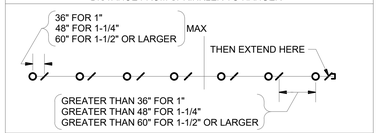
A. THE ESTABLISHED PIPE SIZING SCHEDULE OF THE EXISTING FIRE SPRINKLER SYSTEM TO BE MAINTAINED DURING THE REMODEL PROJECT. NO NEW HYDRAULIC CALCULATIONS WILL BE PROVIDED FOR THE EXISTING BUILDING.

MAXIMUM DISTANCE BETWEEN HANGERS (FT-IN)

STEEL PIPE	NOMINAL PIPE SIZE (IN)							
	1	1-1/4	1-1/2	2	2-1/2	3	4	6
	12-0	12-0	15-0	15-0	15-0	15-0	15-0	15-0

FOR STEEL PIPE, THE MAXIMUM LENGTH FOR UNSUPPORTED ARMOVER SHALL BE 2'-0". WHEN PRESSURE EXCEEDS 100 PSI, UNSUPPORTED LENGTH SHALL BE 1'-0".

DISTANCE FROM SPRINKLER TO HANGER



HANGER ROD SIZE	
PIPE SIZE	DIA. OF ROD
UP TO AND INCLUDING 4"	3/8"
6" AND 8"	1/2"

NOTE: TYPICAL TICK MARKS AS SHOWN ON PIPING PLAN MAY NOT REFLECT ACTUAL FIELD INSTALLATION. FINAL HANGER INSTALLATION SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF NFPA 13 CHAPTER 9.

GENERAL FIRE PROTECTION NOTES

A. CARRY OUT ALL WORK IN ACCORDANCE WITH 2016 CBC. SHOULD ANY CONDITIONS DEVELOP WHICH ARE NOT COVERED BY THE CONTRACT DOCUMENTS WHEREIN THE FINISHED WORK WILL NOT COMPLY WITH SAID 2016 CBC, A CHANGE ORDER DETAILING AND SPECIFYING THE REQUIRED WORK SHALL BE SUBMITTED TO AND APPROVED BY OSHPD BEFORE PROCEEDING WITH THE WORK.

B. ALL WORK SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF LATEST EDITIONS OF TITLE 22, CALIFORNIA CODE OF REGULATIONS AND TITLE 24.

C. ALL ADDENDA AND CHANGE ORDERS SHALL BE SIGNED BY THE ARCHITECT/ENGINEER OF RECORD, THE RESPONSIBLE ENGINEER(S), THE OWNER, AND CONTRACTOR PRIOR TO SUBMITTING FOR APPROVAL TO DEPARTMENT OF THE STATE ARCHITECT (DSA).

D. RESPONSIBILITIES OF ARCHITECT/ENGINEER OF RECORD AND CONSULTANTS, PROJECT INSPECTOR, AND GENERAL CONTRACTOR SHALL BE IN ACCORDANCE WITH C.C.R. TITLE 24, PART 1, SECTIONS 7-141, 7-145, 7-143. VERIFIED REPORTS OF THE CONSTRUCTION ARE REQUIRED BY C.C.R. TITLE 24, PART 1, SECTION 7-151.

E. NO WORK SHALL COMMENCE AT THE PROJECT SITE BEFORE THE BUILDING PERMIT IS FULLY EXECUTED WITH THE START DATE ENTERED AND SIGNED BY THE OWNER, AND GENERAL CONTRACTOR, AND AVAILABLE FOR POSTING AT JOBSITE.

F. ALL WORK PERFORMED UNDER THIS CONTRACT SHALL CONFORM TO THE FOLLOWING CODES AND REGULATIONS AS APPLICABLE:
   a. CALIFORNIA CODE OF REGULATIONS TITLE 8 - INDUSTRIAL REGULATIONS (CHAPTER 1).
   b. CALIFORNIA CODE OF REGULATIONS TITLE 17 - PUBLIC HEALTH (CHAPTER 7).
   c. CALIFORNIA CODE OF REGULATIONS TITLE 19 - PUBLIC SAFETY.
   d. CALIFORNIA CODE OF REGULATIONS TITLE 21 - PUBLIC WORKS.
   e. CALIFORNIA CODE OF REGULATIONS TITLE 22 - SOCIAL SECURITY.
   f. CALIFORNIA CODE OF REGULATIONS TITLE 24 - PARTS 2, 3, 4, 5, AND 9.
   g. CALIFORNIA CODE OF REGULATIONS TITLE 24 - ENERGY INSULATION STANDARDS.
   h. 2016 CALIFORNIA ADMINISTRATIVE CODE (CAC) - PART 1, TITLE 24, CALIFORNIA CODE OF REGULATIONS (CCR).
   i. 2016 CALIFORNIA BUILDING CODE (CBC) - PART 2, TITLE 24, CCR.
   j. 2016 CALIFORNIA ELECTRICAL CODE (CEC) - PART 3, TITLE 24, CCR.
   k. 2016 CALIFORNIA MECHANICAL CODE (CMC) - PART 4, TITLE 24, CCR.
   l. 2016 CALIFORNIA PLUMBING CODE (CPC) - PART 5, TITLE 24, CCR.
   m. 2016 CALIFORNIA FIRE CODE (CFC) - PART 9, TITLE 24, CCR.
   n. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARDS

G. UNLESS OTHERWISE STATED, IT IS INTENDED THAT THE ABOVE CODES AND REGULATIONS REFER TO THE LATEST EDITION OR REVISION IN EFFECT ON THE DATE OF THE CONTRACT. NOTHING ON THE DRAWING IS TO BE CONSTRUED AS REQUIRING OR PERMITTING WORK THAT IS CONTRARY TO THE ABOVE LISTED CODES AND REGULATIONS, OR OTHER LOCAL, STATE OR FEDERAL CODES OR REGULATIONS WHICH MAY BE APPLICABLE.

H. 2016 NFPA 13 SECTION 10.10.2.1.1, UNDERGROUND MAINS AND LEAD-IN CONNECTIONS TO SYSTEM RISERS SHALL BE COMPLETELY FLUSHED BEFORE CONNECTION IS MADE TO OVERHEAD SPRINKLER PIPING. RISER "STUB-UP" SHALL BE PROTECTED TO PREVENT INSECTS, ANIMALS, AND DEBRIS, ETC. FROM ENTERING THE PIPE.

I. PROVIDE FLOW TEST DATA AND INDICATE THE LOCATIONS AND HEIGHT ELEVATIONS OF THE TEST AND RESIDUAL FLOW HYDRANTS. DATA MUST BE NO MORE THAN 6 MONTHS OLD AND PROVIDE INFORMATION ABOUT AVAILABLE WATER AT THE SITE. INFORMATION MAY COME FROM THE LOCAL WATER PURVEYOR, UTILITIES COMPANY, OR LOCAL FIRE DEPARTMENT.

J. 2016 NFPA 13 SECTION 10.10.1: A COPY OF COMPLETED AND SIGNED "CONTRACTOR'S MATERIALS AND TEST CERTIFICATE FOR UNDERGROUND / ABOVE GROUND PIPING" SHALL BE INCLUDED IN OPERATION AND MAINTENANCE MANUAL.

K. 2016 NFPA 13 SECTION 10.10.2.2.1: ALL PIPING AND ATTACHED APPURTENANCES SUBJECTED TO SYSTEM WORKING PRESSURE SHALL BE HYDROSTATICALLY TESTED AT 200 PSI, OR 50 PSI ABOVE WORKING PRESSURE, WHICHEVER IS GREATER, AND SHALL MAINTAIN WITHOUT LOSS FOR 2 HOURS.

L. 2016 NFPA 13 SECTION 6.2.9: PROVIDE SPARE SPRINKLER HEAD CABINET, SPRINKLER WRENCH, AND NO FEWER THAN 6 SPARE SPRINKLER HEADS MATCHING THE TYPES AND TEMPERATURE RATING IN EACH PROTECTED AREA FOR SYSTEMS LESS THAN 300 SPRINKLERS (12 SPARE SPRINKLER HEADS FOR SYSTEMS 300 TO 1,000 SPRINKLERS).

M. 2016 NFPA 13 SECTION 9.3.6.3: THE END SPRINKLER ON EACH LINE SHALL BE RESTRAINED AGAINST EXCESSIVE VERTICAL AND LATERAL MOVEMENT. BRANCH LINES SHALL BE LATERALLY RESTRAINED AT INTERVALS NOT EXCEEDING THOSE SPECIFIED IN NFPA13, TABLE 9.3.6.4 (a) BASED ON BRANCH LINE DIAMETER AND VALUE OF Cp.

N. 2016 NFPA 13 SECTION 25.2.3.1: THE SPRINKLER FLOW SWITCH SHALL BE TESTED TO CONFIRM THAT WHEN THE INSPECTORS TEST VALVE IS ACTIVATED AN AUDIBLE ALARM WILL SOUND NO MORE THAN 5 MINUTES AFTER INITIAL FLOW. TEST TO BE WITNESSED BY PROJECT INSPECTOR.

O. 2016 CBC 904.4.3: CONNECTIONS TO PROTECTED PREMISES AND SUPERVISING STATION FIRE ALARM SYSTEMS SHALL BE TESTED TO VERIFY PROPER IDENTIFICATION AND TRANSMISSION OF ALARMS FROM AUTOMATIC FIRE EXTINGUISHING SYSTEM.

P. 2016 NFPA 13 SECTION 8.17.2.4.7: SIGNAGE SHALL BE PROVIDED AS REQUIRED.

Q. 2016 NFPA 13 SECTION 6.9.1 AND 2010 CBC 903.4.2: FLOW SWITCH SHALL BE CONNECTED TO A 10 INCH OUTSIDE ALARM BELL AT EACH RISER. APPROVED IDENTIFICATION SIGNS SHALL BE PROVIDED TO OUTSIDE ALARM BELL "SPRINKLER FIRE ALARM - WHEN BELL RINGS CALL 911 / FIRE DEPARTMENT."

R. 2016 NFPA 13 FIGURE 25.1: SPRINKLER CONTRACTOR SHALL COMPLETE AND SIGN CONTRACTORS MATERIAL AND TEST CERTIFICATE FOR THE ABOVEGROUND PIPING. THIS FORM SHALL BE GIVEN TO THE PROJECT INSPECTOR WHO WILL FORWARD TO DSA FOR FILING IN PROJECT RECORDS.

S. ALL PIPE LENGTHS SHOWN ON PLANS ARE CENTER TO CENTER LENGTHS ROUNDED TO THE NEAREST INCH.

T. ALL BRANCH LINE PIPING IS SCHEDULE 40 BLACK STEEL.

U. ALL MAIN PIPING IS SCHEDULE 10 BLACK STEEL UNLESS NOTED ON PLANS.

V. 36-INCH AND 60-IN FLEXIBLE SPRINKLER CONNECTIONS WILL BE PROVIDED ON ALL SPRINKLERS INSTALLED AT SUSPENDED CEILINGS WITHIN NEW LIBRARY RESOURCE BUILDING. LENGTH DEPENDENT ON ELEVATION OF BRANCHLINE AND SUSPENDED CEILING.

SHEET INDEX

SPRINKLER HEAD LEGEND

SYMBOL	DESCRIPTION	MODEL NO.	K-FACTOR	ORIFICE SIZE	RESPONSE	TEMP	COVERAGE	FINISH	ESCHUTCHEON	COUNT	COMMENTS
⊙	EXISTING COMBO UPRIGHT/PENDENT	TBD	5.6	1/2"	Quick	155	Standard	WHITE POLY		1	
⊠	UPRIGHT SPRINKLER	TBD	5.6	1/2"	Quick	155	Standard	BRASS	NONE	9	
■	NEW COMBO UPRIGHT/PENDENT	TBD	4.9	1/2"	Quick	155	Standard	WHITE POLY		4	

TOTAL SPRINKLERS: 14

INTERFACE ENGINEERING
PROJECT 2019-0105
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DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
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3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

REGISTERED PROFESSIONAL ENGINEER
JARED F. DOESCHER
No. 35930
CIVIL
STATE OF CALIFORNIA

CONSULTANT:

ITEM:	REVISION / ISSUE:	DATE:
	DSA SUBMITTAL	12/03/19
	DSA BACKCHECK 1	12/03/19

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

SYMBOLS LIST AND GENERAL NOTES - FIRE PROTECTION

DRAWN BY: CHECKED BY:
DATE: 04/30/2019 PROJECT NO: C9506
SHEET NO:

FP001

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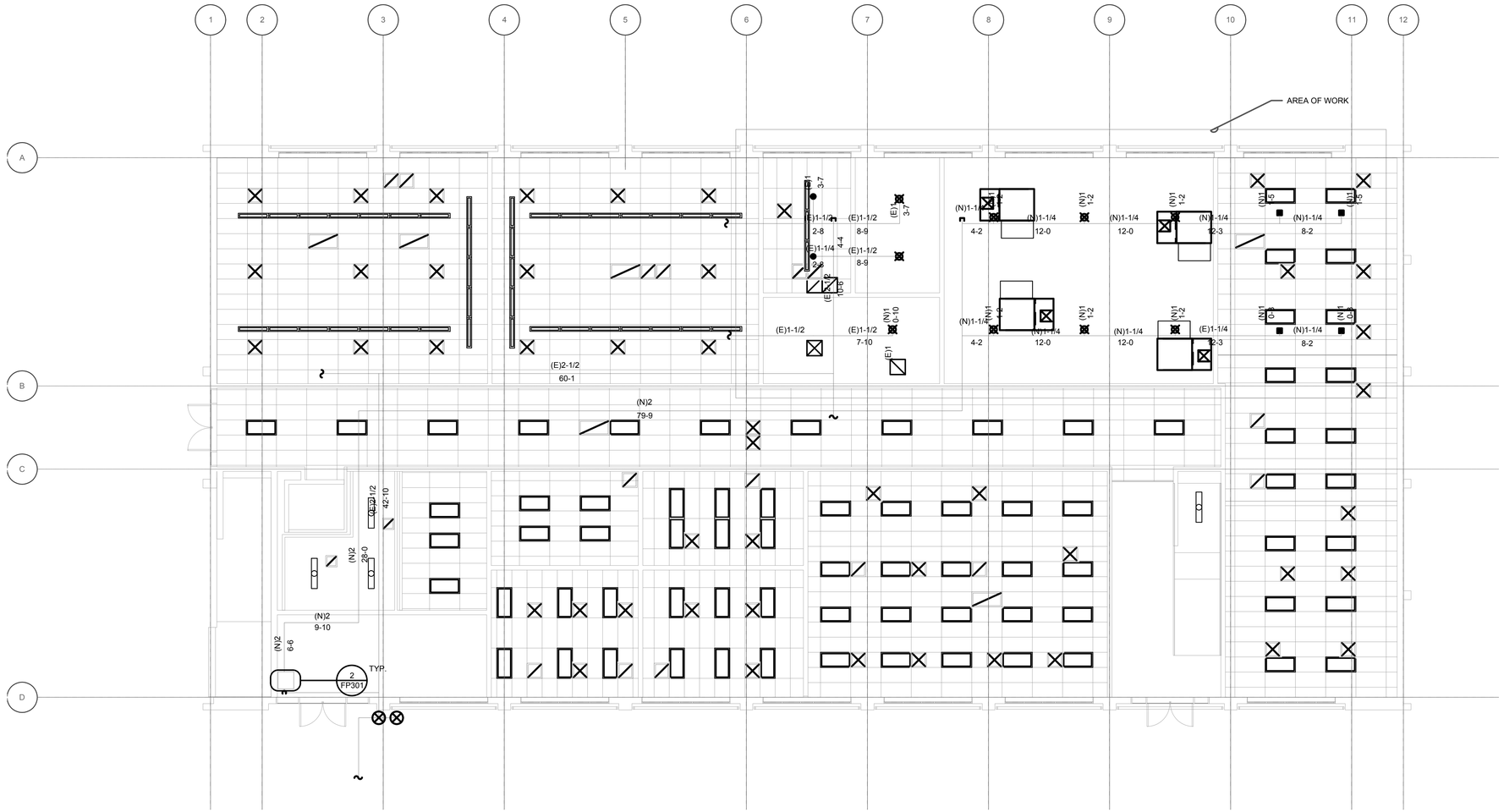

1 FLOOR PLAN - FIRE PROTECTION

0' 4' 8' 16'

1/8" = 1'-0"

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	DSA SUBMITTAL	12/03/19
	DSA BACKCHECK 1	12/03/19

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

FLOOR PLAN- FIRE PROTECTION

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506

SHEET NO:

FP201

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12/19/2019 - 12:37:03 P.M.
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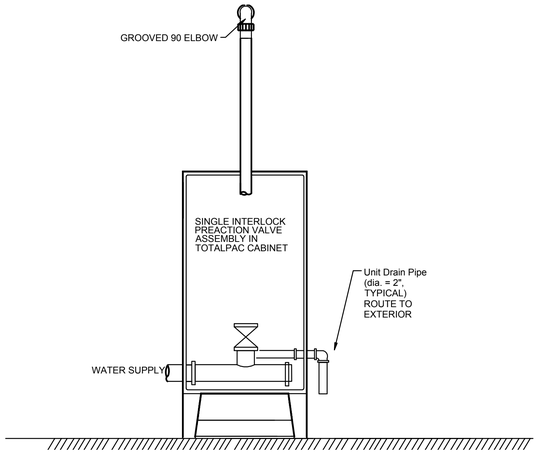
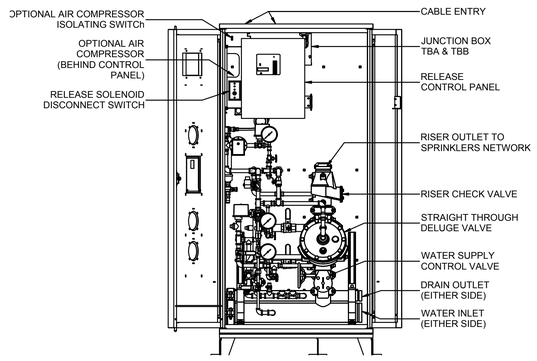


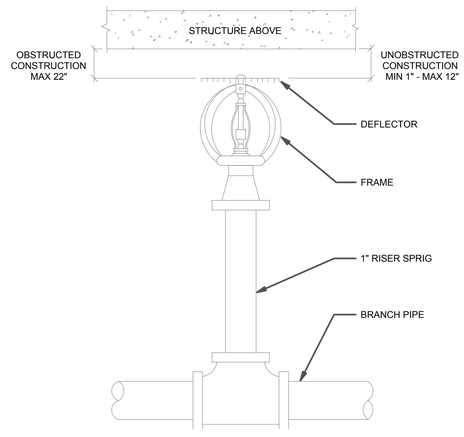
1 PRE-ACTION CABINET

NOT TO SCALE



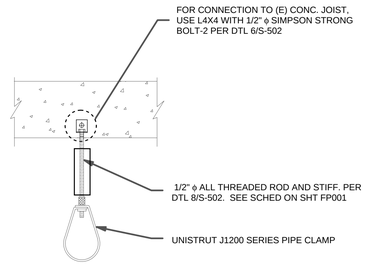
2 PRE-ACTION CABINET INETERIOR

NOT TO SCALE



3 UPRIGHT HEAD ON SPRIG UP

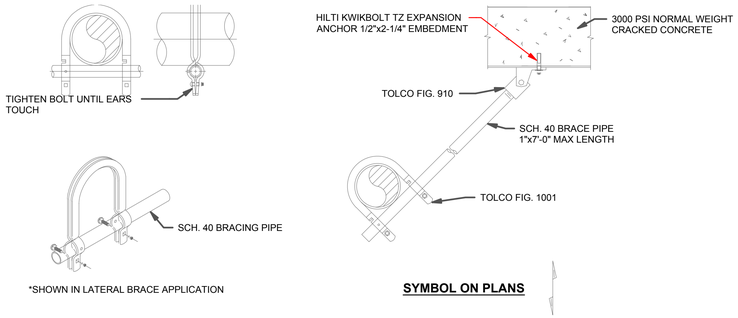
NOT TO SCALE



SYMBOL ON PLANS:

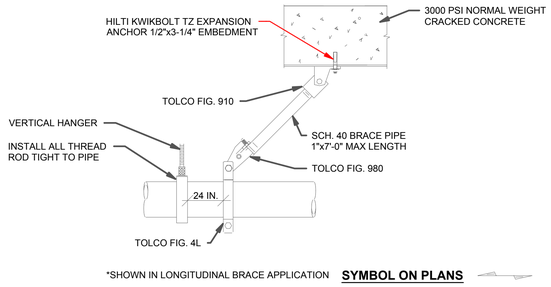
4 DRILLED CONCRETE ANCHOR HANGER

NO TO SCALE



5 LATERAL SWAY BRACE - CONCRETE

NO TO SCALE



6 LONGITUDINAL SWAY BRACE - CONCRETE

0' 4' 8' 16'

NO TO SCALE

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CONSULTANT:

REGISTERED PROFESSIONAL ENGINEER JARED F. DOESCHER No. 35930 STATE OF CALIFORNIA

ITEM:	REVISION / ISSUE:	DATE:
	DSA SUBMITTAL	12/03/19
	DSA BACKCHECK 1	12/03/19

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/ LEARNING SKILLS TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

DETAILS- FIRE PROTECTION

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506

SHEET NO:

FP301

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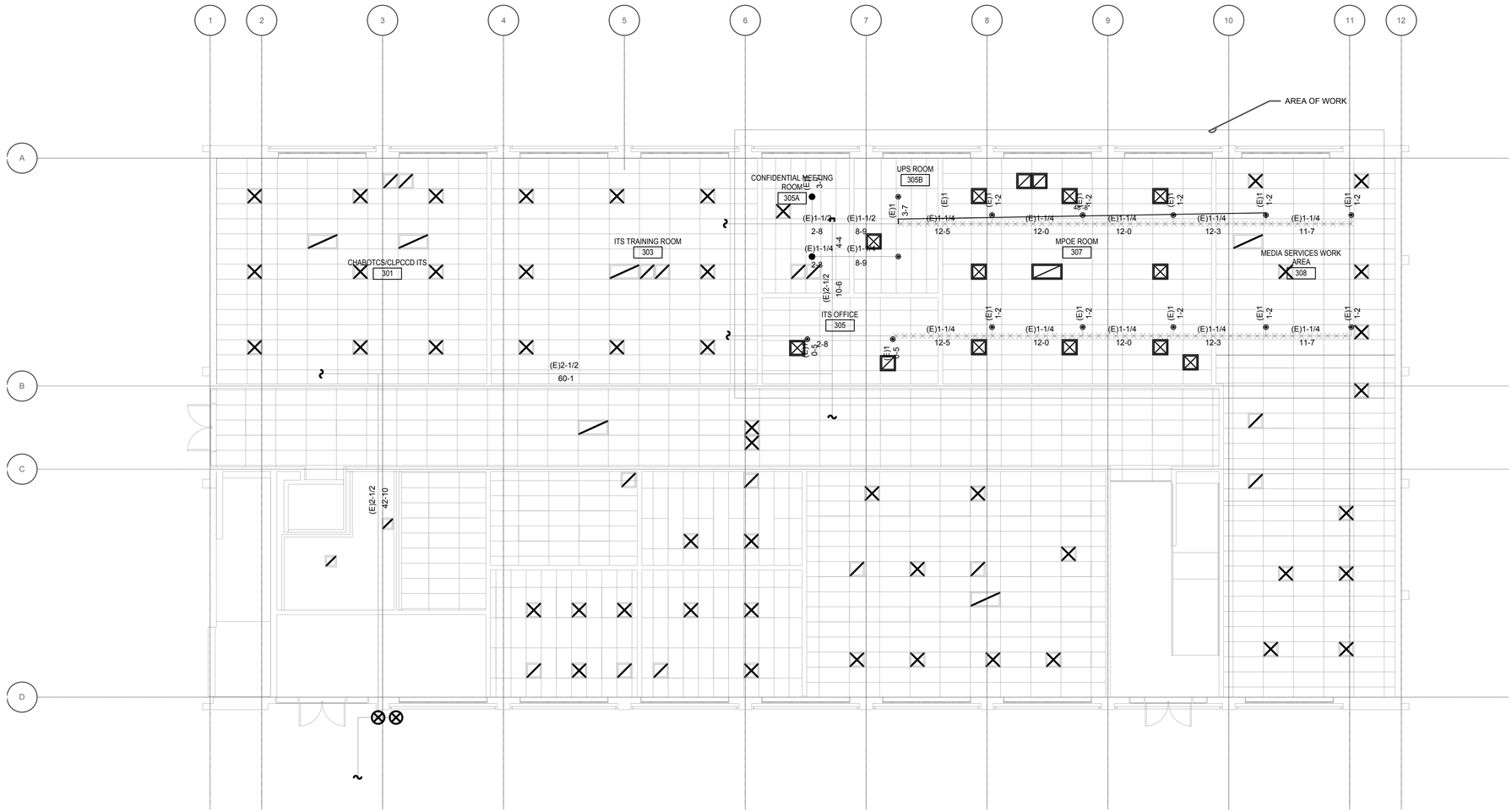

1 FLOOR DEMO PLAN - FIRE PROECTION

0' 4' 8' 16'

1/8" = 1'-0"

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SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

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STATE OF CALIFORNIA

ITEM:	REVISION / ISSUE:	DATE:
	DSA SUBMITTAL	12/03/19
	DSA BACKCHECK 1	12/03/19

KEY PLAN:

CHABOT COLLEGE

MPOE REPLACEMENT/
LEARNING SKILLS
TESTING RELOCATION

25555 HESPERIAN BLVD
HAYWARD, CA 94545

FLOOR DEMO PLAN - FIRE PROTECTION

DRAWN BY:	CHECKED BY:
DATE: 04/30/2019	PROJECT NO: C9506

SHEET NO:

FDP201

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TELECOMMUNICATIONS TITLE SHEET

THE PURPOSE OF THIS SHEET IS TO ILLUSTRATE AND DEFINE GRAPHIC SYMBOLS WHICH MAY OCCUR ON THE TECHNOLOGY DRAWING SET. THE ILLUSTRATION OF A SYMBOL, OR SYSTEM OF SYMBOLS, ON THIS SHEET DOES NOT NECESSARILY INDICATE THAT THE BUILDING COMPONENT REPRESENTED SYSTEM BY THE SYMBOL IS USED AS PART OF THIS PROJECT. REFER TO THE COMPLETE DRAWING PACKAGE AND SPECIFICATIONS TO DETERMINE THE SCOPE OF THE WORK

ABBREVIATIONS

A	AMPERES
ACAMS	ACCESS CONTROL AND ALARM MONITORING SYSTEM
ACT	ACOUSTICAL CEILING TILE
ADA	AMERICANS WITH DISABILITIES ACT
AFC	ABOVE FINISHED CEILING
AFF	ABOVE FINISHED FLOOR
ALS	ASSISTIVE LISTENING SYSTEM
ANT	ANTENNA
ARF	ABOVE RAISED FLOOR
AVC	AUDIOVISUAL CONTRACTOR
AWG	AMERICAN WIRE GAUGE
BAS	BUILDING AUTOMATION SYSTEM
BCT	BONDING CONDUCTOR FOR TELECOMMUNICATIONS
BDF	BUILDING DISTRIBUTION FACILITY
BFC	BELOW FINISHED CEILING
BICSI	BUILDING INDUSTRY CONSULTING SERVICE INTERNATIONAL
C	CONDUIT
CAM	CAMERA
CAT3	CATEGORY 3 (UTP CABLE)
CAT5E	ENHANCED CATEGORY 5 (UTP CABLE)
CAT6	CATEGORY 6 (UTP CABLE)
CAT6A	AUGMENTED CATEGORY 6 (UTP CABLE)
CATV	COMMUNITY ANTENNA TELEVISION
CATVP	COMM. ANTENNA TELEVISION PLENUM
CB	CEILING BOX
CD	CONFERENCE ROOM DISPLAY
CMP	COMMUNICATIONS MEDIA PLENUM
CMR	COMMUNICATIONS MEDIA RISER
CP	CONTROL PANEL
CPU	CENTRAL PROCESSING UNIT
CTL	CONTROL
D	DEEP (DIMENSION)
DAS	DISTRIBUTED ANTENNA SYSTEM
DIV	DIVISION
DOC	VIDEO DOCUMENT CAMERA
DS	DIGITAL SIGNAGE DISPLAY
DSP	DIGITAL SIGNAL PROCESSOR
(E)	EXISTING
EC	ELECTRICAL CONTRACTOR
EMS	ELECTRICAL MANAGEMENT SYSTEM
EMT	ELECTRICAL METALLIC TUBING
EQUIP	EQUIPMENT
(F)	FUTURE
FACP	FIRE ALARM CONTROL PANEL
FATC	FIRE ALARM TERMINAL CABINET
FB	FLOOR BOX
FO	FIBER OPTIC
FTP	FOIL (SCREENED PER PAIR) TWISTED PAIR
GC	GENERAL CONTRACTOR
GRS	GALVANIZED RIGID STEEL
H	HIGH (DIMENSION)
IDF	INTERMEDIATE DISTRIBUTION FACILITY
IDS	INTRUSION DETECTION SYSTEM
IR	INFRARED
ISP	INSIDE PLANT
JB	JUNCTION BOX
L	LONG (DIMENSION)
LV	LOW VOLTAGE
LVI	LOW VOLTAGE INTERFACE
MBGRB	MAIN BUILDING GROUNDING REFERENCE BUS
MDF	MAIN DISTRIBUTION FACILITY
MH	MAINTENANCE HOLE
MIC	MICROPHONE
MMF	MULTIMODE (FIBER TYPE)
MPOE	MINIMUM POINT OF ENTRY
MTR	MAIN TELECOMMUNICATIONS ROOM
MTX	MATRIX
(N)	NEW
NC	NORMALLY CLOSED (SWITCH TYPE)
NIC	NOT IN CONTRACT
NPF	NETWORK PATCHING FACILITY
NO	NORMALLY OPEN (SWITCH TYPE)
NTS	NOT TO SCALE
OC	ON CENTER
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFCP	OPTICAL FIBER CONDUCTIVE PLENUM
OFCR	OPTICAL FIBER CONDUCTIVE RISER
OFE	OWNER FURNISHED EQUIPMENT
OFOI	OWNER FURNISHED, OWNER INSTALLED
OFNP	OPTICAL FIBER NON-CONDUCTIVE PLENUM
OFNR	OPTICAL FIBER NON-CONDUCTIVE RISER
OSP	OUTSIDE PLANT
(P)	PROTECTED SIDE OF DOOR
PB	PULL BOX
PBB	PRIMARY BUSBAR
PNL	PANEL
PR	PAIR (OF COPPER CONDUCTORS)
PRJ	PROJECTOR
PS	PROJECTION SCREEN
PSU	POWER SUPPLY
PT	POKE-THROUGH DEVICE
PTZ	PAN/TILT/ZOOM (CAMERA)
PVC	POLYVINYL CHLORIDE
REX	REQUEST TO EXIT
RF	RADIO FREQUENCY
RX	RECEIVER
SAD	SEE ARCHITECTURAL DRAWINGS
SBB	SECONDARY BUSBAR
SEC	SECURITY EQUIPMENT CABINET
SED	SEE ELECTRICAL DRAWINGS
SMM	SINGLEMODE (FIBER TYPE)
SPK	LOUDSPEAKER
SCTP	SCREENED (OVERALL) TWISTED PAIR
STR	STRANDS (OF FIBER OPTIC CABLE)
STP	SHIELDED (PAIRS AND OVERALL) TWISTED PAIR
TBB	TELECOM BONDING BACKBONE
TBC	TELECOM BONDING CONDUCTOR
TC	TELECOM CONTRACTOR
TDMM	TELECOMMUNICATIONS DISTRIBUTION METHODS MANUAL
TGB	TELECOM GROUNDING BUSBAR
TIA	TELECOMMUNICATIONS INDUSTRY ASSOCIATION
TMGB	TELECOM MAIN GROUNDING BUSBAR
TP	TERMINAL PANEL
TR	TELECOMMUNICATIONS ROOM
TS	TERMINATION STRIP
TVT	TV TUNER
TX	TRANSMITTER
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTP	UNSHIELDED TWISTED PAIR
V	VOLTS
VC	VOLUME CONTROL
VSS	VIDEO SURVEILLANCE SYSTEM
WAP	WIRELESS ACCESS POINT
W	WIDE (DIMENSION)
WB	WALL BOX
WP	WEATHERPROOF
XFMR	TRANSFORMER

GENERAL SYMBOLS

01 — NUMBERED NOTE (SPECIFIC TO THE SHEET WHERE SHOWN)

X01 — EQUIPMENT IDENTIFICATION TAG
X = "T" TELECOMMUNICATIONS
X = "A" AUDIOVISUAL
X = "S" SECURITY

001 — DOOR NUMBER

XX — COMMUNICATIONS CONDUIT BANK TAG - REFER TO SCHEDULE

DETAIL REFERENCE

1 / X1.01 — DETAIL DESIGNATION; SHEET NUMBER (X = DISCIPLINE) (DASH SIGN = DETAIL FROM SAME SHEET)

ELEVATION REFERENCE

1 / X1.01 — ELEVATION DESIGNATION; SHEET NUMBER (X = DISCIPLINE) (DASH SIGN = DETAIL FROM SAME SHEET)

INTERIOR ELEVATION REFERENCE

2 / 1 / X1.01 / 3 / 4 — ELEVATION DESIGNATION, TYP; SHEET NUMBER (X = DISCIPLINE) (DASH SIGN = DETAIL FROM SAME SHEET)

MATCHLINE REFERENCE

X1.01 — X1.01 — CURRENT SHEET; CONTINUING SHEET (X = DISCIPLINE)

TELECOMMUNICATIONS

TELECOM OUTLET, WALL MOUNT

TELECOM OUTLET, FLOOR MOUNT

TELECOM OUTLET, CEILING MOUNT

C — CABLE FEED POINT, WALL MOUNT

C — CABLE FEED POINT, FLOOR MOUNT

C — CABLE FEED POINT, CEILING MOUNT

TELECOM + AV COMBINATION OUTLET/DEVICE, WALL MOUNT

TELECOM + AV COMBINATION OUTLET/DEVICE, FLOOR MOUNT

TELECOM + AV COMBINATION OUTLET/DEVICE, CEILING MOUNT

TELECOMMUNICATION ROOM / EQUIPMENT ROOM DESIGNATIONS

IDF-XXX.##

- ROOM SEQ. #
- FLOOR #
- BUILDING
- TELECOMMUNICATIONS ROOM - IDF, MDF, OR MPOE

TELECOMMUNICATION SERVING AREA FOR MULTIPLE DESIGNATION

OUTLETS AND DEVICES SERVED FROM IDF-11.01 — AREA SERVED FROM THIS DESIGNATED TR

SERVING AREA DELINEATOR

OUTLETS AND DEVICES SERVED FROM IDF-11.01 — AREA SERVED FROM THIS DESIGNATED TR

TELECOMMUNICATION SERVING AREA FOR SINGLE DESIGNATION

OUTLETS AND DEVICES SERVED FROM IDF-11.01 — AREA SERVED FROM THIS DESIGNATED TR

SECURITY SYSTEMS

PTZ — VIDEO CAMERA - PTZ
PROVIDE AND INSTALL (2) CAT6A CABLES FROM SECURITY DEVICE LOCATION TO EXISTING MDF.

GENERAL NOTES

GENERAL:

1. THE TECHNOLOGY DRAWINGS ARE A SUBSET OF A LARGER SET OF DRAWINGS. AS A SUBSET, WORK DESCRIBED IN THE TECHNOLOGY DRAWINGS REQUIRES REFERENCE TO DRAWINGS OF OTHER DISCIPLINES FOR A COMPLETE UNDERSTANDING OF THE TRUE SCOPE OF WORK. REFER TO THE COMPLETE DRAWING PACKAGE AND SPECIFICATIONS TO DETERMINE THE SCOPE OF THE WORK.
2. THE WORK, INCLUDING MATERIALS, METHODS, ASSEMBLIES, ETC., AND INCLUDING SEISMIC BRACING, SHALL COMPLY WITH OR EXCEED THE MINIMUM REQUIREMENTS OF THE GOVERNING LAWS, ORDINANCES, AND REGULATIONS OF AUTHORITIES HAVING JURISDICTION OVER THE WORK. ADDITIONALLY, THE CONTRACT DOCUMENTS MAY REQUIRE ADDITIONAL COMPLIANCE OVER AND ABOVE THOSE IDENTIFIED IN THIS SUBSET OF DRAWINGS. NO PART OF THIS SUBSET OF CONTRACT DOCUMENTS MAY BE CONSTRUED TO REQUIRE OR PERMIT WORK CONTRARY TO A GOVERNING LAW, ORDINANCE, REGULATION, OR CONTRACT DOCUMENTS ADDITIONAL TO THIS SUBSET.
3. MANAGE, SUPERVISE, REVIEW, AND COORDINATE THE WORK OF SUB-CONTRACTORS, TRADES, AND SUPPLIERS PER THE REQUIREMENTS OF THE CONTRACT DOCUMENTS PRIOR TO COMMENCING SPECIFIC WORK TO ASSURE EACH INDIVIDUAL PERFORMING THE WORK ARE AWARE AND UNDERSTAND THE REQUIREMENTS, REGARDLESS OF WHERE THE REQUIREMENTS OCCUR WITHIN THE CONTRACT DOCUMENTS.
4. MAINTAIN A COMPLETE COPY OF SPECIFICATIONS AND DRAWINGS AT THE JOB SITE. PRESENT THE SPECIFICATIONS AND DRAWINGS UPON REQUEST. MAINTAIN DAILY MARKUPS OF THE ACTUAL INSTALLATION AND PRESENT FOR REVIEW UPON REQUEST.
5. SYMBOLOGY USED IN THE TECHNOLOGY DRAWINGS IS DIAGRAMMATIC AND NOT INTENDED TO IDENTIFY THE EXACT FIXED POSITION OF AN OUTLET OR DEVICE. THE ARCHITECTURAL DRAWINGS ESTABLISH THE FINISHED APPEARANCE AND EXACT LOCATIONS OF EXPOSED ELEMENTS OF THE WORK, INCLUDING WORK ILLUSTRATED ON THIS DRAWING SUBSET. REFER TO ARCHITECTURAL DRAWINGS FOR FINISHED LOCATIONS.
6. REFER TO SPECIFICATIONS FOR PROJECT SCOPE, GENERAL REQUIREMENTS, PRODUCT SPECIFICATIONS, AND INSTALLATION REQUIREMENTS, ETC. WHERE QUANTITY AND/OR QUALITY DIFFER FROM THE DRAWING SUBSET, THE HIGHER QUANTITY AND QUALITY OF EACH SHALL PREVAIL.
7. PROVIDE NECESSARY EQUIPMENT AND ACCESSORIES FOR FULLY FUNCTIONAL SYSTEMS MEETING THE DESIGN INTENT AND OWNER REQUIREMENTS, WHETHER EXPRESSLY SPECIFIED OR NOT.
8. PROVIDE MATERIALS AND EQUIPMENT LISTED BY UNDERWRITERS LABORATORIES FOR THE PURPOSE USED AND BEARING THEIR LABEL.
9. PRIOR TO PERFORMING WORK, IDENTIFY AND IMMEDIATELY NOTIFY THE OWNER, OR OWNER'S REPRESENTATIVE, IN WRITING OF ANY CONDITION THAT PREVENTS INSTALLATION ACCORDING TO DRAWINGS AND SPECIFICATIONS.
10. REMOVE ABANDONED CABLING, LEFT OVER CONDUIT, WIRE, SCRAPS, ETC. LEAVE PREMISES CLEAN AND FREE OF TRASH OR DEBRIS RESULTING FROM THE WORK. PROPERLY RECYCLE MATERIAL ACCORDING TO CODE AND PROJECT REQUIREMENTS.
11. INSTALL TELECOMMUNICATIONS SYSTEMS PER BICSI TDMM, AND PER TIA 568 TELECOMMUNICATIONS STANDARDS (568 SERIES, 569 "TELECOMMUNICATIONS PATHWAYS AND SPACES", 606 STANDARD, 607, 758, AND 942).
12. WHEN IDENTIFIED ON THESE DRAWINGS, MOUNTING HEIGHTS ARE REFERENCED FROM THE FINISHED FLOOR TO THE CENTERLINE OF THE DEVICE OR OUTLET.

POWER:

13. REFER TO DIVISION 26 FOR COORDINATION WITH POWER REQUIREMENTS.

PATHWAYS:

14. REFER TO T-002 FOR PATHWAYS REQUIREMENTS (CONDUIT, BOXES, CABLE TRAY, CABLE HANGERS, SURFACE RACEWAY, ETC.).

CABLING AND DEVICES:

15. WHEN PULLING CABLES INTO CONDUITS AND/OR SLEEVES, FULLY OCCUPY A GIVEN CONDUIT AND/OR SLEEVE BEFORE MOVING TO THE NEXT (THIS WILL INCREASE UTILIZATION EFFICIENCY AND FUTURE FLEXIBILITY OF THE SPARE CONDUITS/SLEEVES). ADHERE TO FILL REQUIREMENTS PER INSTANCE.
16. ROUTE CABLES PERPENDICULAR OR PARALLEL TO BUILDING LINES. ROUTE CABLES NO LESS THAN 6 INCHES FROM AN ADJACENT POWER SOURCE OR LIGHTING FIXTURE, AND NO LESS THAN 4 FEET FROM A TRANSFORMERS OR MOTOR.
17. DO NOT ATTACH CABLES TO OTHER STRUCTURES NOT INTENDED FOR CABLE SUPPORT. DO NOT TIE CABLES TO CABLE TRAYS.
18. WHEN PLACING CABLES IN CABLE HANGERS, CABLE SAG BETWEEN HANGERS SHALL NOT BE CLOSER TO THE CEILING THAN 200-250 MILLIMETERS (8-10 INCHES).
19. LABEL EACH CABLE AT BOTH ENDS ACCORDING TO DRAWINGS AND/OR SPECIFICATIONS.

TELECOMMUNICATIONS ROOMS:

20. GROUP AND DRESS EXPOSED CABLE GROUPS USING VELCRO TYPE TIES.
21. DO NOT INSTALL COMPONENTS (I.E., PIPING, DUCTWORK, PNEUMATIC TUBING, ETC.) WITHIN OR THAT PASS THROUGH TELECOMMUNICATIONS ROOMS NOT RELATED TO THE SUPPORT OF THE ROOMS' FUNCTION.
22. LOCATE PIPES AND OTHER TUBING COMPONENTS CONTAINING LIQUID OUTSIDE OF TELECOMMUNICATIONS ROOMS.

SHEET INDEX

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T-011	DIAGRAM - CABLING	•	•
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T-100	SITE PLAN	•	•
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T-400	ENLARGED ROOM PLAN - MPOE	•	•
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LICENSED ARCHITECT ANNA T. WIN C 23260 Exp. Apr.30, 2019 STATE OF CALIFORNIA

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CHABOT COLLEGE

NEW MPOE AT CHABOT CAMPUS BLDG. 300

25555 Hesperian Blvd
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TITLE SHEET AND INDEX

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DATE: 11/07/2019 **PROJECT NO: C9506**
SHEET NO:

T-001

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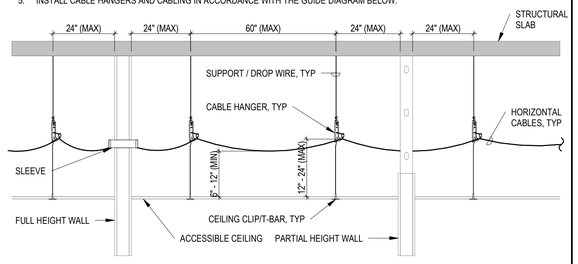
TELECOMMUNICATIONS PATHWAY REQUIREMENTS

CABLE HANGERS ("J HOOKS")

1. INSTALL CABLE HANGERS ACCORDING TO STATE CODES, LOCAL CODES, AND REGULATORY REQUIREMENTS FOR SEISMIC BRACING. INSTALL CABLE HANGERS PER ANSI/TIA-569 AND BICSI TDMM.
2. PROVIDE DEDICATED SUPPORTS (WIRES AND/OR RODS) FOR CABLE HANGERS - DO NOT SHARE WITH CEILING SUPPORT WIRES. PROVIDE IDENTIFICATION ONTO DEDICATED SUPPORTS, SUCH AS BLUE COLORING, TAGGING, OR OTHER EFFECTIVE MEANS.
3. COORDINATE CABLE HANGER INSTALLATION WITH OTHER TRADES. FIELD DETERMINE CABLE HANGER ROUTES TO SUIT FIELD CONDITIONS, UNLESS SPECIFICALLY SHOWN WITH DIMENSIONS.
4. AT FULL HEIGHT WALLS, PROVIDE SLEEVES TO ALLOW CABLES TO PASS. REFER TO THE "THROUGH PENETRATIONS" TABLE FOR APPROVED UL SYSTEMS WHEN PENETRATING FIRE BARRIERS, SMOKE BARRIERS, AND/OR SMOKE PARTITIONS.
5. INSTALL CABLE HANGERS AND CABLING IN ACCORDANCE WITH THE GUIDE DIAGRAM BELOW:



6. CABLE HANGERS ARE APPROVED FOR USE ABOVE ACCESSIBLE CEILINGS ONLY. FOR INACCESSIBLE CEILINGS, TRANSITION TO CONDUIT.
7. REFER TO THE MANUFACTURERS' PRODUCT DOCUMENTATION TO DETERMINE MAXIMUM CABLE QUANTITY AND STATIC LOAD, BASED ON CABLE TYPE.

INSIDE PLANT CONDUIT SYSTEMS

1. CONDUIT ROUTING SHOWN IS DIAGRAMMATIC UNLESS SPECIFICALLY SHOWN WITH DIMENSIONS. DETERMINE FINAL CONDUIT ROUTES TO SUIT FIELD CONDITIONS WHILE CONFORMING TO THE DESIGN INTENT, DRAWINGS, AND SPECIFICATIONS. COORDINATE CONDUIT SYSTEM INSTALLATION REQUIREMENTS WITH OTHER TRADES.
2. FOR EACH PENETRATION THROUGH FIRE BARRIERS AND SMOKE BARRIERS, PROVIDE APPROVED UL LISTED FIRE STOP SYSTEMS (SEE "THROUGH PENETRATIONS" MATRIX ON THIS SHEET) TO MAINTAIN THE SEPARATION RATING. COORDINATE REQUIREMENTS WITH THE AUTHORITY HAVING JURISDICTION (AHJ) PRIOR TO INSTALLATION.
3. PROVIDE DEFLECTION FITTINGS AT STRUCTURAL EXPANSION JOINT CROSSINGS.
4. PROVIDE DEDICATED SUPPORTS (DO NOT SHARE SUPPORTS WITH OTHER TRADES/SYSTEMS OTHER THAN SYSTEMS IDENTIFIED IN THIS SET OF DRAWINGS) FOR CONDUIT SYSTEMS/DUCT BANKS INTENDED FOR TECHNOLOGY SYSTEM CABLES, UNLESS APPROVED BY THE ENGINEER.
5. ROUTE CONDUITS PARALLEL OR PERPENDICULAR TO BUILDING LINES.
6. INSTALL CONDUIT RUNS WITH A MAXIMUM OF 100-FT BETWEEN PULL POINTS.
7. CONDUIT RUNS SHALL HAVE NO MORE THAN 180 TOTAL DEGREES OF BENDS BETWEEN PULL BOXES, AND NO SINGLE BEND SHALL EXCEED 90 DEGREES.
8. WHEN ROUTING CONDUIT IN CONCRETE, PLACE CONDUITS INTO FORMS WITH A GRADUATED BEND RADIUS OF 10 TIMES THE CONDUIT TRADE SIZE TO MITIGATE CAPACITY REDUCTION. .
9. CONDUIT BENDS MINIMUM RADII:
   - CONDUITS LESS THAN OR EQUAL TO 2-INCH TRADE SIZE: SIX TIMES THE INSIDE DIAMETER
   - CONDUITS GREATER THAN 2-INCH TRADE SIZE: TEN TIMES THE INSIDE DIAMETER
10. PROVIDE INSULATED OR GROUNDED BUSHINGS ON EXPOSED ENDS OF CONDUITS AND SLEEVES.
11. CONSOLIDATION OF WORK-AREA CONDUITS IS ALLOWED. THE CONSOLIDATED CONDUIT CAPACITY SHALL BE EQUAL TO OR GREATER THAN THE AGGREGATE CAPACITY OF THE WORK-AREA CONDUITS. PROVIDE APPROVED JUNCTION AND OR PULL BOXES FOR CONDUIT CONSOLIDATION.
12. CONDUIT BODIES ("LB" FITTINGS, ETC.) ARE PROHIBITED FOR USE IN TELECOMMUNICATIONS AND AUDIOVISUAL PATHWAY SYSTEMS. THEY ARE ALLOWED FOR USE IN SECURITY PATHWAY SYSTEMS.
13. PROVIDE A PULL STRING IN EACH CONDUIT RUN. LEAVE WORKING SLACK IN THE PULL STRING AT EACH END; TIE OFF SLACK TO PREVENT RECOIL (BACK INTO THE CONDUIT).

PATHWAY SYMBOLS

CABLE TRAY

- 12"Wx6"D WIRE MESH CABLE TRAY (SIZE SHOWN AS EXAMPLE)
- CABLE TRAY (WIDTH x DEPTH + TYPE)
- 12"Wx6"D LADDER CABLE TRAY (SIZE SHOWN AS EXAMPLE)
- CABLE TRAY (WIDTH x DEPTH + TYPE)
- 12"W CABLE RUNWAY (SIZE SHOWN AS EXAMPLE)
- CABLE RUNWAY (WIDTH ONLY)
- SURFACE RACEWAY
- CABLE HANGER RUN
- 12"W FIBER RUNNER (SIZE SHOWN AS EXAMPLE)
- FIBER RUNNER (WIDTH ONLY)

SLEEVES

FIRESTOP SLEEVE: AT FLOOR, AT WALL

CONDUIT SLEEVE: AT FLOOR, AT WALL

CONDUIT

SINGLE LINE
- CONDUIT RUN EXPOSED OR ABOVE CEILING
- CONDUIT RUN IN SLAB, UNDER SLAB OR UNDERGROUND
- CONDUIT TURNED UP
- CONDUIT TURNED DOWN

DOUBLE LINE
- CONDUIT RUN EXPOSED OR ABOVE CEILING
- CONDUIT RUN IN SLAB, UNDER SLAB OR UNDERGROUND
- CONDUIT TURNED UP (BEYOND)
- CONDUIT TURNED UP (SECTION)
- CONDUIT TURNED DOWN

CONDUIT TAG
- (1) 4" C ((Q) S" C - SIZE SHOWN AS EXAMPLE)
- Q = QUANTITY
- S = TRADE SIZE
- C = CONDUIT

CONDUIT BANK TAG
- (3) 4" C ((Q) S" C - SIZE SHOWN AS EXAMPLE)

THROUGH PENETRATIONS

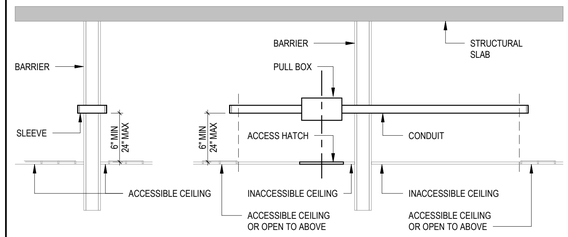
THE TABLE BELOW LISTS THE FIRESTOPPING SYSTEMS APPROVED FOR PENETRATIONS OF FIRE BARRIERS AND SMOKE BARRIERS. APPLY THE PROPER UL SYSTEM TO THE BARRIER BEING PENETRATED AND THE PENETRANT TO MEET THE REQUIRED F AND T RATINGS. MIXING PRODUCTS AND/OR COMPONENTS BETWEEN SYSTEMS IS PROHIBITED FOR QUANTITY OF SYSTEMS, REFER TO "CABLE TRAY -TO- SLEEVE TRANSITION EQUIVALENCY TABLE" (THIS SHEET).

SUBSTITUTIONS MAY BE ALLOWED. SUBMIT A SUBSTITUTION REQUEST FOR SYSTEMS DIFFERING FROM THOSE LISTED BELOW.

PENETRANT	UL SYSTEM #	F RATING	T RATING	COMMENTS
CONCRETE FLOORS AND WALLS				
-	-	-	-	-
FRAMED WALLS				
SINGLE AND/OR MULTIPLE EZ-PATH SLEEVE(S)	W-L-3306	1 HR OR 2 HR	1, 1-1/2, AND 2 HR	F RATING = WALL RATING T RATING - REFER TO UL DETAIL
SINGLE SPEEDSLEEVE (2" AND/OR 4")	W-L-3334	1, 2, 3, AND 4 HR	0, 1/2, 1, 1-1/2, 2 HR	F RATING = WALL RATING T RATING - REFER TO UL DETAIL
EMT SLEEVE WITH CABLES	W-L-3210	1 HR OR 2 HR	3/4 HR	F RATING = WALL RATING
SINGLE EMT CONDUIT	W-L-1222	1 HR AND 2 HR	1/4, 3/4, AND 1 HR	F RATING = WALL RATING
-	-	-	-	-

FOR PENETRATIONS OF FULL-HEIGHT PARTITIONS ABOVE ACCESSIBLE CEILINGS, PROVIDE APPROVED, RATED SLEEVES OR APPROVED FIRESTOP SYSTEMS. FOR PENETRATIONS ABOVE INACCESSIBLE CEILINGS, PROVIDE EMT CONDUIT SPANNING THE INACCESSIBLE CEILING DISTANCE AND PENETRATION THROUGH THE BARRIER.

THE DIAGRAM BELOW CONCEPTUALLY ILLUSTRATES THE REQUIREMENTS.



NOTES:
1. ALIGN ACCESS HATCHES WITH PULL BOXES. SIZE HATCHES TO ALLOW PULL BOXES TO BE OPENED AND ACCESSED.
2. POSITION PULL BOXES A MAXIMUM OF 24" ABOVE ACCESS HATCHES.
3. POSITION CONDUIT STUBS IN ACCESSIBLE LOCATIONS.

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LICENSED ARCHITECT — ANNA T. WIN — C 23260 — Exp. Apr.30, 2019 — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — LARRY A. ANDERSON — No. 17587 — ELECTRICAL — STATE OF CALIFORNIA

Date Sealed 11/07/2019

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KEY PLAN:

NORTH

CHABOT COLLEGE

NEW MPOE AT CHABOT CAMPUS BLDG. 300

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Hayward, CA 94545
VOLUME 1

PATHWAY REQUIREMENTS

DRAWN BY: RM | CHECKED BY: DM
DATE: 11/07/2019 | **PROJECT NO: C9506**
SHEET NO:

T-002

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SHEET NOTES

1. THIS DRAWING REPRESENTS A DIAGRAMMATIC OVERVIEW OF THE TECHNOLOGY BACKBONE PATHWAY INFRASTRUCTURE.
2. REFER TO SITE PLANS, FLOOR PLANS, REFLECTED CEILING PLANS AND TELECOM ROOM PLANS FOR MORE INFORMATION ABOUT PATHWAY LOCATIONS, ROUTING, TYPES, AND QUANTITIES.
3. PATHWAYS SHOWN DEDICATED FOR TECHNOLOGY CABLING ONLY, UON.

NUMBERED NOTES

01 REFER TO REFLECTED CEILING PLANS FOR SIZE AND QUANTITY OF SLEEVES.

02 HALLWAY IS VERY CONGESTED.

SYMBOL LEGEND

- CABLE TRAY - REFER TO CEILING PLANS OR UNDERFLOOR PLANS FOR HORIZONTAL CABLE TRAY ROUTING
- CONDUIT - QUANTITY AND SIZE AS NOTED
- CONDUIT SLEEVE (CONDUIT OF LENGTH LESS THAN 3 FEET) - QUANTITY AND SIZE AS NOTED
- CONDUIT AND/OR SLEEVE(S) WITH WEATHERHEAD - QUANTITY AND SIZE AS NOTED
- FIRESTOP DEVICE(S) - QUANTITY AS NOTED
- CABLE HANGER RUN
- CABLE TROUGH

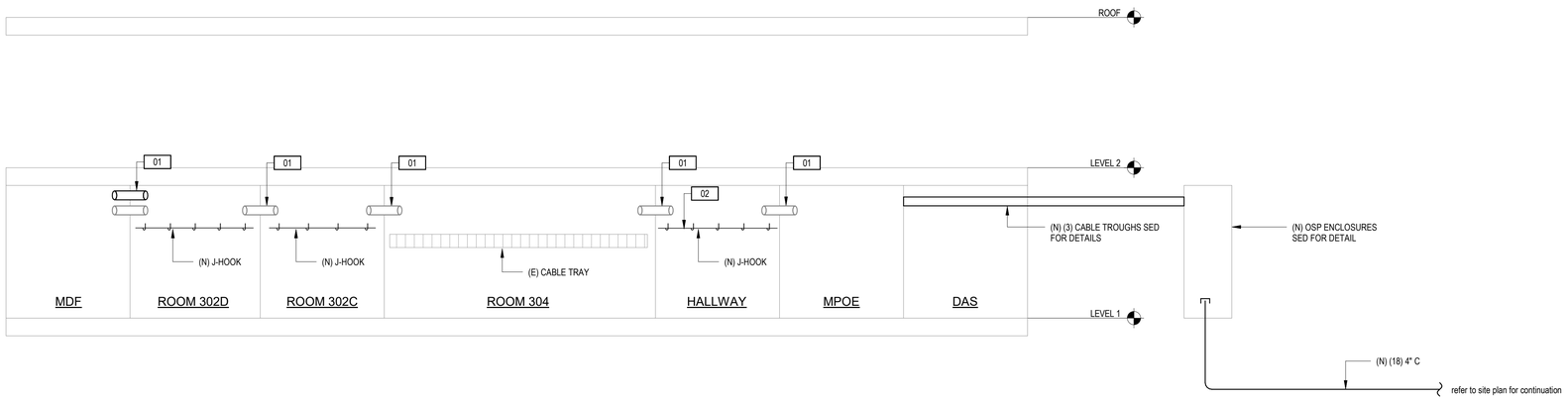

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DIAGRAM - BACKBONE PATHWAY

DRAWN BY: RM CHECKED BY: DM
DATE: 11/07/2019 **PROJECT NO: C9506**
SHEET NO:

T-010

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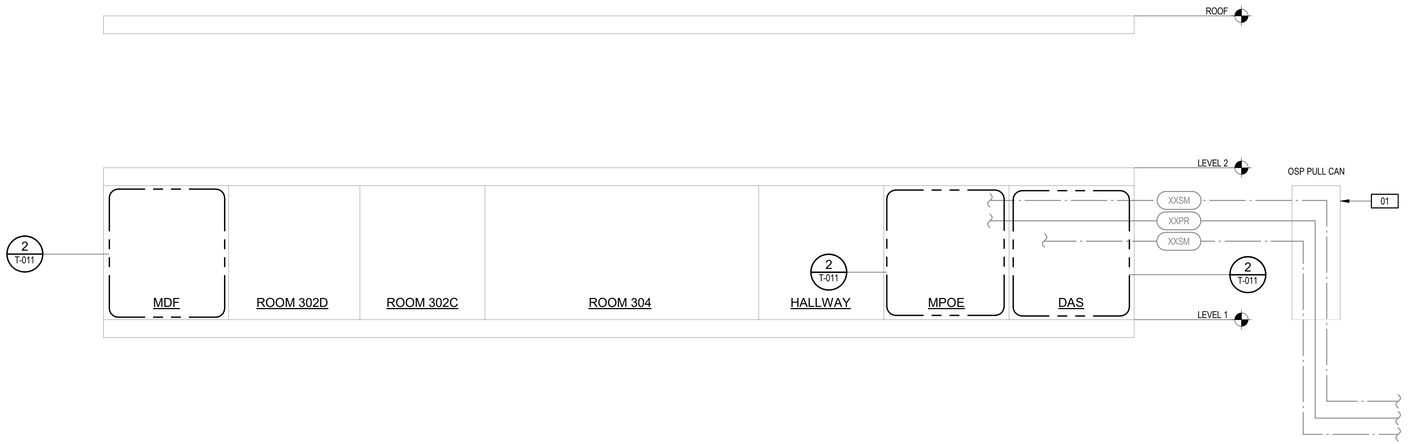
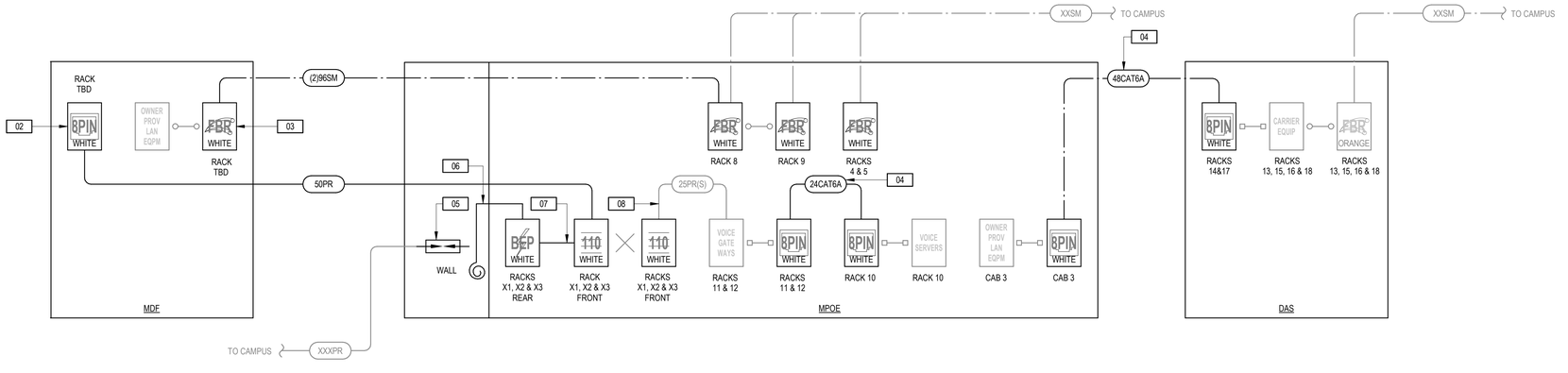


1 CABLING DIAGRAM

SCALE: NONE



2 MDF/MPOE/DAS CABLING

SCALE: NONE

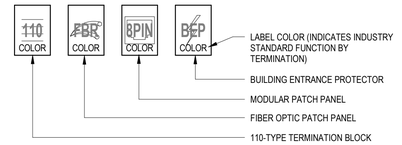
SHEET NOTES

1. THIS DRAWING REPRESENTS A DIAGRAMMATIC OVERVIEW OF THE TECHNOLOGY CABLING INFRASTRUCTURE. REFER TO SITE PLANS, FLOOR PLANS, REFLECTED CEILING PLANS, AND TELECOM ROOM PLANS FOR MORE INFORMATION AND FOR ESTIMATING CABLE LENGTHS. REFER TO TELECOM ROOM PLANS FOR TERMINATION INFORMATION AND EQUIPMENT PLACEMENT.
2. SCREENED (GRAY) ITEMS ARE FOR REFERENCE ONLY AND PROVIDED UNDER A SEPARATE CONTRACT.

NUMBERED NOTES

01	USED FOR ALL OSP CABLE SERVICE LOOPS.
02	PROVIDE 48 PORT PATCH PANEL (MATCH EXISTING) IN MDF, RACK TBD, 1 PAIR PER PORT, PINS 4 & 5.
03	PROVIDE (2) 4U FIBER HOUSINGS IN MDF, RACK TBD, WITH (16) SM SC COUPLER PANELS PER FIBER HOUSING.
04	QUANTITIY OF CAT6A IS PER RACK.
05	FURNISH SPLICE CASE AND END CAPS, DO NOT INSTALL, COORDINATE HANDOFF TO OWNER.
06	25-PAIR CABLES FROM BEPS, COIL ~12' OF EACH CABLE FOR FUTURE SPLICING. COORDINATE IN FIELD WITH TEEOCM PRIOR TO PROVISION AND INSTALLATION.
07	25-PAIR RJ21 MALE/FEMALE CABLES BETWEEN BEP AND PRE-WIRED 300-PAIR 110 BLOCKS.
08	FUTURE 25-PAIR RJ21 FEMALE/MALE CABLES BETWEEN PRE-WIRED 300-PAIR 110 BLOCKS AND VOICE GATEWAYS.

SYMBOL LEGEND



LABEL (COLOR) LEGEND PER TIA-606-B

ORANGE	DEMARCATION POINT	WHITE	1ST LEVEL BACKBONE
GREEN	NETWORK CONNECTION	GREY	2ND LEVEL BACKBONE
PURPLE	EQUIPMENT (PBX, LAN)	BLUE	STATION (HORIZONTAL)
BROWN	INTERBUILDING BACKBONE		

- CROSS CONNECT (1-PAIR, UON)
- UTP PIGTAIL (SINGLE ENDED CORD); 4 PAIR MODULAR, UON
- UTP PATCH CORD; 4 PAIR MODULAR, UON
- SPLICE POINT- FIBER OR UTP, AS NOTED
- FIBER PATCH CORD; 2 STRAND, UON
- OWNER PROV LAN EQPM — COMMUNICATIONS EQUIPMENT PROVIDED BY OWNER
- SM/MM — FIBER SERVICE CABLE (STRAND COUNTS)
- ##PR — COPPER SERVICE CABLE (PAIR COUNT)

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DIAGRAM - CABLING

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SHEET NO:

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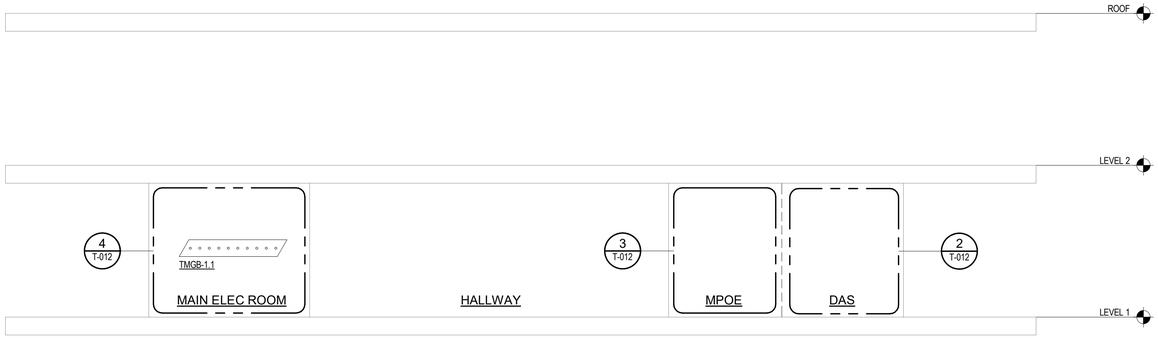
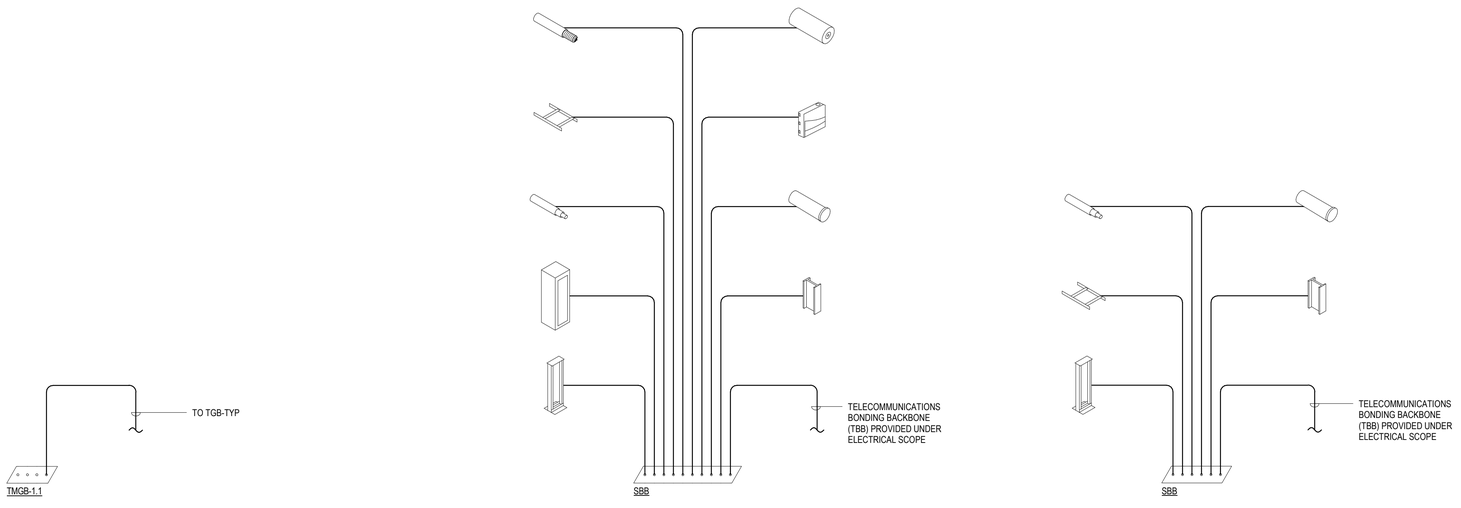


1 BONDING DIAGRAM

SCALE: NONE



4 MAIN ELECTRICAL ROOM BONDING

SCALE: NONE

3 MPOE AREA BONDING

SCALE: NONE

2 DAS AREA BONDING

SCALE: NONE

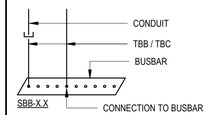
ANSI/TIA-607-C

TBB/GE/TBC/ LINEAR LENGTH M (FT)	SIZE (AWG)
LESS THAN 4 (13)	6
4-6 (14-20)	4
6-8 (21-26)	3
8-10 (27-33)	2
10-13 (34-41)	1
13-16 (42-52)	1/0
16-20 (53-66)	2/0
20-26 (67-84)	3/0
26-32 (85-105)	4/0
32-38 (106-125)	250 KCMIL
38-46 (126-150)	300 KCMIL
46-53 (151-175)	350 KCMIL
53-76 (176-250)	500 KCMIL
76-91 (251-300)	600 KCMIL
GREATER THAN 91 (>300)	750 KCMIL

SHEET NOTES

1. THIS DRAWING REPRESENTS A DIAGRAMMATIC OVERVIEW OF THE TELECOMMUNICATION GROUNDING AND BONDING INFRASTRUCTURE. REFER TO SITE PLANS, FLOOR PLANS, REFLECTED CEILING PLANS, AND ROOM PLANS FOR ESTIMATING BACKBONE CONDUCTOR LENGTHS AND ROOM PLANS FOR COMPONENT PLACEMENT.
2. REFER TO GROUNDING AND BONDING DETAILS ON SHEET T013 FOR INSTALLATION REQUIREMENTS.
3. LABEL BUSBARS AND GROUNDING CONDUCTORS. REFER TO SPECIFICATIONS FOR LABELING REQUIREMENTS.
4. REFER TO PATHWAYS RISER DIAGRAM (SHEET T0.11) TO DETERMINE ROUTE FOR TBB.
5. SIZE BCT, TBB, AND TBC CONDUCTORS PER ANSI/TIA-607-C.

SYMBOL LEGEND



SYMBOL	BONDING REQUIREMENTS
CABLE RUNWAY	PROVIDE TBC FROM TMGB/TGB TO CABLE RUNWAY
CABLE TRAY (BASKET)	PROVIDE TBC FROM TMGB/TGB TO CABLE TRAY
CABLE TRAY (LADDER)	PROVIDE TBC FROM TMGB/TGB TO CABLE TRAY
CABLE TRAY (SOLID)	PROVIDE TBC FROM TMGB/TGB TO CABLE TRAY
EQUIPMENT CABINET	PROVIDE TBC FROM TMGB/TGB TO EQUIPMENT CABINET BAYS.
EQUIPMENT RACK	PROVIDE TBC FROM TMGB/TGB TO EQUIPMENT RACK BAYS.
CONDUIT	PROVIDE TBC FROM TMGB/TGB TO CONDUITS. CONDUITS MAY BE BONDED IN SERIES WITH "LAST" CONDUIT BONDED TO TMGB/TGB. USE ONLY ONE GROUNDING LUG PER CONDUIT.
SPLICE CASE	PROVIDE TBC FROM TMGB/TGB TO SPLICE CASES GROUND LUG
ARMORED CABLE	PROVIDE TBC FROM TMGB/TGB TO ARMORED FIBER OPTIC BACKBONE CABLE.
ARMORED CABLE	PROVIDE TBC FROM TMGB/TGB TO ARMORED COPPER BACKBONE CABLE.
BUILDING STEEL	PROVIDE TBC FROM TMGB/TGB TO BUILDING STEEL WHERE EXPOSED WITHIN TELECOM ROOM.
TERMINATION APPARATUS	PROVIDE TBC FROM TMGB/TGB TO TERMINATION APPARATUS (SUCH AS 110 BLOCKS).
ELECTRICAL PANEL	PROVIDE TBC FROM TMGB/TGB TO ELECTRICAL PANEL WHERE EXPOSED WITHIN TELECOM ROOM.
BEP TERMINAL	BUILDING ENTRANCE PROTECTOR
SLACK LOOP	TBC SLACK LOOP FOR SERVICE PROVIDER

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3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

LICENSED ARCHITECT ANNA T. WIN C 23260 Exp: Apr.30, 2019 STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER LARRY A. ANDERSON No. 17587 ELECTRICAL STATE OF CALIFORNIA

Date Sealed 11/07/2019

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ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

NORTH

CHABOT COLLEGE

NEW MPOE AT CHABOT CAMPUS BLDG. 300

25555 Hesperian Blvd
Hayward, CA 94545
VOLUME 1

DIAGRAM - BONDING

DRAWN BY: RM CHECKED BY: DM
DATE: 11/07/2019 **PROJECT NO: C9506**
SHEET NO:

T-012

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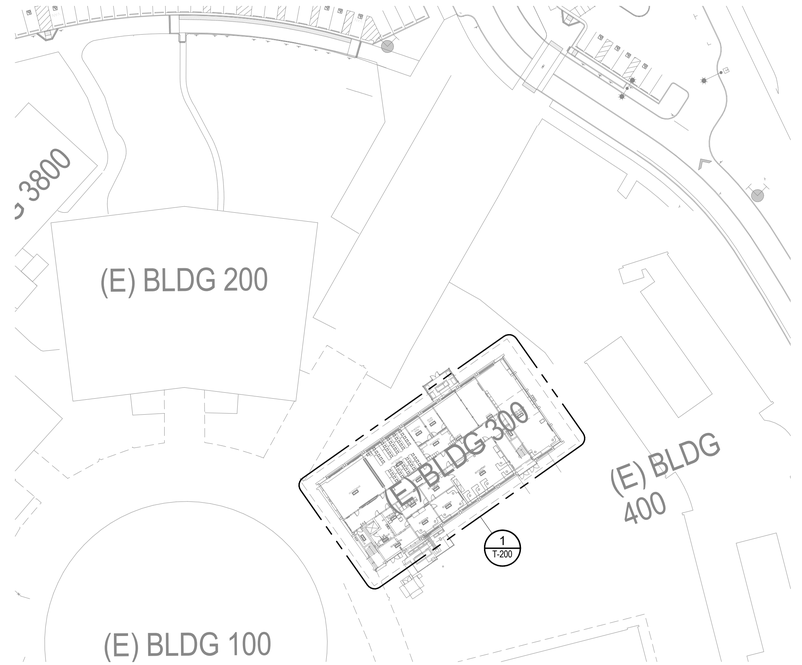
1 SITE PLAN

SCALE: 1" = 160'-0"



2 SITE PLAN SECTION

SCALE: 1" = 50'-0"

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NORTH

CHABOT COLLEGE

NEW MPOE AT CHABOT CAMPUS BLDG. 300

25555 Hesperian Blvd
Hayward, CA 94545
VOLUME 1

SITE PLAN

DRAWN BY: RM CHECKED BY: DM
DATE: 11/07/2019 **PROJECT NO: C9506**
SHEET NO:

T-100

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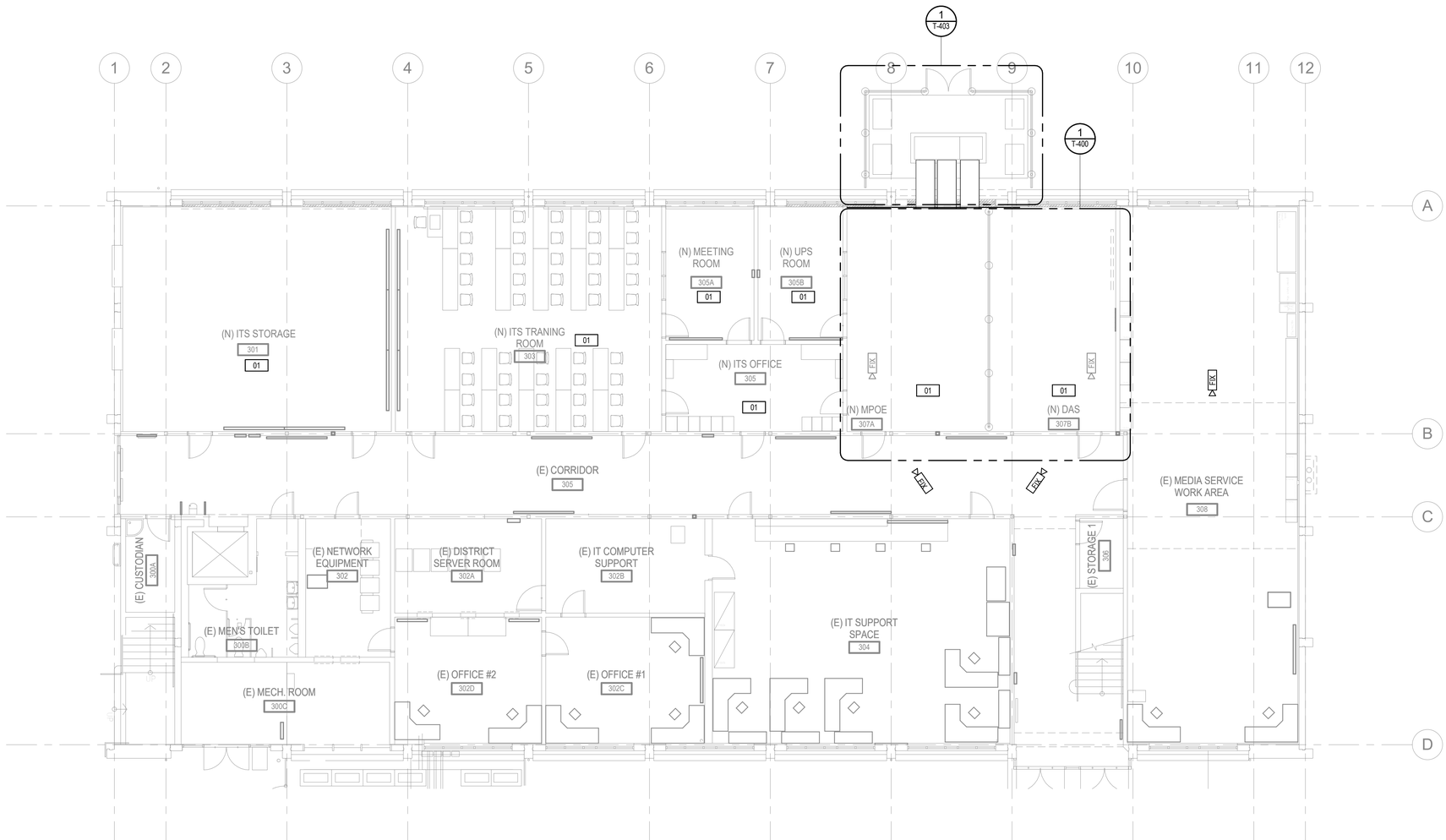
NUMBERED NOTES

01	EXISTING DATA OUTLETS IN CONSTRUCTION AREAS ARE TO REMAIN IN PLACE AND BE PROTECTED FROM DAMAGE DURING CONSTRUCTION.



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KEY PLAN:

NORTH

CHABOT COLLEGE

NEW MPOE AT CHABOT CAMPUS BLDG. 300

25555 Hesperian Blvd
Hayward, CA 94545
VOLUME 1

OVERALL FLOOR PLAN - LEVEL 1

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DATE: 11/07/2019 **PROJECT NO: C9506**
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T-200

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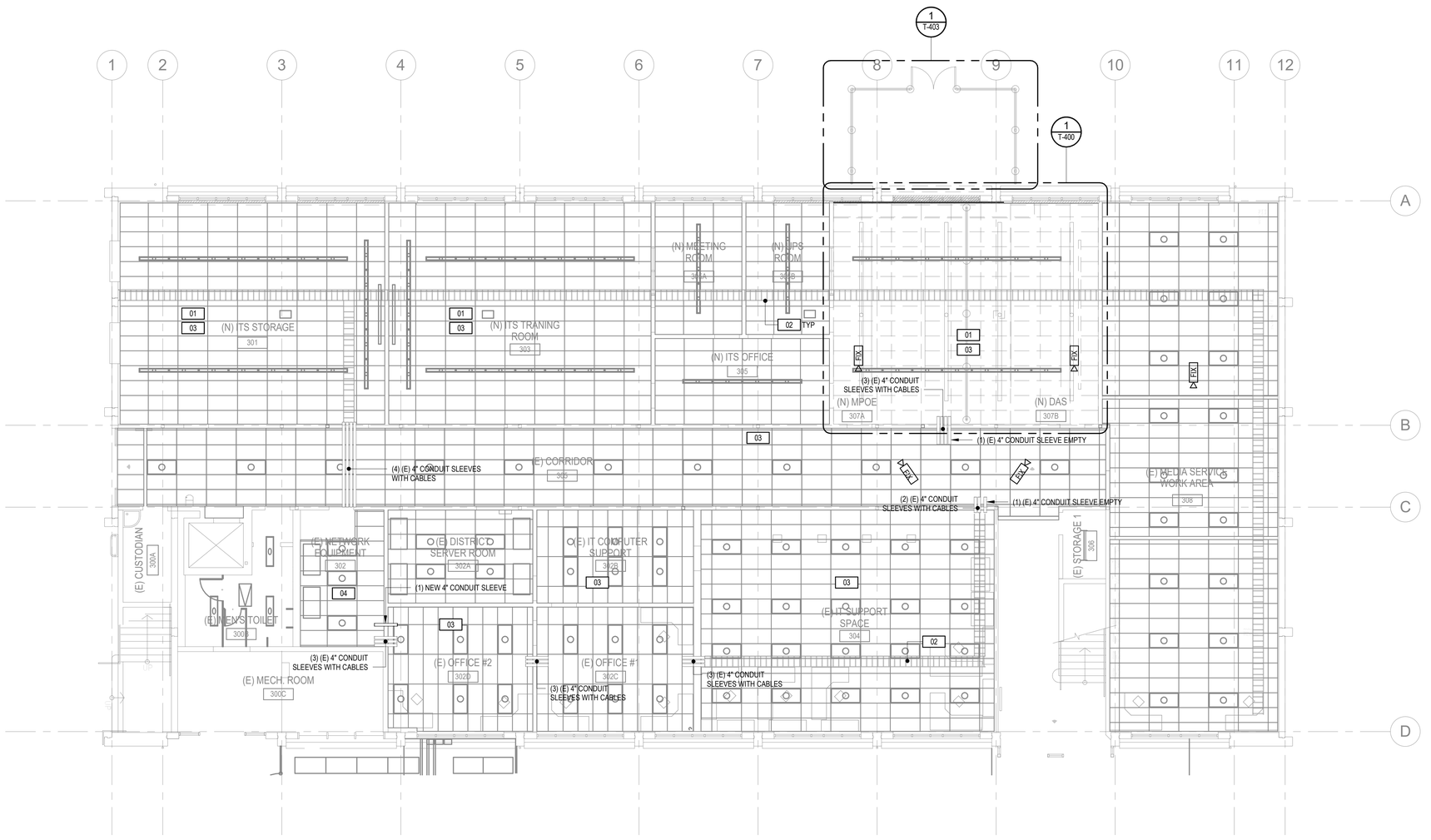
SHEET NOTES

1. REFER TO ARCHITECTURAL PLANS FOR EXACT LOCATIONS OF OUTLETS, DEVICES AND EQUIPMENT. ALSO REFER TO ELECTRICAL PLANS TO COORDINATE FINAL LOCATIONS OF OUTLETS, DEVICES AND EQUIPMENT.
2. SERVE LOW VOLTAGE DEVICES/OUTLETS ON THIS SHEET FROM MDF, ROOM 302.
3. REFER TO SHEET T-002 FOR PATHWAY REQUIREMENTS.
4. PATHWAYS SHOWN ARE DEDICATED FOR TELECOMMUNICATIONS CABLING ONLY, UON.
5. PROVIDE APPROVED FIRESTOP SYSTEMS AT PENETRATIONS THROUGH FIRE BARRIERS, SMOKE BARRIERS, AND SMOKE PARTITIONS TO MAINTAIN RATING. REFER TO SHEET T-002 FOR APPROVED FIRESTOP SYSTEMS.

NUMBERED NOTES

01	EXISTING WIRELESS ACCESS POINTS AND THEIR DATA OUTLETS IN CONSTRUCTION AREAS ARE TO REMAIN IN PLACE AND BE PROTECTED FROM DAMAGE DURING CONSTRUCTION.
02	(E) 18"W BASKET TRAY TO REMAIN, NOT TO BE DEMOLISHED.
03	CONTRACTORS SHALL ENSURE THAT ALL CAT6A AND/OR FIBER OPTIC CABLING/INNERDUCT REMAINS IN EXISTING J-HOOKS ABOVE CEILING.
04	EXISTING MDF.



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CHABOT COLLEGE

NEW MPOE AT CHABOT CAMPUS BLDG. 300

25555 Hesperian Blvd
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VOLUME 1

OVERALL REFLECTED CEILING PLANS - LEVEL 1

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DATE: 11/07/2019 **PROJECT NO: C9506**
SHEET NO:

T-300

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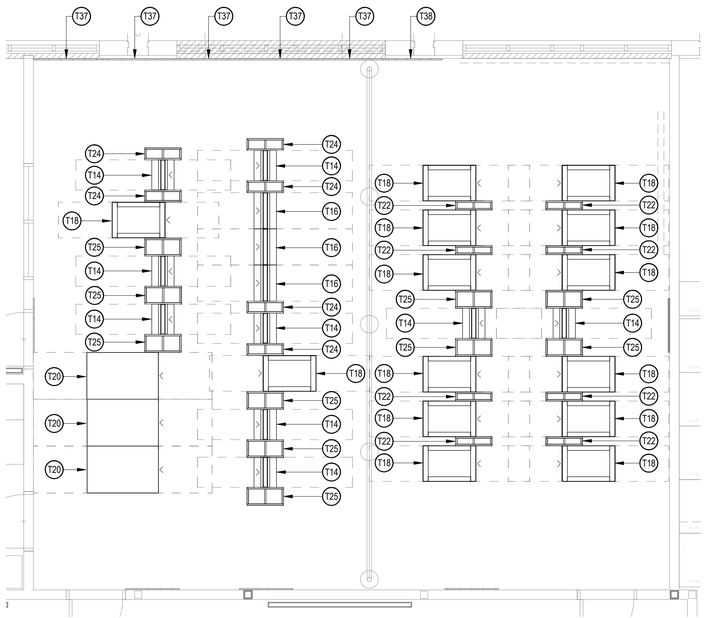
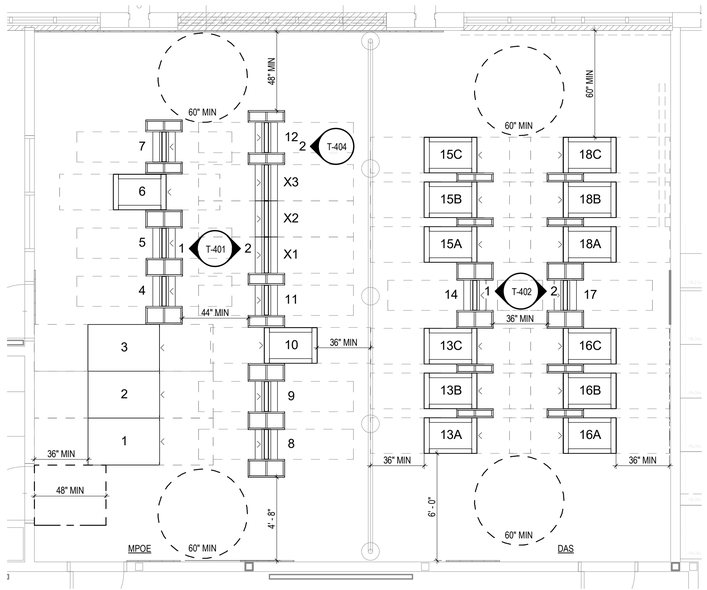


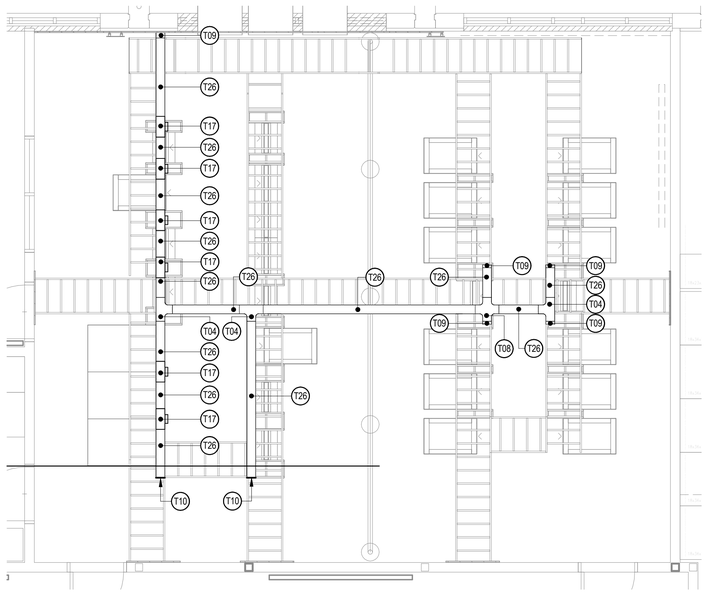
2 EQUIPMENT PLAN

SCALE: 1/4" = 1'-0"



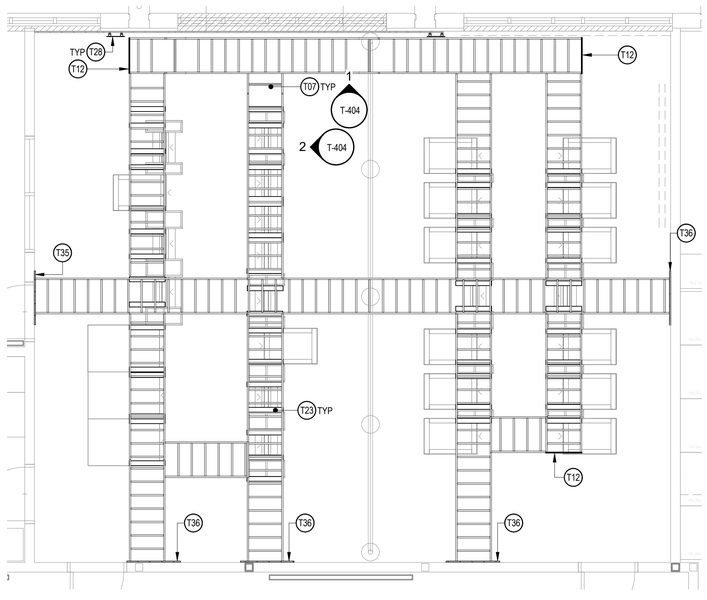
1 REFERENCE PLAN

SCALE: 1/4" = 1'-0"



4 OVERHEAD PLAN 2

SCALE: 1/4" = 1'-0"



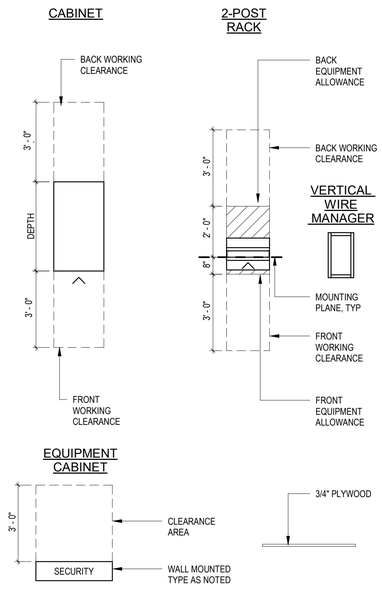
3 OVERHEAD PLAN 1

SCALE: 1/4" = 1'-0"

SHEET NOTES

1. PROVIDE BACKBOARDS ON WALLS OF ROOM AS SHOWN, STARTING AT 6" AFF TP 8'-6" AFF. MASK FIRE RATING STAMP PRIOR TO PAINTING. USE FLUSH FASTENERS FOR MOUNTING PLYWOOD.
2. PROVIDE RADIUS DROP OUTS WHERE CABLES TRANSITION DOWNWARD FROM OVERHEAD HORIZONTAL CABLE TRAY.
3. LABEL RACKS AND PATCH PANELS.
4. REFER TO ELECTRICAL DRAWINGS FOR ELECTRICAL CIRCUITS/OUTLETS AND LIGHTING REQUIREMENTS.
5. PATHWAYS SHOWN ARE DEDICATED FOR TELECOMMUNICATIONS CABLING ONLY, UON.
6. NEATLY BUNDLE (DRESS CABLE LONGITUDINALLY) AND SUPPORT (USING FASTENERS AND TIES DESCRIBED IN SPECS AND DRAWINGS) TELECOMMUNICATIONS CABLES ONTO OVERHEAD CABLE TRAY OR RUNWAY. NEATLY BUNDLE AND SUPPORT TELECOMMUNICATIONS CABLES ONTO VERTICALLY MOUNTED CABLES RUNWAY WHEN RISING FROM FLOOR SLEEVES OR DESCENDING FROM CEILING SLEEVES USING APPROVED TIES. NEATLY BUNDLE TELECOMMUNICATIONS CABLES INTO THE BACK OF THE VERTICAL CABLE MANAGEMENT SECTIONS USING APPROVED TIES. DRESS TELECOMMUNICATIONS CABLES FROM THE VERTICAL MANAGEMENT SECTIONS TO THE TERMINATION POSITION. MAXIMUM BUNDLE SIZE: 24 CABLES.
7. RACK LAYOUTS SHALL BE REVIEWED AND APPROVED BY CLPCDD DISTRICT ITS AND TEECOM PRIOR TO ANY DRILLING OF CONCRETE FOR THE ANCHORING OF RACKS.
8. REFER TO STRUCTURAL DRAWININGS B&LL/S-501 FOR RACK AND CABINET ANCHORAGE DETAILS.
9. REFER TO STRUCTURAL DRAWINGS 5&6/S-502 FOR OVERHEAD RUNWAY BRACING DETAILS.

SYMBOL LEGEND



TR EQUIPMENT LIST

ID	DESCRIPTION
T04	FIBER RUNNER 6X4 TEE
T07	24"W X 1-1/2"H OVERHEAD CABLE RUNWAY
T08	FIBER RUNNER 6X4 CROSS
T09	FIBER RUNNER 6X4 SPILL-OUT
T10	FIBER RUNNER 6X4 END CAP
T12	24"W RUNWAY END KIT
T14	2-POST RACK, 19"W X 3"D X 84"H
T16	2-POST RACK, XLBET, 23"W X 6"D X 84"H
T17	FIBER RUNNER VERTICAL TEE
T18	4-POST RACK, 19"W X 36"D X 84"H
T20	SERVER CABINET, 31.5"W X 48"D X 84"H
T22	6" DOUBLE SIDED VERTICAL WIRE MANAGER
T23	CABLE RUNWAY DROP-OUT
T24	8" DOUBLE SIDED VERTICAL WIRE MANAGER
T25	12" DOUBLE SIDED VERTICAL WIRE MANAGER
T26	6"W X 4"H FIBER RUNNER, MOUNTED ABOVE OVERHEAD RUNWAY
T28	GROUND BUSBAR AT 100" TO CENTER AFF
T35	36"W X 12"H X 3/4" D FIRE RATED PLYWOOD AT 92" TO CENTER AFF
T36	36"W X 24"H X 3/4" D FIRE RATED PLYWOOD AT 92" TO CENTER AFF
T37	4' W X 8'D X 3/4"D FIRE RATED PLYWOOD WITH BOTTOM AT 6" AFF
T38	3' W X 8'D X 3/4"D FIRE RATED PLYWOOD WITH BOTTOM AT 6" AFF

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PROFESSIONAL STAMP:

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REGISTERED PROFESSIONAL ENGINEER LARRY A. ANDERSON No. 17587 ELECTRICAL STATE OF CALIFORNIA

Date Sealed 11/07/2019

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KEY PLAN:

NORTH

CHABOT COLLEGE

NEW MPOE AT CHABOT CAMPUS BLDG. 300

25555 Hesperian Blvd
Hayward, CA 94545
VOLUME 1

ENLARGED ROOM PLAN - MPOE

DRAWN BY: RM CHECKED BY: DM
DATE: 11/07/2019 **PROJECT NO: C9506**
SHEET NO:

T-400

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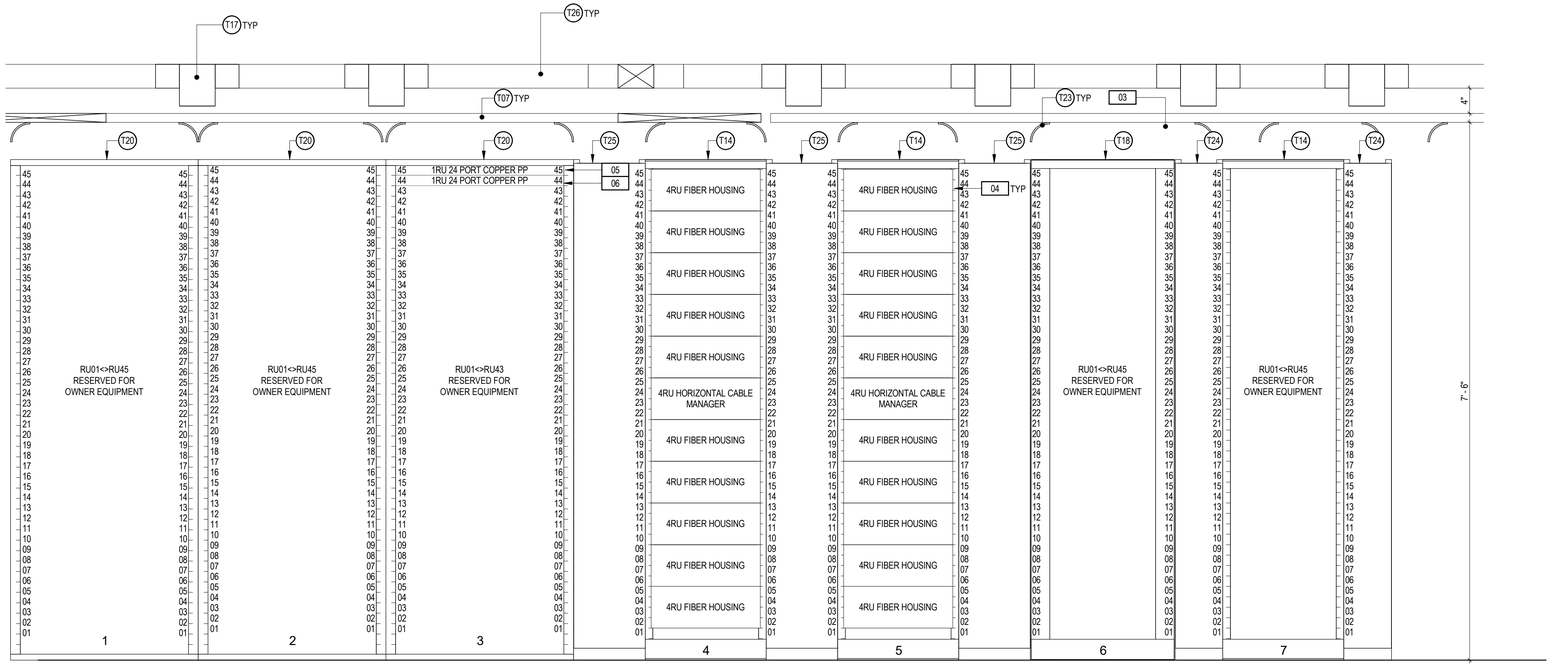
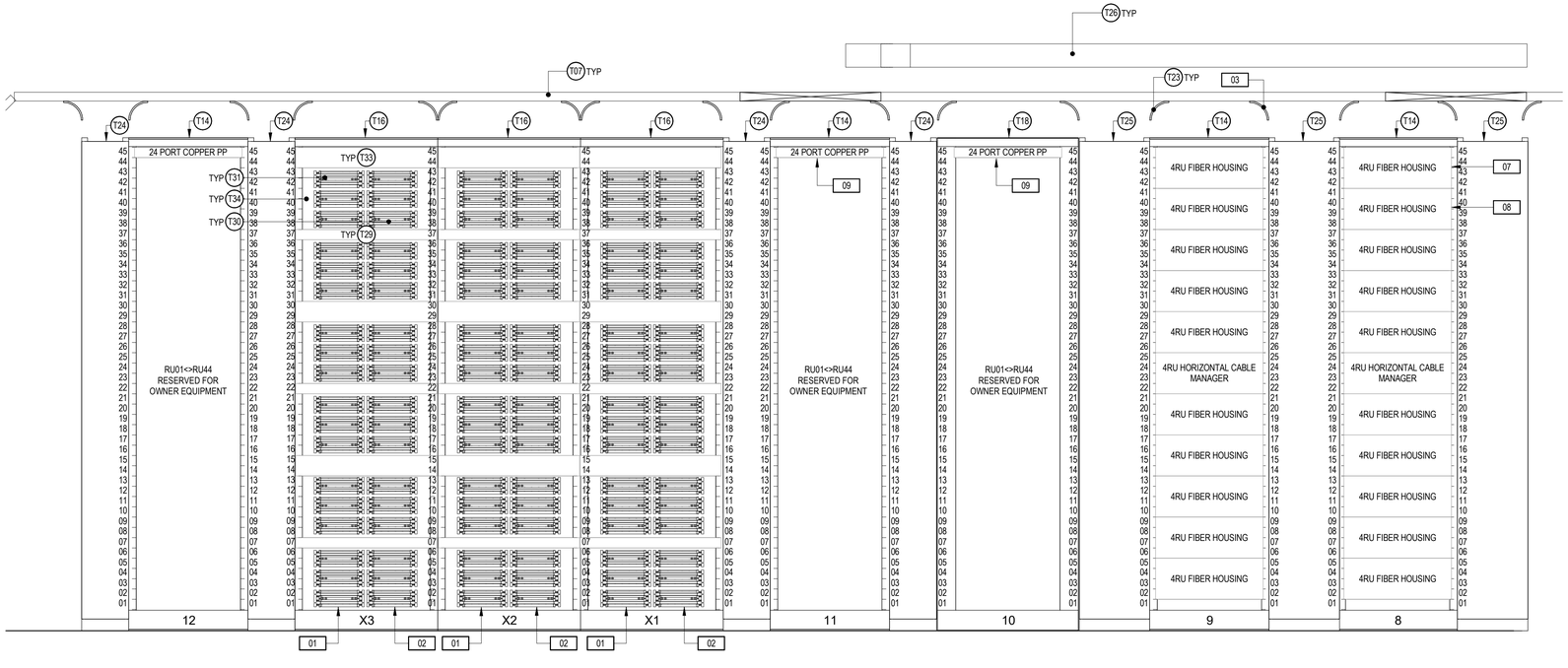


1 MPOE RACK ELEVATION-WEST

SCALE: 1" = 1'-0"



2 MPOE RACK ELEVATION-EAST

SCALE: 1" = 1'-0"

SHEET NOTES

1. PROVIDE RADIUS DROP OUTS WHERE CABLES TRANSITION DOWNWARD FROM OVERHEAD HORIZONTAL CABLE TRAY.
2. LABEL RACKS AND PATCH PANELS.
3. PATHWAYS SHOWN ARE DEDICATED FOR TELECOMMUNICATIONS CABLING ONLY, UON.
4. NEATLY BUNDLE (DRESS CABLE LONGITUDINALLY) AND SUPPORT (USING FASTENERS AND TIES DESCRIBED IN SPECS AND DRAWINGS) TELECOMMUNICATIONS CABLES ONTO OVERHEAD CABLE TRAY OR RUNWAY. NEATLY BUNDLE AND SUPPORT TELECOMMUNICATIONS CABLES ONTO VERTICALLY MOUNTED CABLES RUNWAY WHEN RISING FROM FLOOR SLEEVES OR DESCENDING FROM CEILING SLEEVES USING APPROVED TIES. NEATLY BUNDLE TELECOMMUNICATIONS CABLES INTO THE BACK OF THE VERTICAL CABLE MANAGEMENT SECTIONS USING APPROVED TIES. DRESS TELECOMMUNICATIONS CABLES FROM THE VERTICAL MANAGEMENT SECTIONS TO THE TERMINATION POSITION. MAXIMUM BUNDLE SIZE: 24 CABLES.
5. THE QUANTITY OF PATCH PANELS SHOWN ON THE ELEVATIONS IS FOR REFERENCE ONLY. IT IS THE RESPONSIBILITY OF THE TELECOM CONTRACTOR TO DETERMINE THE EXACT QUANTITY OF PATCH PANELS IN EACH IDF.
6. RACK LAYOUTS SHALL BE REVIEWED AND APPROVED BY CLPCDD DISTRICT ITS AND TEECOM PRIOR TO ANY DRILLING OF CONCRETE FOR THE ANCHORING OF RACKS.

NUMBERED NOTES

01	OSP COPPER CABLE PROTECTED OUTPUT COLUMN, CONNECTS TO BUILDING ENTRANCE TERMINAL (BET) ON REAR OF RACK VIA RJ-21.
02	VOICE GATEWAY COLUMN. CONNECTS TO VOICE GATEWAYS IN ADJACENT RACKS VIA RJ-21 CABLES. CABLING TO VOICE GATEWAYS IS NOT INCLUDED IN THIS PROJECT, ONLY THE 300 PAIR PRE-WIRED 110 BLOCKS.
03	OVERHEAD RUNWAY RUNGS SHALL BE ADJUSTED SO THAT DROPOUT SPILLS DIRECTLY INTO IT'S RESPECTIVE VERTICAL CABLE MANAGER.
04	EACH 4RU FIBER HOUSING TO BE EQUIPPED WITH (16) 360DP-SC-6SC (NON SHUTTERED) SINGLEMODE FIBER ADAPTER PACKS.
05	(24) CAT6A UTP COPPER CABLES, MPOE<>DAS RACK 14.
06	(24) CAT6A UTP COPPER CABLES, MPOE<>DAS RACK 17.
07	96-STRAND SINGLEMODE FIBER OPTIC CABLE, MPOE<>MDF RACK TBD.
08	96-STRAND SINGLEMODE FIBER OPTIC CABLE, MPOE<>MDF RACK TBD.
09	COPPER PATCH PANEL WILL BE INSTALLED ON THE REAR OF THE RACK.

TR EQUIPMENT LIST

ID	DESCRIPTION
T07	24"W X 1-1/2"H OVERHEAD CABLE RUNWAY
T14	2-POST RACK, 19"W X 3"D X 84"H
T16	2-POST RACK, XLBET, 23"W X 6"D X 84"H
T17	FIBER RUNNER VERTICAL TEE
T18	4-POST RACK, 19"W X 36"D X 84"H
T20	SERVER CABINET, 31.5"W X 48"D X 84"H
T23	CABLE RUNWAY DROP-OUT
T24	8" DOUBLE SIDED VERTICAL WIRE MANAGER
T25	12" DOUBLE SIDED VERTICAL WIRE MANAGER
T26	6"W X 4"H FIBER RUNNER, MOUNTED ABOVE OVERHEAD RUNWAY
T29	SMALL X-CONNECT WIRE MANAGEMENT
T30	300-PAIR, 110 PRE-WIRED, 2.5' CABLE, RJ-21 MALE
T31	300 PAIR, 110 PRE-WIRED, 1' CABLE, RJ-21 FEMALE
T33	LARGE X-CONNECT WIRE MANAGEMENT
T34	23" WIDE MOUNTING BAR FOR 300-PAIR 110 BLOCKS

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PROFESSIONAL STAMP:

LICENSED ARCHITECT ANNA T. WIN C 23260 Exp: Apr.30, 2019 STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER LARRY A. ANDERSON No. 17587 ELECTRICAL STATE OF CALIFORNIA

Date Sealed 11/07/2019

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KEY PLAN:

NORTH

CHABOT COLLEGE

NEW MPOE AT CHABOT CAMPUS BLDG. 300

25555 Hesperian Blvd
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VOLUME 1

ROOM ELEVATIONS-MPOE

DRAWN BY: RM CHECKED BY: DM
DATE: 11/07/2019 **PROJECT NO: C9506**
SHEET NO:

T-401

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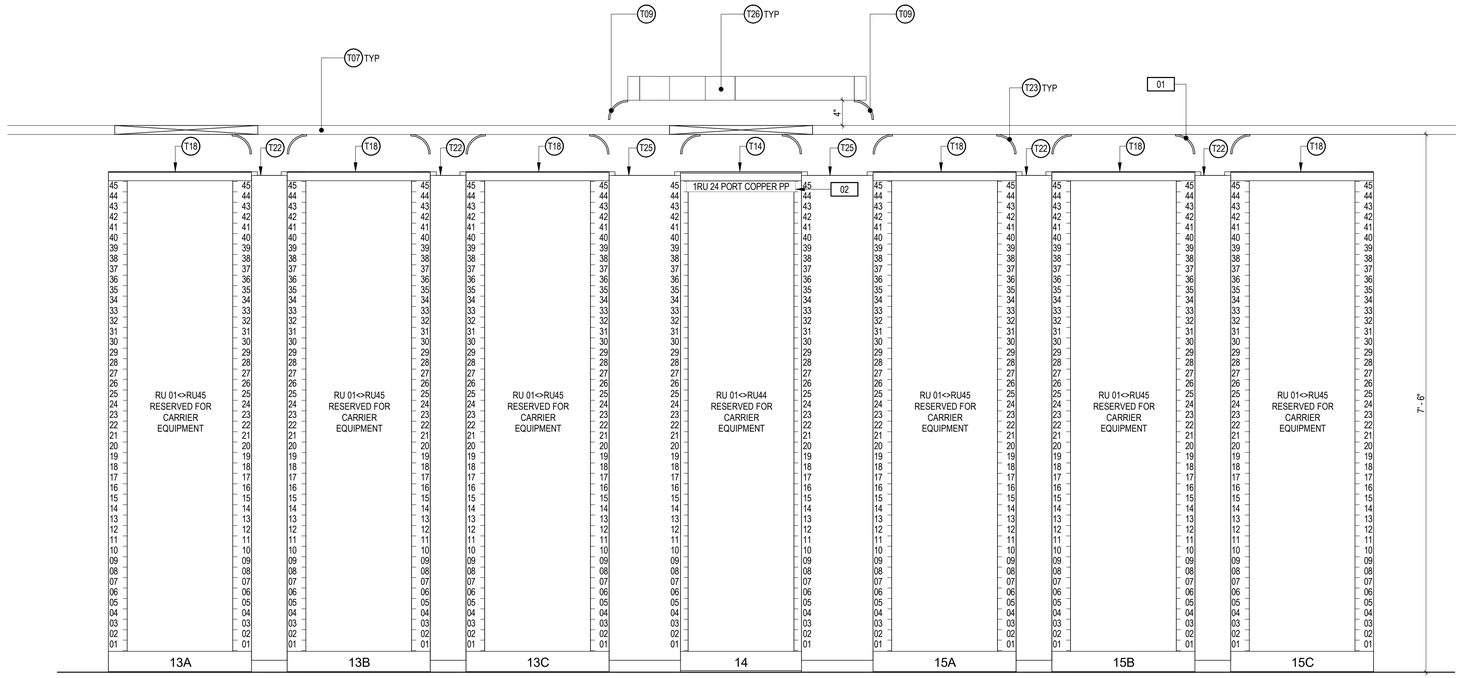
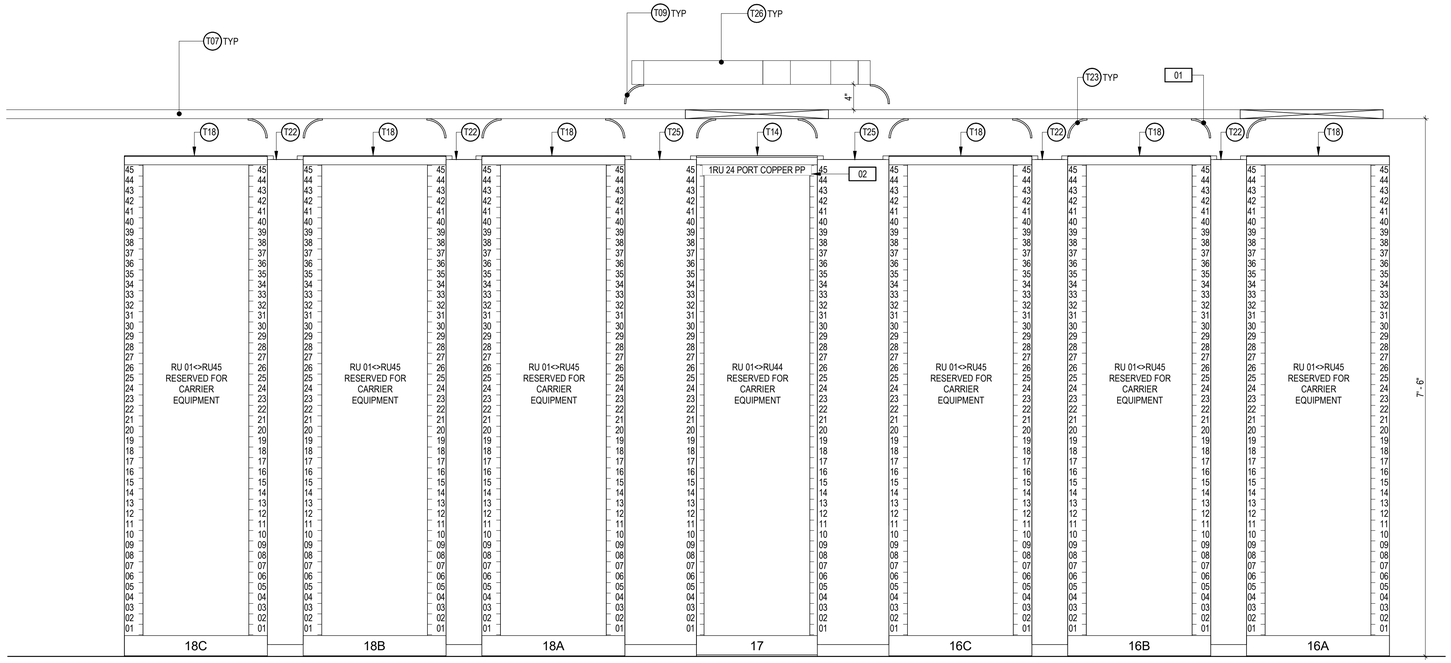


1 DAS RACK ELEVATION-WEST

SCALE: 1" = 1'-0"



2 DAS RACK ELEVATION-EAST

SCALE: 1" = 1'-0"

SHEET NOTES

1. PROVIDE RADIUS DROP OUTS WHERE CABLES TRANSITION DOWNWARD FROM OVERHEAD HORIZONTAL CABLE TRAY.
2. LABEL RACKS AND PATCH PANELS.
3. PATHWAYS SHOWN ARE DEDICATED FOR TELECOMMUNICATIONS CABLING ONLY, UON.
4. NEATLY BUNDLE (DRESS CABLE LONGITUDINALLY) AND SUPPORT (USING FASTENERS AND TIES DESCRIBED IN SPECS AND DRAWINGS) TELECOMMUNICATIONS CABLES ONTO OVERHEAD CABLE TRAY OR RUNWAY. NEATLY BUNDLE AND SUPPORT TELECOMMUNICATIONS CABLES ONTO VERTICALLY MOUNTED CABLES RUNWAY WHEN RISING FROM FLOOR SLEEVES OR DESCENDING FROM CEILING SLEEVES USING APPROVED TIES. NEATLY BUNDLE TELECOMMUNICATIONS CABLES INTO THE BACK OF THE VERTICAL CABLE MANAGEMENT SECTIONS USING APPROVED TIES. DRESS TELECOMMUNICATIONS CABLES FROM THE VERTICAL MANAGEMENT SECTIONS TO THE TERMINATION POSITION. MAXIMUM BUNDLE SIZE: 24 CABLES.
5. THE QUANTITY OF PATCH PANELS SHOWN ON THE ELEVATIONS IS FOR REFERENCE ONLY. IT IS THE RESPONSIBILITY OF THE TELECOM CONTRACTOR TO DETERMINE THE EXACT QUANTITY OF PATCH PANELS IN EACH IDF.
6. RACK LAYOUTS SHALL BE REVIEWED AND APPROVED BY CLPCDD DISTRICT ITS AND TEECOM PRIOR TO ANY DRILLING OF CONCRETE FOR THE ANCHORING OF RACKS.

NUMBERED NOTES

01	OVERHEAD RUNWAY RUNGS SHALL BE ADJUSTED SO THAT DROPOUT SPILLS DIRECTLY INTO IT'S RESPECTIVE VERTICAL CABLE MANAGER.OVERHEAD RUNWAY RUNGS SHALL BE ADJUSTED SO THAT DROPOUT SPILLS DIRECTLY INTO IT'S RESPECTIVE VERTICAL CABLE MANAGER.
02	(24) CAT6A UTP COPPER CABLES, DAS<>MPOE, CABINET 3.

TR EQUIPMENT LIST

ID	DESCRIPTION
T07	24"W X 1-1/2"H OVERHEAD CABLE RUNWAY
T09	FIBER RUNNER 6X4 SPILL-OUT
T14	2-POST RACK, 19"W X 3"D X 84"H
T18	4-POST RACK, 19"W X 36"D X 84"H
T22	6" DOUBLE SIDED VERTICAL WIRE MANAGER
T23	CABLE RUNWAY DROP-OUT
T25	12" DOUBLE SIDED VERTICAL WIRE MANAGER
T26	6"W X 4"H FIBER RUNNER, MOUNTED ABOVE OVERHEAD RUNWAY

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APP. 01-118445 INC:
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DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

LICENSED ARCHITECT ANNA T. WIN C 23260 Exp. Apr.30, 2019 STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER LARRY A. ANDERSON No. 17587 ELECTRICAL STATE OF CALIFORNIA

Date Sealed 11/07/2019

CONSULTANT:

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ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

NORTH

CHABOT COLLEGE

NEW MPOE AT CHABOT CAMPUS BLDG. 300

25555 Hesperian Blvd
Hayward, CA 94545
VOLUME 1

ROOM ELEVATIONS-DAS

DRAWN BY: RM CHECKED BY: DM
DATE: 11/07/2019 **PROJECT NO: C9506**
SHEET NO:

T-402

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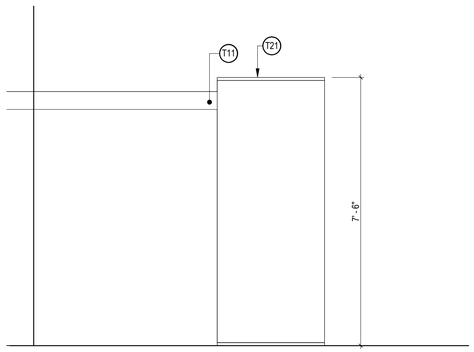
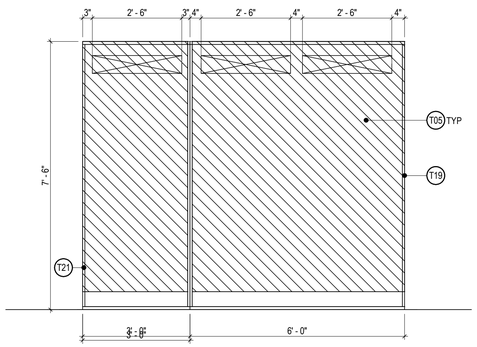
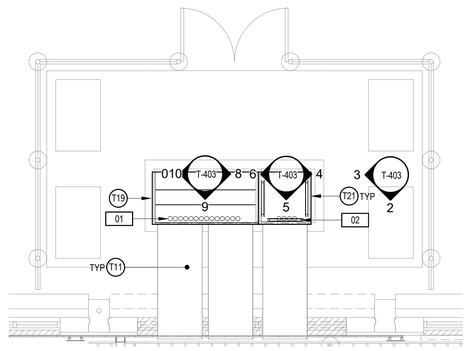


3 OSP CAN ELEVATION
SCALE: 1/2" = 1'-0"



2 OSP CAN ELEVATION
SCALE: 1/2" = 1'-0"



1 REFERENCE PLAN
SCALE: 1/4" = 1'-0"

SHEET NOTES

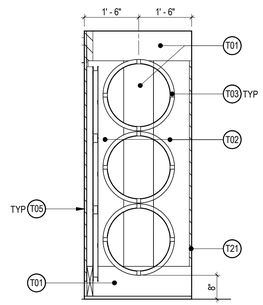
1. PROVIDE BACKBOARDS ON WALLS AND CEILINGS OF BOTH OSP CANS. MASK FIRE RATING STAMP PRIOR TO PAINTING. USE FLUSH FASTENERS FOR MOUNTING PLYWOOD.
2. COORDINATE EXACT LAYOUT OF WIRE BASKET TRAY AND CABLE SERVICE LOOP RINGS WITH TEECOM PRIOR TO PROVISION AND INSTALLATION.
3. ALL WIRE BASKET TRAY SHALL BE INSTALLED WITH THE BOTTOM OF THE TRAY FACING OUTWARDS. ATTACH TOP OF TRAY DIRECTLY TO PLYWOOD.
4. CABLE SERVICE LOOP RINGS SHALL BE INSTALLED TO PLYWOOD THROUGH BASKET TRAY WITH FASTENER.
5. PATHWAYS SHOWN ARE DEDICATED FOR TELECOMMUNICATIONS CABLING ONLY, UON.

NUMBERED NOTES

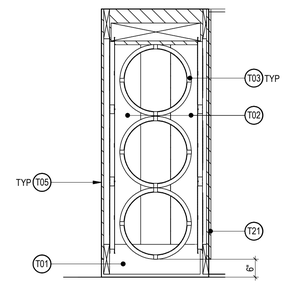
01	(14) 4" CONDUITS TO NEAREST OSP VAULT, FOR OWNER PROVIDED CABLING.
02	(4) 4" CONDUITS TO NEAREST OSP VAULT, FOR SERVICE PROVIDER CABLING.

TR EQUIPMENT LIST

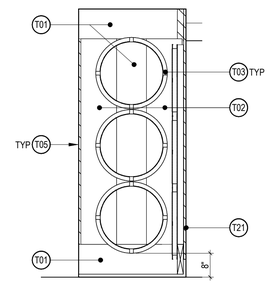
ID	DESCRIPTION
T01	10"W X 2"D WIRE BASKET TRAY
T02	12"W X 2"D WIRE BASKET TRAY
T03	24" CABLE SERVICE LOOP RING
T05	3/4" FIRE RATED PLYWOOD
T06	18"W X 2"D WIRE BASKET TRAY
T11	30"W X 72"L X 6"H CABLE TROUGH, SED FOR DETAILS
T19	72"W X 36"D X 90"H OSP CAN, SED FOR DETAILS
T21	36"W X 36"D X 90"H OSP CAN, SED FOR DETAILS



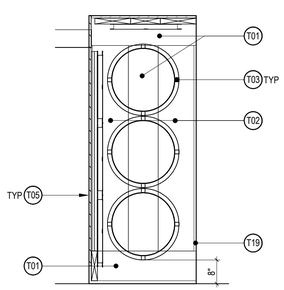
6 36"W OSP CAN WEST ELEVATION
SCALE: 1/2" = 1'-0"



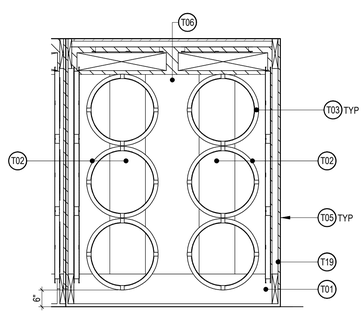
5 36"W OSP CAN SOUTH ELEVATION
SCALE: 1/2" = 1'-0"



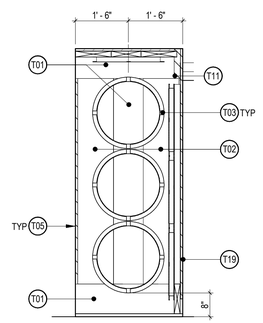
4 36"W OSP CAN EAST ELEVATION
SCALE: 1/2" = 1'-0"



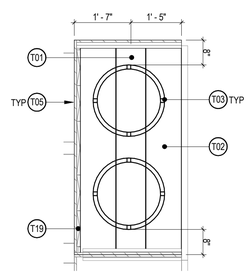
010 72"W OSP CAN WEST ELEVATION
SCALE: 1/2" = 1'-0"



9 72"W OSP CAN SOUTH ELEVATION
SCALE: 1/2" = 1'-0"



8 72"W OSP CAN EAST ELEVATION
SCALE: 1/2" = 1'-0"



7 72" W OSP CAN CEILING ELEVATION
SCALE: 1/2"=1'-0"

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PROFESSIONAL STAMP:

LICENSED ARCHITECT ANNA T. WIN C 23260 Exp. Apr 30, 2019 STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER LARRY A. ANDERSON No. 17587 ELECTRICAL STATE OF CALIFORNIA

Date Sealed
11/07/2019

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KEY PLAN:

NORTH

CHABOT COLLEGE

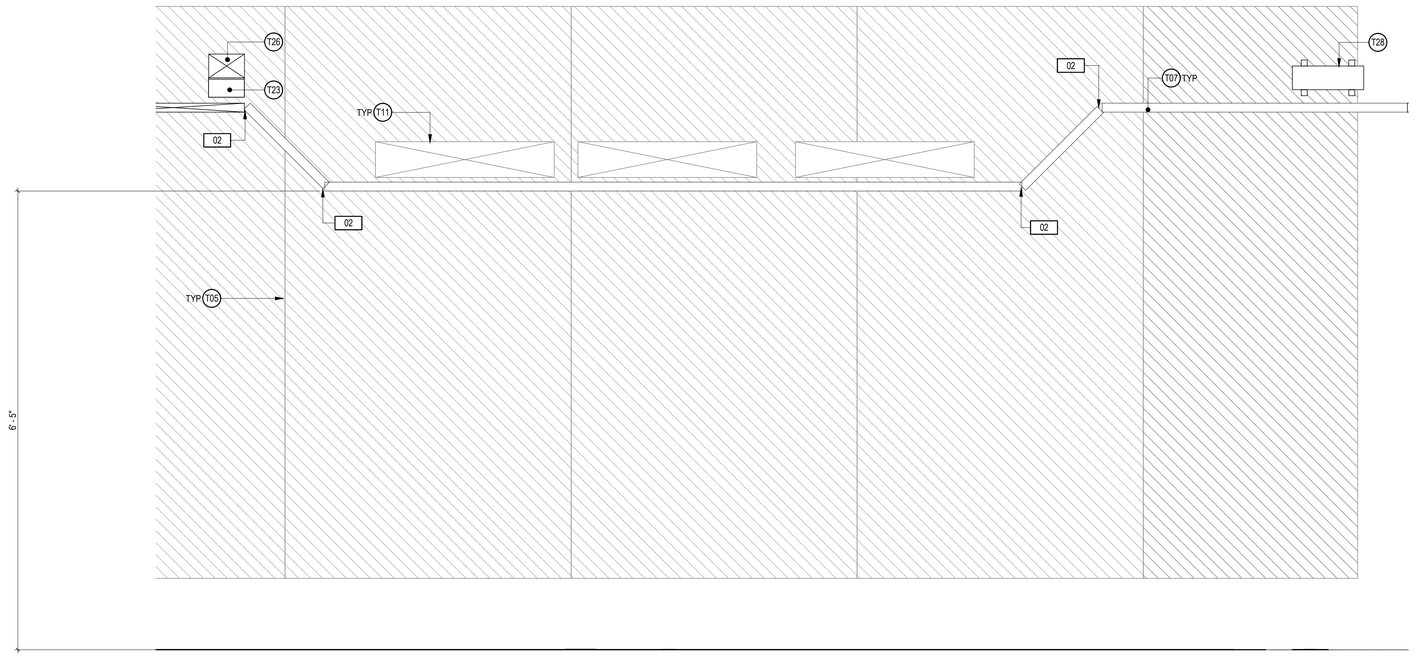
NEW MPOE AT CHABOT CAMPUS BLDG. 300

25555 Hesperian Blvd
Hayward, CA 94545
VOLUME 1

ENLARGED ROOM PLAN & ROOM ELEVATIONS-OSP

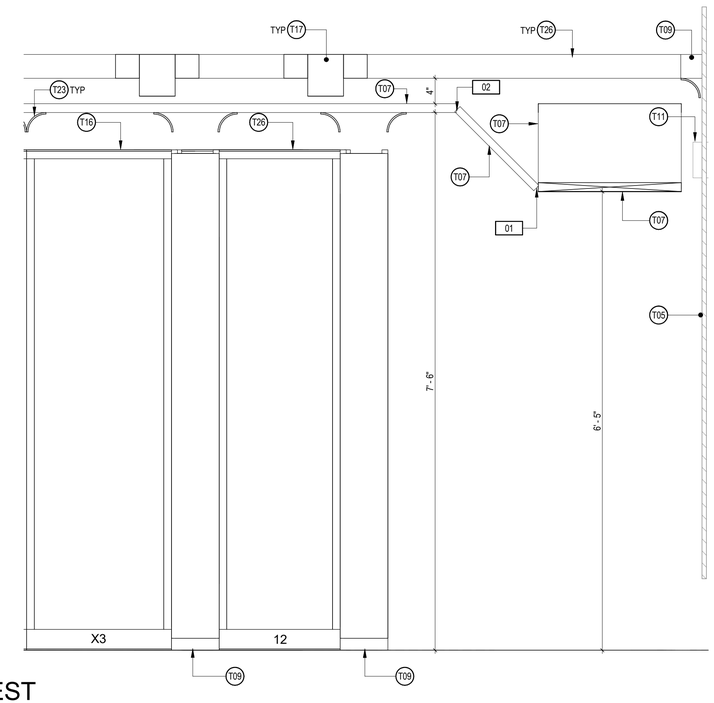
DRAWN BY: RM | CHECKED BY: DM
DATE: 11/07/2019 | **PROJECT NO: C9506**
SHEET NO:

T-403



1 MPOE OVERHEAD RUNWAY ELEVATION-NORTH

SCALE: 1" = 1'-0"



2 MPOE RACK/OVERHEAD RUNWAY-WEST

SCALE: 1" = 1'-0"

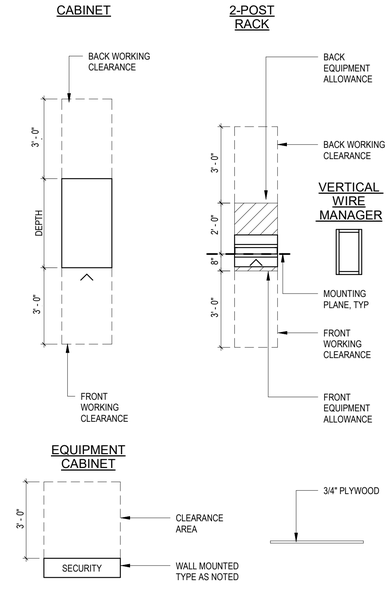
SHEET NOTES

1. PATHWAYS SHOWN ARE DEDICATED FOR TELECOMMUNICATIONS CABLING ONLY, UON.
2. NEATLY BUNDLE (DRESS CABLE LONGITUDINALLY) AND SUPPORT (USING FASTENERS AND TIES DESCRIBED IN SPECS AND DRAWINGS) TELECOMMUNICATIONS CABLES ONTO OVERHEAD CABLE TRAY OR RUNWAY. NEATLY BUNDLE AND SUPPORT TELECOMMUNICATIONS CABLES ONTO VERTICALLY MOUNTED CABLES RUNWAY WHEN RISING FROM FLOOR SLEEVES OR DESCENDING FROM CEILING SLEEVES USING APPROVED TIES. NEATLY BUNDLE TELECOMMUNICATIONS CABLES INTO THE BACK OF THE VERTICAL CABLE MANAGEMENT SECTIONS USING APPROVED TIES. DRESS TELECOMMUNICATIONS CABLES FROM THE VERTICAL MANAGEMENT SECTIONS TO THE TERMINATION POSITION. MAXIMUM BUNDLE SIZE: 24 CABLES.
3. REFER TO STRUCTURAL DRAWINGS S&6/S-502 FOR OVERHEAD RUNWAY BRACING DETAILS.

NUMBERED NOTES

01	USE JUNCTION-SWIVEL SPLICE
02	USE BUTT-SWIVEL SPLICE

SYMBOL LEGEND



TR EQUIPMENT LIST

ID	DESCRIPTION
T05	3/4" FIRE RATED PLYWOOD
T07	24"W X 1-1/2"H OVERHEAD CABLE RUNWAY
T09	FIBER RUNNER 6X4 SPILL-OUT
T11	30"W X 72"L X 6"H CABLE TROUGH, SED FOR DETAILS
T16	2-POST RACK, XLBET, 23"W X 6'D X 84"H
T17	FIBER RUNNER VERTICAL TEE
T23	CABLE RUNWAY DROP-OUT
T26	6"W X 4"H FIBER RUNNER, MOUNTED ABOVE OVERHEAD RUNWAY
T28	GROUND BUSBAR AT 100" TO CENTER AFF

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REGISTERED PROFESSIONAL ENGINEER LARRY A. ANDERSON No. 17587 ELECTRICAL STATE OF CALIFORNIA

Date Sealed 11/07/2019

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KEY PLAN:

NORTH

CHABOT COLLEGE

NEW MPOE AT CHABOT CAMPUS BLDG. 300

25555 Hesperian Blvd
Hayward, CA 94545
VOLUME 1

ROOM ELEVATIONS

DRAWN BY: RM CHECKED BY: DM

DATE: 11/07/2019 **PROJECT NO: C9506**

SHEET NO:

T-404

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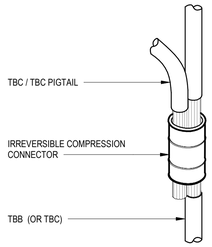
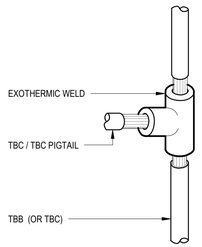
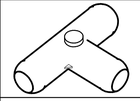
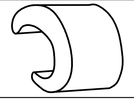
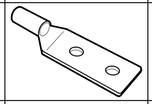
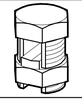
OPTION 1: MECHANICAL



OPTION 2: WELD



APPROVED BONDING CONNECTION TYPES

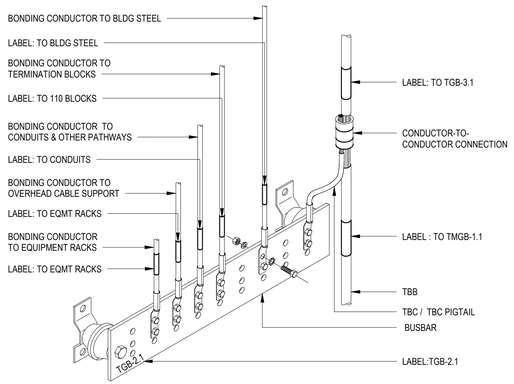
CONNECTION	EXOTHERMIC WELD	IRREVERSIBLE COMPRESSION CONNECTION	COMPRESSION TWO HOLE LUG	SPLIT BOLD CONNECTOR
				
CONDUCTOR-TO-CONDUCTOR	APPROVED	APPROVED	NOT APPROVED	NOT APPROVED
CONDUCTOR-TO-RACK	NOT APPROVED	NOT APPROVED	APPROVED	NOT APPROVED
CONDUCTOR-TO-EQUIPMENT	NOT APPROVED	NOT APPROVED	APPROVED	NOT APPROVED
CONDUCTOR-TO-CONDUIT	NOT APPROVED	NOT APPROVED	NOT APPROVED	NOT APPROVED
CONDUCTOR-TO-WIRE MESH CABLE TRAY	APPROVED	APPROVED	NOT APPROVED	APPROVED
CONDUCTOR-TO-BUILDING STEEL	APPROVED	NOT APPROVED	NOT APPROVED	NOT APPROVED
CONDUCTOR-TO-BINDING POST	NOT APPROVED	NOT APPROVED	APPROVED (1-HOLE LUG APPROVED)	NOT APPROVED

SHEET NOTES

1. THIS SHEET DEPICTS CONNECTION REQUIREMENTS FOR INFRASTRUCTURE BONDING. REFER TO T012 FOR PER-ROOM BONDING REQUIREMENTS.
2. DO NOT ROUTE TBC CONDUCTORS THROUGH CABLE TRAY, CABLE RUNWAY, OR OTHER METALLIC ELEMENTS THAT FULLY ENCIRCLE THE CONDUCTOR.
3. REMOVE PAINT AT CONNECTION POINTS TO ENSURE METAL-ON-METAL CONTACT.
4. PROVIDE TOOTH WASHERS WITH FASTENING HARDWARE TO IMPROVE METAL-TO-METAL CONTACT.
5. IF A SURFACE IS NOT ELECTRO-TIN PLATED, APPLY ANTI-OXIDANT COMPOUND AT THE CONNECTION POINT TO COVER CONTACT AREA.
6. PROVIDE UL CLASSIFIED SPLICES AND FITTING PIECES AT RUNWAY AND TRAY JUNCTIONS. OTHERWISE, PROVIDE BONDING JUMPERS AT EACH JUNCTION TO ATTAIN A UL CLASSIFIED SYSTEM (ASSEMBLED PARTS).

2 CONDUCTOR-TO-CONDUCTOR CONNECTION

SCALE: NONE



NOTE:
1. REFER TO ROOM PLANS FOR BUSBAR MOUNTING LOCATION.
2. REFER TO GROUNDING RISER DIAGRAM FOR LIST OF EQUIPMENT REQUIRING GROUNDING. ITEMS AND LABELING SHOWN HERE ARE AN EXAMPLE.

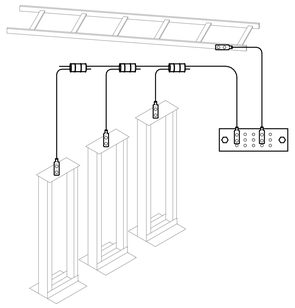
4 BUSBAR LABELING EXAMPLE

SCALE: NONE

1 APPROVED BONDING CONNECTION TYPES

SCALE: NONE

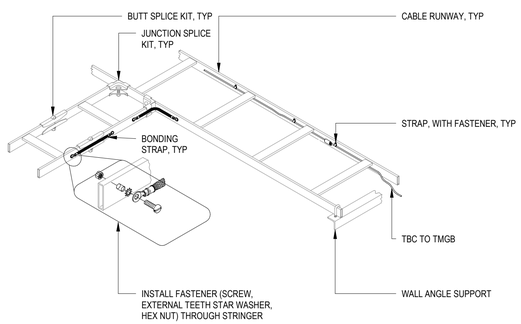
OPTION 1 (PREFERRED): TBC STRING BETWEEN RACKS AND TGB, AND BETWEEN OVERHEAD CABLE SUPPORT AND TGB



NOTE:
1. THESE APPROVED CONFIGURATIONS APPLY TO EQUIPMENT RACKS AND CABINETS, AND TO CABLE TRAY AND RUNWAY (AS OVERHEAD CABLE SUPPORT).

3 EQUIPMENT RACK BAY AND OVERHEAD CABLE SUPPORT BONDING CONFIGURATIONS

SCALE: NONE



NOTES:
1. FASTENER FOR STRAP SHALL CONSIST OF SELF-TAPPING SCREW WITH LOCK WASHER. FASTENER LENGTH SHALL NOT IMPEDE ON OPPOSITE SIDE OF STRINGER.

5 BONDING - RUNWAY

SCALE: NONE

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VOLUME 1

BONDING DETAILS

DRAWN BY: RM CHECKED BY: DM
DATE: 11/07/2019 **PROJECT NO: C9506**
SHEET NO:

T-500

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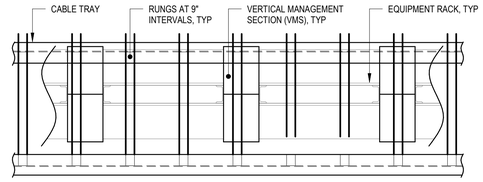
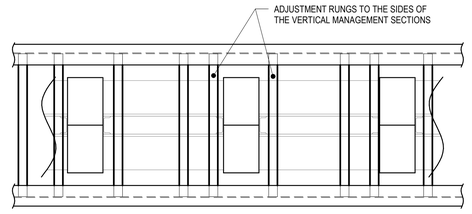


CABLE TRAY OVER BAY BEFORE RUNG ADJUSTMENT



CABLE TRAY OVER RACK BAY AFTER RUNG ADJUSTMENT

1 CABLE TRAY ALIGNMENT TO VMS

SCALE: NONE

DSA:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 01-118445 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 12/19/2019

ATI ARCHITECTS + ENGINEERS
4750 Willow Road #250 Pleasanton, CA 94588 - T 925.648.8800
3009 Douglas Blvd #290 Roseville, CA 95661 - T 916.772.1800
3050 Pullman Street Costa Mesa, CA 92626 - T 714.338.1600

PROFESSIONAL STAMP:

LICENSED ARCHITECT ANNA T. WIN C 23260 Exp: Apr.30, 2019 STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER LARRY A. ANDERSON No. 17587 ELECTRICAL STATE OF CALIFORNIA

Date Sealed
11/07/2019

CONSULTANT:

TEECOM
1333 Broadway
Suite 601
Oakland, CA
94612
(510) 337 2800
www.teecom.com

ITEM:	REVISION / ISSUE:	DATE:

KEY PLAN:

NORTH

CHABOT COLLEGE

NEW MPOE AT CHABOT CAMPUS BLDG. 300

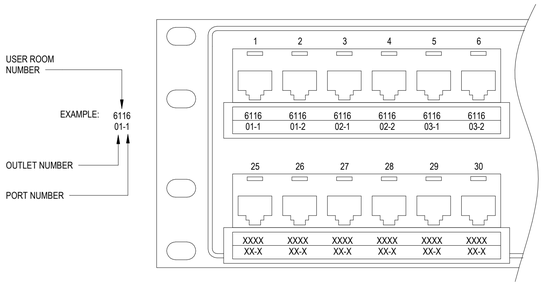
25555 Hesperian Blvd
Hayward, CA 94545
VOLUME 1

INSTALLATION DETAILS

DRAWN BY: RM CHECKED BY: DM
DATE: 11/07/2019 **PROJECT NO: C9506**
SHEET NO:

T-501

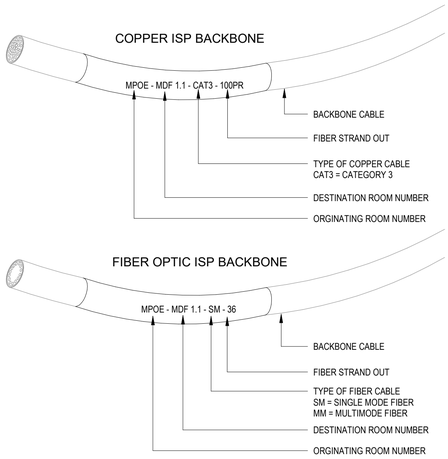
11/7/2019 2:46:06 PM C:\Users\ryan.meek\Documents\Revit 2017 Projects\19059 T Central_ryan.meek6R4TM.rvt



NOTES:
1. ROOM NUMBER SHOWN HERE AS EXAMPLE. REFER TO ARCHITECTURAL PLANS FOR PROJECT ROOM NUMBERS.
2. PATCH PANEL SHOWN MAY NOT REFLECT ACTUAL PRODUCT SPECIFIED FOR THIS PROJECT.

3 LABELING - PATCH PANEL

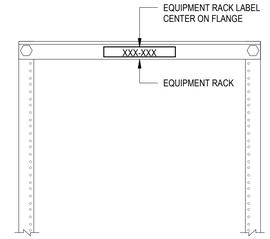
SCALE: NONE



NOTES:
1. ROOM NUMBER SHOWN HERE AS EXAMPLE. REFER TO ARCHITECTURAL PLANS FOR PROJECT ROOM NUMBERS.
2. MODULAR CONNECTOR SHOWN FOR CLARITY ONLY, AND MAY NOT REFLECT ACTUAL CONNECTOR SPECIFIED FOR THIS PROJECT.

2 LABELING - CABLE FORMAT (BOTH ENDS)

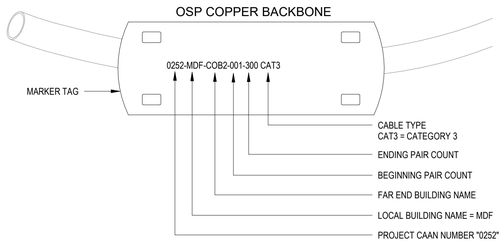
SCALE: NONE



FRONT VIEW

1 LABELING - EQUIPMENT RACK

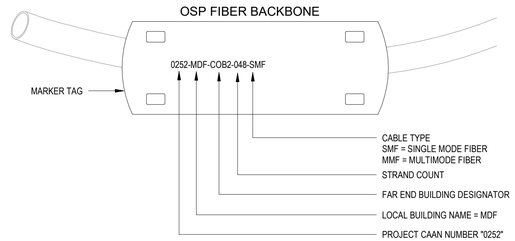
SCALE: NONE



NOTES:
1. LABEL BOTH ENDS OF BACKBONE CABLES AND IN EACH ROOM IN WHICH THE CABLE ROUTES THROUGH.
2. ROOM NUMBERS SHOWN IN DETAIL ARE AN EXAMPLE AND MAY NOT REFLECT ACTUAL ROOM NUMBERS.

5 LABELING - COPPER BACKBONE CABLES

SCALE: NONE



NOTES:
1. LABEL BOTH ENDS OF BACKBONE CABLES AND IN EACH ROOM IN WHICH THE CABLE ROUTES THROUGH.
2. ROOM NUMBERS SHOWN IN DETAIL ARE AN EXAMPLE AND MAY NOT REFLECT ACTUAL ROOM NUMBERS.

4 LABELING - FIBER BACKBONE CABLES

SCALE: NONE

SHEET NOTES

1. LABELING EXAMPLES BELOW ARE FOR PRICING PURPOSES ONLY. CLPCCD ITS WILL PROVIDE EXAMPLES OF EXACTLY WHAT AND HOW THEY WANT ITEMS LABELED.

DSA:

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LABELING DETAILS

DRAWN BY: RM CHECKED BY: DM
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SHEET NO:

T-503

11/7/2019 2:46:06 PM C:\Users\ryan.meek\Documents\Revit 2017 Projects\19099 T Central_ryan.meek@RATTM.rvt