



**CHABOT – LAS POSITAS
COMMUNITY COLLEGE DISTRICT**

Facilities Planning & Management Department

April 11, 2011

**Addendum No. 2
INVITATION FOR BID NO.: 11-01
Chabot College Physical Education Complex Alterations
Buildings 2500-2900**

All Prospective Bidders:

This Addendum modifies the original Bid Documents for the above Bid. Acknowledge receipt of this addendum in the space provided on the BID PROPOSAL FORM. Failure to do so may subject Bidder to disqualification.

The original Bid Documents are modified by the revision as follows:

- A. **Work described in this addendum is to be of the same quality as specified in the original documents.**
- B. **ADDENDUM DRAWINGS** (8-1/2X11 unless noted otherwise)

ARCHITECTURAL

AD.1	GENERAL INFORMATION (30x42)
AD.2	PROJECT PHASING DIAGRAMS (11x17)
AD.3	PROJECT PHASING DIAGRAMS
AD.4	PROJECT PHASING DIAGRAMS
AD.5	PROJECT PHASING DIAGRAMS (11x17)
AD.6	PROJECT PHASING DIAGRAMS (11x17)
AD.7	1/2.A2.4 2800A FLOOR PLAN - NORTH
AD.8	1/3.A2.1 2900B REF. CLG. PLAN
AD.9	1/5.A2.1 2600A FLOOR PLAN
AD.10	1/3.A2.1 2900C FLOOR PLAN
AD.11	1/3.A2.1 2900C FLOOR PLAN (11x17)
AD.12	2/3.A2.1 2900C REF CLG. PLAN (11x17)
AD.13	2/3.A2.1 2900C REF CLG. PLAN
AD.14	1/5.A2.2 2700C FLOOR PLAN
AD.15	5/A5.5 BACKBOARD ANCHORAGE
AD.16	8/A5.5 BACKBOARD ANCHORAGE
AD.17	3A/A6.2.1 MEN'S TOILET 2621
AD.18	3C,D/A6.2.1 MEN'S TOILET 2621
AD.19	3E,F/A6.2.1 MEN'S TOILET 2621
AD.20	5A/A6.3 ADAPTIVE PE 2704

AD.21	5D/A6.3 ADAPTIVE PE 2704
AD.22	1A/A6.5.2 EXERCISE ROOM 2912
AD.23	1A/A6.5.2 EXERCISE ROOM 2912
AD.24	1B/A6.5.2 EXERCISE ROOM 2912
AD.25	1C/A6.5.2 EXERCISE ROOM 2912
AD.26	1C/A6.5.2 EXERCISE ROOM 2912
AD.27	1D/A6.5.2 EXERCISE ROOM 2912
AD.28	13/A9.7 ANGLE BRACKET

STRUCTURAL

AD.29	PHASE 1 TEMPORARY & RENOVATED FOUNDATION PLAN BLDG 2900
AD.30	PHASE 1 TEMPORARY & RENOVATED ROOF FRAMING PLAN BLDG 2900
AD.31	PHASE 1 MEZZANINE PLAN & DETAILS BLDG 2900
AD.32	PHASE 1 MEZZANINE PLAN & DETAILS BLDG 2900
AD.33	PHASE 1 MEZZANINE PLAN & DETAILS BLDG 2900 (11x17)

TELECOMMUNICATIONS

AD.34	2700C ELECTRONIC SECURITY DEVICE SCHEDULE (11x17)
AD.35	2700C ELECTRONIC SECURITY DEVICE PLAN

C. PROJECT MANUAL

1. Division 0
 - a. Section 00 01 10 TABLE OF CONTENTS
 1. Delete "10 51 13 Team Lockers" and replace with "10 51 14 Team Lockers".
2. Division 0
 - a. GENERAL CONDITIONS
 1. Article 7: Delete paragraphs 7.3.2 through 7.3.6.2.
3. Division 0
 - a. SPECIAL CONDITIONS
 1. Part 4; Item 4.1: Delete "**Seven Hundred and Thirty (730)**" and replace with "**Seven Hundred and Ninety One (791)**".
 2. Part 4; Item 4.1.1: Delete "..., as well as multiple" and replace with "and".
 3. Part 4; Item 4.2.2: Delete "... &..." and replace with "or". Delete "Contract Time" and replace with "time assigned to a Phase or Sub-Phase". Insert "for that Phase or Sub-Phase" after "achieved".
 4. Part 4; Item 4.2.3: Delete "...&..." and replace with "or". Insert "for a Phase or Sub-Phase" between "Items" and before "..., the Contractor shall". Insert "for that Phase or Sub-Phase" after "...are completed".
 5. Part 5; Delete the second and third sentences and replace with "Refer to Specification Section 01 50 00 – Temporary Facilities Subsection 1.02 Item J.1 Temporary Field Office, for specific requirements."
 6. Part 13; Item 13.1: After "Pursuant to Drawings" insert:

2600A AREA: IN 2600, INTERIOR WALLS, DOORS AND CEILINGS ARE BEING DEMOLISHED IN ORDER TO RECONFIGURE FACULTY OFFICES. SOME EXTERIOR WALL INFILL OCCURS TO FACILITATE INTERIOR RECONFIGURATION. EXTERIOR WINDOWS ARE ALSO BEING REPLACED WITHIN EXISTING OPENINGS. LARGE CENTRAL CLASSROOM WITH SLOPING FLOOR WILL BE FILLED IN TO CREATE FLAT FLOOR.

NEW ROOF WORK INCLUDES INSTALLATION OF NEW BLOCKING, STRENGTHENING OF THE CONNECTIONS OF THE ROOF TO THE TOP OF THE CONCRETE WALLS ALL AROUND, AND THE ROOF MEMBRANE. NEW FIRE SPRINKLER SYSTEM WILL BE INSTALLED AND FED FROM NEW FIRE RISER IN 2700A. ALL MECHANICAL, PLUMBING, ELECTRICAL, DATA COMMUNICATIONS, AV, SECURITY AND FIRE ALARM SYSTEMS WILL BE REPLACED.”

7. Part 13; Item 13.2: Insert the following at end of item:

2600A AREA: 2600A WILL STILL BE UNDER CONSTRUCTION THROUGH THIS PHASE.

8. Part 13; Item 13.4, Paragraph 3: Delete “...and plywood sheathing...” and replace with “..., strengthening or replacement of plywood sheathing, ...”.
9. Part 13, Item 13.4, Paragraph 3: Delete “...sheathing and...”.
10. Part 13, Item 13.4, Paragraph 4: Delete.
11. Part 13, Item 13.5, Paragraphs 1 & 2: Delete.
12. Part 13, Item 13.5, Paragraph 4: Delete “...and **2600**...”.
13. Part 13, Item 13.5: Insert at end of item:

2900 AREA: ALL PAVING LANDSCAPING AND IRRIGATION, FENCING, MONUMENTS AND GATES TO THE **NORTH OF 2900** WILL BE DONE.”

14. Part 13; Item 13.7: Delete paragraph 13.7 in its entirety and replace with revised paragraph 13.7, included with this addendum.

4. Section 01 26 00 MODIFICATION PROCEDURES

- a. Item 9: Delete.

5. Section 01 50 00 TEMPORARY FACILITIES

- a. Part 1; Item 1.02, 1: Delete paragraphs "a." and "b." and replace with the following:

“a. Field office at least 10 feet by 30 feet for exclusive use by the Inspector including

- i. One (1) plain paper commercial type copier with fax capability and the capacity to reproduce 8.5 inch by 11 inch paper, 11 inch by 17 inch paper, and ledger size paper at a rate of 65 pages per minute.
- ii. One (1) large L-shaped desk, one (1) chair, one (1) conference table sufficient for seating at least six (6) people, and a minimum of eight (8) chairs.
- iii. One (1) plan table at least 8 feet wide and suitable for review of full size drawings.
- iv. Two (2) matching file cabinets, one (1) plan rack with 12 clamps, one (1) large book

case with 3 shelves.

- v. First aid kit
 - vi. Fire extinguisher
 - vii. Digital camera, to remain with the District.
- b. Services for Inspector field offices
- i. Telephone service with two (2) lines and one (1) high speed internet connection.
 - ii. Electrical service
 - iii. Water cooler with water service
 - iv. Maintenance and service of all equipment
 - v. Trash removal and general janitorial services”
6. Section 10 51 13 TEAM LOCKERS
- a. Delete all occurrences of “10 51 13” and replace with “10 51 14”.
7. Section 23 05 50 HEATING, VENTILATING AND AIR CONDITIONING
- a. Insert this section, included with this addendum.
8. Section 26 24 13 LOW VOLTAGE DISTRIBUTION SWITCHBOARDS
- a. Insert this section, included with this addendum.

D. DRAWINGS

1. A0.2 GENERAL INFORMATION
- a. Revise per AD.1, included with this addendum.
2. A0.7 PROJECT PHASING DIAGRAMS
- a. Phase 2: Insert: “**2600 AREA:** 2600A WILL STILL BE UNDER CONSRUCTION THROUGH THIS PHASE” at end of text.
 - b. Revise per AD.2 through AD.6, included with this addendum.
3. 1.A2.03 2900B – DEMO ROOF PLAN
- a. Sheet Notes, SN.30: Delete and replace with “(E) BUILT UP ROOFING SYSTEM TO BE REMOVED. SEE STRUCTURAL FOR SHEATHING REMOVAL INFORMATION”.
 - b. Sheet Notes; SN.32: Delete “OR” and replace with “OF”.
4. 2.A2.01 2500A – DEMO FLOOR AND REFLECTED CEILING PLANS
- a. General Notes: Add, “2. TAKE EXTREME CARE TO PROTECT EXISTING FLOORING AND BLEACHERS FROM DAMAGE.”
 - b. Sheet Notes; SN.07: Insert “REMOVE (E) FINISHES AT” before “UNDERSIDE”.
 - c. Sheet Notes; SN.09: Insert “REMOVE” before “(E)”. Delete “TO REMAIN”.

- d. Sheet Notes; SN.12, Delete "REMAIN" and replace with, "TO BE REMOVED".
- 5. 2.A2.02 2500A – DEMO ROOF PLAN
 - a. Sheet Notes, SN.03: Delete "INSULATION, AND SHEATHING". Delete "SEE STRUCTURAL FOR DETAILS".
- 6. 2.A2.06 2800A – DEMO ROOF PLAN
 - a. Sheet Notes, SN.30: Delete and replace with "(E) BUILT UP ROOFING SYSTEM TO BE REMOVED. SEE STRUCTURAL FOR SHEATHING REMOVAL INFORMATION".
 - b. Sheet Notes, SN.32: Delete "OR" and replace with "OF".
- 7. 2.A2.1 2500A – FLOOR AND REFLECTED CEILING PLANS
 - a. General Notes: Add, "1. TAKE EXTREME CARE TO PROTECT EXISTING FLOORING AND BLEACHERS FROM DAMAGE."
 - b. Sheet Notes; SN.02: Delete, "REPAINT" and replace with "REPAIR". Delete "BEHIND DRINKING FOUNTAIN TO MATCH EXISTING" and replace with "AT DRINKING FOUNTAIN DEMO".
 - c. Sheet Notes; SN.08: Insert, "UNDERSIDE OF" between "(E)" and "MECHANICAL ENCLOSURE".
- 8. 2.A2.4 2800A FLOOR PLANS
 - a. Revise detail 1 per AD.7, included with this addendum.
- 9. 3.A2.01 2900C – DEMO FLOOR AND REFLECTED CEILING PLANS
 - a. Sheet Notes; SN.07: Insert, "CONCRETE" between "DEMO" and "EXISTING".
- 10. 3.A2.02 2900C – DEMO ROOF PLAN
 - a. Sheet Notes, SN.30: Delete and replace with "(E) BUILT UP ROOFING SYSTEM TO BE REMOVED. SEE STRUCTURAL FOR SHEATHING REMOVAL INFORMATION".
 - b. Sheet Notes; SN.32: Delete "OR" and replace with "OF".
- 11. 3.A2.1 2900C – FLOOR AND REFLECTED CEILING PLANS
 - a. Sheet Notes; SN.03: Delete "NOT USED" and replace with "OUTLINE OF SKYLIGHT ABOVE".
 - b. Detail 1: Delete all instances of "SN.03" in rooms 2906 and 2907. Delete both instances of "SN.03" between gridlines 46 and 47.
 - c. Sheet Notes; SN.40: Delete "...ON SWING ARM ABOVE, TYP."
 - d. Revise detail 1 per AD.8, AD.10 and AD.11, included with this addendum.
 - e. Revise detail 2 per AD.12 and AD.13, included with this addendum.
- 12. 4.A2.02 2700B – DEMO ROOF PLAN
 - a. Sheet Notes; SN.32: Delete "OR" and replace with "OF".
 - b. Sheet Notes: Add "SN.34 (E) SINGLE PLY ROOFING SYSTEM TO BE REMOVED.

SEE STRUCTURAL FOR SHEATHING REMOVAL INFORMATION".

- c. Detail 1: Delete all instances of "SN.30" and replace with "SN.34".
13. 5.A2.01 2600A - DEMO FLOOR, REFLECTED CEILING AND ROOF PLANS
- a. Sheet Notes; Add: "SN.34 (E) SINGLE PLY ROOFING SYSTEM TO BE REMOVED. SEE STRUCTURAL FOR SHEATHING REMOVAL INFORMATION".
 - b. Detail 1: Delete all instances of "SN.30" and replace with "SN.34".
14. 5.A2.02 2700C - DEMO FLOOR, REFLECTED CEILING AND ROOF PLANS
- a. Sheet Notes; Add: "SN.34 (E) SINGLE PLY ROOFING SYSTEM TO BE REMOVED. SEE STRUCTURAL FOR SHEATHING REMOVAL INFORMATION".
 - b. Detail 1: Delete all instances of "SN.30" and replace with "SN.34".
15. 5.A2.1 2600A FLOOR, REFLECTED CEILING AND ROOF PLANS
- a. Revise detail 1 per AD.9, included with this addendum.
16. 5A2.2 2700C FLOOR, REFLECTED CEILING AND ROOF PLANS
- a. Revise detail 1 per AD.14, included with this addendum.
17. A5.1 DOOR, WINDOW TYPES & DOOR SCHEDULES
- a. Doors 2608 through 2627: In "FINISH" column. Delete "P" and replace with "S&S".
 - b. Legend: Add, "S&S STAIN AND SEAL".
18. A5.5 2900C COURTS STRIPING PLANS AND MOUNTING DETAILS
- a. Details 5 and 6: Delete.
 - b. Revise detail 5 per AD.15, included with this addendum.
 - c. Revise detail 8 per AD.16, included with this addendum.
19. A6.2.1 BLDG 2600 INTERIOR ELEVATIONS
- a. Revise detail 3A per AD.17, included with this addendum.
 - b. Revise detail 3C per AD.18, included with this addendum.
 - c. Revise details 3E and 3F per AD.19, included with this addendum.
20. A6.3 BLDG 2700 INTERIOR ELEVATIONS
- a. Revise detail 5A per AD.20, included with this addendum.
 - b. Revise detail 5D per AD.21, included with this addendum.
21. A6.5.2 BLDG 2900 INTERIOR ELEVATIONS
- a. Revise detail 1A per AD.22 and AD.23, included with this addendum.
 - b. Revise detail 1B per AD.24, included with this addendum.

- c. Revise detail 1C per AD.25 and AD.26, included with this addendum.
 - d. Revise detail 1D per AD.27, included with this addendum.
22. A9.7 CASEWORK DETAILS
- a. Revise detail 13 per AD.28, included with this addendum
23. 1.S2.1 PHASE 1 TEMPORARY & RENOVATED FOUNDATION PLAN BLDG 2900
- a. Revise detail B per AD.29, included with this addendum.
24. 1.S2.2 PHASE 1 TEMPORARY & RENOVATED ROOF FRAMING PLAN BLDG 2900
- a. Revise detail B per AD.30, included with this addendum.
25. 1.S2.3 PHASE 1 MEZZANINE PLAN & DETAILS BLDG 2900
- a. Add Detail 1 per AD.31, included with this addendum.
 - b. Add Detail 2 per AD.32, included with this addendum.
 - c. Revise detail B per AD.33, included with this addendum.
26. 3.S2.2 PHASE 3 RENOVATED PARTIAL ROOF FRAMING PLAN BLDG 2900
- a. Detail 1: Add note, "1. REMOVE EXISTING SHEATHING AND REPLACE WITH NEW, TYPICAL, PER PLAN".
27. 4.S2.1 PHASE 4 RENOVATED PARTIAL FOUNDATION & ROOF FRAMING PLANS BLDG 2700
- a. Detail A title: Delete "2700C" and replace with "2700B".
 - b. Detail B title: Delete "2700C" and replace with "2700B".
28. 5.S2.2 PHASE 5 RENOVATED PARTIAL ROOF FRAMING & FOUNDATION PLANS BLDG 2700
- a. Detail A title: Delete "2700D" and replace with "2700C".
 - b. Detail B title: Delete "2700D" and replace with "2700C".
29. 2.T2.1 2500A TELECOM AND A/V DEVICE PLAN AND SCHEDULE
- a. Revise side wall 'MP1' plate keynote 'TN12' to keynote 'TN11'.
30. 5.T2.12 2600A ELECTRONIC SECURITY DEVICE SCHEDULE (New Sheet)
- a. Add AD.34, included with this addendum.
 - b. Add AD.35, included with this addendum.
31. T4.8 2600A CLASSROOM 2610 ENLARGED PLANS & ELEVATIONS
- a. Add 3 gang box w/ 3 gang ring @ +18" A.F.F. w/ (2) 1" C. to accessible ceiling at wall adjacent to presentation desk.
32. T7.6 MAT SPORTS A/V SINGLE LINE DIAGRAM

- a. Revise 'DSP' devices to 'DSP MOD' devices.
- 33. T7.7 AEROBICS A/V SINGLE LINE DIAGRAM
 - a. Revise 'DSP' devices to 'DSP MOD' devices.
- 34. T7.8 GYMNASIUM A/V SINGLE LINE DIAGRAM
 - a. Add note to 'SH' loudspeakers "Wire loudspeakers in series/parallel to utilize 60% maximum amplifier power."
- 35. T7.9 EXERCISE A/V SINGLE LINE DIAGRAM
 - a. Revise 'DSP' devices to 'DSP MOD' devices.
- 36. T7.10 FIRE/POLICE A/V SINGLE LINE DIAGRAM
 - c. Revise 'DSP' devices to 'DSP MOD' devices.

E. BID QUESTIONS

1. **Will the district consider waiving the AISC certification requirement for a company that complies with AISC standards, but does not participate in the certification program? The certification comes at a high cost and will exclude small businesses that would normally bid this type of work.**

The AISC certification requirements for fabrication and erection as detailed in Specification 05 12 00 will not be waived.

2. **Sheet A9.1 provides 7 wall types for new construction. Please designate wall types for new construction at all buildings.**

This will be addressed in Addendum No. 3.

3. **Sheet 2.A2.04, Legend Note #7 states to remove all flooring down to concrete slab. Please provide (e) flooring type for all rooms in building 2800A.**

This will be addressed in Addendum No. 3.

4. **Sheet 2.A2.04, Sheet Note SN.03 at gridline shows a location for a new door opening. Floor plan on 2.A2.4 does not show a door in this location. Please clarify.**

Remove the subject note. This revision will be addressed in Addendum No. 3

5. **Sheet 2.A2.02, Sheet Note SN.04 states to remove and salvage (e) roof access hatch. The demo roof plan shows SN.04 typical at the roof edges. Should this note be SN.05?**

Yes. This revision will be addressed in Addendum No. 3

6. **Sheet 2.A2.01, General Note #1 state to remove all light fixtures. Sheet Note SN.12 states (e) light fixtures to remain. SN.12 on reflected ceiling plan states typical for all lights. Please clarify.**

All (e) light fixtures in Gym 2501 are to be removed in Phase 2. This will be addressed in Addendum No. 3.

7. **Sheet Note SN.04 states to infill recessed slab with concrete. SN.04 is pointing to lockers at Temp. Men's Team room number 4. Please clarify.**

Remove the subject note. This revision will be addressed in Addendum No. 3

8. **Sheet 3.A2.1, Sheet Note SN.03 says not used. Sheet Note SN.03 is shown 4 times in Exercise Room 2912. Please clarify.**

This is addressed in this addendum.

9. **Sheet A5.2, Room 2812 is not listed in the finish schedule for building 2800A. Please provide wall, floor & ceiling finishes.**

This will be addressed in Addendum No. 3.

10. **If GC lists the subcontractors - HVAC, Plumbing and Electrical with no bonding capacity or unbondable, would it be considered GC as the non-responsive bidder and grounds for rejection?**

Special Conditions Item No. 3 remains unchanged. Responsiveness of a Bidder will be determined after the bids have been opened and evaluated.

11. **Is it acceptable to hire a scheduler or use own employee with the Microsoft Project experience with similar experience? We have no problem to put the schedule with Primavera or Sure Track, but most of our previous projects, we used the Microsoft Project for scheduling.**

Specification 01 32 00 Progress Schedules and Reports Subsection 1.02 Qualifications Paragraph A explicitly allows the use of a consultant as well as employees to perform the scheduling required by this Specification Section. The Specification requires the use of Primavera Project Planner, P3, or version 3.0 of SureTrak. The Specification also requires some advanced scheduling techniques such as cost and labor loading the activities so familiarity with the software and technique is important. The District will evaluate the qualifications of the individual presented by the successful Bidder after Notice of Award.

12. **Plans and Specs show 6 phases. (1) Does substantial completion apply to at the end of each phases? (2) When is final completion? After finishing all phases? (3) Do each phases have separate warranty starting dates?**

- a. Substantial Completion applies to each Phase and Sub-phase.
- b. Final Completion applies to the Project which includes all phases, Sub-phases, Punchlist Items and Close-out Documents .
- c. The Guarantee that is part of the exhibits in the Special Conditions establishes the start of one year after Final Acceptance of the Work. Specification Section 01 70 00 – Contract Close out Sub-section 1.10 – Warranties & Bonds Item J provides some clarification to this. Item J “Term of Warranties: For materials, equipment , systems and workmanship warranty period shall be two (2) years minimum from the date of Substantial Completion of the entire Work except where:
 1. Detailed specifications for certain materials, equipment and 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.”

The District will take beneficial use of portions of the Project as it is completed on a Phase or Sub-phase basis. Substantial Completion of a Phase or Sub-phase may occur coincident with the District taking beneficial use of a Phase or Sub-phase. Work not included in the scope of the beneficial use will default to the general terms of the Contract.

13. **Sheets 4/S2.1 and 5/A2.2, Building 2700C PARTIAL FOUNDATION PLAN does not match up with architectural plans 2700C. Please clarify.**

See revision items for sheet 4.S2.1 in this addendum.

14. **Volume 1 of 3, Guarantee Form on page 138 after SPECIAL CONDITIONS note 1 year project guarantee – Page 82, Division 1 GRs notes 2 years. Confirm term of warranty.**

Please refer to the response to bid question number 12 above.

F. SUBSTITUTION REQUESTS

All substitution requests will be addressed in Addendum No. 3.

If you have any questions regarding this Addendum No. 2, please contact the Office of the Facilities Planning & Management in writing, via facsimile or email. All other terms and conditions of BID No. 11-01 to remain the same.

Sincerely,
Ms. Victoria L. Lamica
Contract Manager
Facilities Planning & Management

Stafford King Wiese, Architects
Cole Yee Schubert, Structural Engineers
Smith Fause McDonald, Inc., Low Voltage Engineers

13.7 MILESTONE AND DURATION OF PHASES AND SUB-PHASES

PHASE	WORK TYPE	MILESTONE DATES		CALENDAR DAY DURATION
		START	FINISH	
Phase 1	2600	09/01/11	06/30/12	303 days
	2900A	06/01/11	07/31/11	61 days
	2900B, 2500/2800 LV Cabinet	08/02/11	11/30/11	121 days
Phase 2	2700A	09/16/11	11/15/11	61 days
	2800	11/16/11	05/14/12	180 days
	2500A (Alternate 1)	05/01/12	07/31/12	92 days
Phase 3	2900C	06/02/12	12/01/12	183 days
Phase 4	2700B	12/02/12	04/30/13	150 days
Phase 5	2700C	05/01/13	06/30/13	61 days
	Sitework	05/01/13	07/30/13	91 days
Phase 6	Sitework/Portable	06/16/13	07/30/13	31 days
Total		06/01/11	07/30/13	791 days

NOTE: CONTRACTOR SHALL INCLUDE PUNCLIST INSPECTIONS AND CORRECTIVE WORK WITHIN MILESTONE DATES AND CALENDAR DAYS DURATIONS IDENTIFIED ABOVE.

PART 1 - GENERAL**1.01 RELATED DOCUMENTS:**

- A. The requirements of the General Conditions and Division 1 apply to all work hereunder, also applicable provisions of Section 230500 MECHANICAL WORK - General Requirements.
- B. Drawings and general provisions of the Contract, including general and supplementary conditions apply to the work of this Section.

1.02 DESCRIPTION OF WORK:

- A. Furnish and install all heating, ventilating and air conditioning work indicated on the drawings and described herein. Also any incidental work not shown or specified that is necessary to provide the complete system.

1.03 COORDINATED LAYOUTS:

- A. Contractor shall provide 1/4" equals one foot scaled coordination drawings showing plan and pertinent section views of all piping, ductwork and electrical systems. Drawings shall be on mylar, reproducible and the work represented shall be fully coordinated with the structure, other disciplines, and with all finishes. Since scale of contract drawings is small and all offsets and fittings are not shown, contractor shall make allowances in bid for additional coordination time, detailing, fittings, offsets, hangers and the like to achieve a fully coordinated installation. If changes in duct size are required, equivalent area shall be maintained and the aspect ratio shall not be in excess of 2 to 1 unless approved by the engineer. Drawings shall be submitted for review prior to fabrication and installation. Drawings may be submitted in packages representing at least 1/4 of the building ductwork.
- B. Check routing on all ductwork before fabricating. Report any discrepancies to Architect. No extra cost will be allowed for failure to conform to above.
- C. It shall be responsibility of Heating, Ventilating and Air Conditioning Contractor to coordinate the other mechanical and electrical trades so that complete job is neat and in conformity with plans and specifications.

1.04 PLUMBING:

- A. All plumbing work required in the course of this contract shall be performed in strict accordance with all codes and regulations. Plumbing work done under this contract shall not adversely affect the operation of the existing plumbing systems. All materials shall be new and shall match existing.

PART 2 - PRODUCTS (OR MATERIALS)

2.01 PIPE AND FITTINGS:

- A. See General Requirements section for dielectric fittings and pipe protection.
- B. Hot Water Slab or Ground: Schedule 40 black steel pipe, ASTM A-53. Fittings shall be Nibco standard butt welding type conforming to ANSI Specification B16.28; except that fittings 2" and smaller and local exposed connections to equipment may be 150 psi malleable screwed fittings. Changes in size of steam piping shall be made with eccentric fittings.
- C. Air Vent Discharge Piping: Type L hard copper tubing with wrought copper fittings.
- D. Water drain, or gas connections to equipment shall match connected piping.
- E. Blow Off and Relief Valve Discharge Piping: Schedule 40 galvanized steel pipe and galvanized malleable fittings.
- F. Fuel oil suction and return piping shall be Schedule 80 black steel with 300 psi black malleable iron fittings assembled with Permatex "High-tack Adhesive Sealant".
- G. Fuel Oil Vent Piping: Schedule 40 steel pipe with Schedule 40 malleable fittings except vent piping exposed to the weather shall be galvanized, assemble with Permatex "High-tack Adhesive Sealant".

2.02 PREINSULATED HEATING WATER SUPPLY AND RETURN DISTRIBUTION PIPING UNDERGROUND:

- A. General: All underground heating water lines with fluid temperatures up to 250° shall be the POLY-THERM type, as manufactured by PERMA-PIPE. All straight sections, fittings, anchors and other accessories shall be factory fabricated to job dimensions and designed to minimize the number of field welds. Each system layout shall be computer analyzed by the piping system manufacturer to determine stress on the service pipe and anticipated thermal movement of the service pipe. The system design shall be in strict conformance with ANSI B31.1, latest edition. Factory trained field technical assistance shall be provided for critical periods of installation; unloading, field joint instruction, and testing.
- B. Service Piping: Internal piping shall be standard weight carbon steel, except for condensate return lines which shall be Schedule 80. All joints shall be butt-welded for 2-1/2" and greater, and socket or butt-welded for 2" and below. Where possible, straight sections shall be supplied in 40-foot random lengths with piping exposed at each end for field joint fabrication.

- C. Accessories: End seals, gland seals and anchors shall be designed and factory fabricated to prevent the ingress of moisture into the system.
- D. Insulation: Service pipe insulation shall be spray applied nominal 2 pound per cubic foot density, polyurethane foam for straight sections and preformed polyurethane foam for all fittings. To ensure no voids are present, all insulation shall be inspected by one of the following three methods: visually checked prior to application of the protective jacket; infrared inspection of the entire length; or x-ray inspection of the entire length. The insulation shall be applied to the minimum thickness specified below. The insulation thickness shall not be less than indicated in these specifications.

<u>Pipe Size (in.)</u>	<u>Insulation Thickness (in.)</u>
1	1
1½ - 3	1.5
4 - 6	2
8 - 14	2.5
16 - 20	3
22 - 30	3.5

- E. Projective Jacket: All straight sections of the insulated piping system shall be filament wound, polyester resin/fiberglass reinforcement composite directly applied on the insulating foam. Thermoplastic casing material, e.g., PVC or PE, shall not be allowed.

The minimum thickness for FRP jacket shall be as follows: for jacket diameter up to 15 inches, thickness = .055 inches; jacket diameter between 15 and 24 inches, thickness = 0.85 inches; jacket diameter between 24 and 30 inches, thickness = .110 inches; and jacket diameter between 30 and 48 inches, thickness = .140 inches.

All fittings of the insulated piping system shall be prefabricated to minimize field joints and jacketed in a chopped spray-up, polyester resin/fiberglass-reinforced composite, directly applied onto the insulating foam to a thickness related to the filament-wound jacket thickness.

- F. Field Joints: The internal pipe shall be hydrostatically tested to 150 psig or 1½ times the operating pressure, whichever is greater. Insulation shall then be poured in place into the field weld area. All field applied insulation shall be placed only in straight sections. Field insulation of fittings shall not be acceptable. The installer shall seal the field joint area with a heat shrinkable adhesive-backed wrap or with wrappings of glass reinforcement fully saturated with a catalyzed resin identical in properties to the factory-applied resin. Backfilling shall not begin until the heat shrink wrap or the FRP lay-up has cured. All insulation and coating materials for making the field joint shall be furnished by PERMA-PIPE.

- G. Backfill: A 4" layer of sand or fine gravel shall be placed and tamped in the trench to provide a uniform bedding for the pipe. The entire trench width shall be evenly backfilled with a similar material as the bedding in 6-inch compacted layers to a minimum height of 6 inches above the top of the insulated piping system. The remaining trench shall be evenly and continuously backfilled in uniform layers with suitable excavated soil.

2.03 FANS:

- A. All fans AMCA labeled with self aligning, enclosed ball bearings, accessible for lubrication, unless specified otherwise.
- B. Roof Mounted:
 - 1. Provide bird guard and disconnect switch.
 - 2. Fan wheels shall be centrifugal, non-overloading, all aluminum.
 - 3. Curb cap and orifice inlet shall be one piece aluminum.
 - 4. Shaft and motor bearings shall be relubricable ball bearings for belt-drive.
 - 5. Wheel configuration shall be as scheduled on the drawings.
 - 6. Hood fans shall be all aluminum with horizontal discharge, access door for cleaning, belts and drive system shall be completely out of air stream. Motor shall be mounted in completely enclosed compartment with positive ventilation.
 - 7. Laboratory hood exhaust fans shall be Keysite coated.
 - 8. Provide ventilated curb for kitchen exhaust fans.
- C. In-Line:
 - 1. Heavy duty propeller type with belt or direct drive as specified. Blades shall be individually mounted to wheel.
 - 2. Centrifugal fan with air foil blades, aluminum or steel housing, externally mounted belt-drive motor, external lube tubes, integral support brackets.
- D. Ceiling: Acoustic lined cabinet, built-in backdraft damper, vibration isolated fan and motor, variable speed switch.

2.04 FAN DRIVES:

- A. Drive Design: The design horsepower rating of each drive shall be at least 1.5

times, single belt drives 2 times, the name plate rating of the motor with proper allowances for sheave diameters, speed ratio, arcs of contact and belt length.

1. All drives shall be variable speed, Dayco, Browning or Woods. Allow for replacement of fan drive and belt as required to suite the balance requirements of the project.
 2. All drives for 5 horsepower motors and larger shall have a minimum of 2 belts.
 3. Belts shall be within 1 degree 30 minutes of true alignment in all cases.
 4. All variable speed drives shall be selected to allow an increase or decrease of minimum of 10% of design fan speed.
 5. Motors of 25 HP and less shall have adjustable pitch sheaves; sheaves on motors above 25 HP may be non-adjustable. Change, at no extra cost to Owner, the non-adjustable sheaves to obtain desired air quantities.
- B. Sheaves: Sheaves shall be cast or fabricated, bored to size or bushed with fully split tapered bushings to fit properly on the shafts. All sheaves shall be secured with keys and set screws.
- C. Belts: All belts shall be furnished in matched sets.

2.05 FILTERS:

- A. Pre - filters shall be 2" thick Farr 30/30, or 1" or 2" throwaway as scheduled on the drawings.
- B. Final Air filters shall be of an approved type tested in accordance with test method SFM-12-71-1 as shown in Part 12, Title 24, California Code of Regulations. Preformed filters having combustible framing shall be tested as a complete assembly. Shall have a MERV 13 rating for LEED compliance.
- C. Air filters in all occupancies shall be Class 2 or better as defined in the test method above.
- D. Air filters shall be accessible for cleaning.
- E. Air filters shall be SFM listed.
- F. Panel type filters shall be 2" thick Farr 30/30, Farr D/C, or equal with replaceable media.

2.06 DAMPERS:

- A. Fire Dampers
 - 1. Dampers shall be rated and approved by California State Fire Marshal. Installation shall conform to manufacturer's instructions.
 - 2. Ruskin D1BD2, UL 555 dynamic rated fire damper for wall installation.
 - 3. Ruskin CFD2 or CFD4, UL listed fire damper for ceiling installation. Provide UL classified thermal insulating blanket to fit inlet or outlet condition.
 - 4. Smoke/fire dampers: Class 2, UL 555S classified, Ruskin FSD36 120 volt, single phase controlled from smoke detection system. Provide all accessories required to make a complete operating system, including end switches, wiring, conduit, relays, etc.
- B. Backdraft Dampers: Ruskin CBD2, counterbalanced.
- C. Manual Air and Balance Dampers: Ruskin CD35, opposed blade.

2.07 DUCTWORK:

- A. Galvanized Sheet Metal, See Part 3.

2.08 TEMPERATURE CONTROL SYSTEM:

- A. Shall be Alerton Bactalk to match campus controls

PART 3 - EXECUTION**3.01 EQUIPMENT START-UP:**

- A. Initial start-up of supply, exhaust and return fan systems and pumps shall be under the direct supervision of the Testing and Balancing Contractor.

3.02 PIPING:

- A. All piping under suspended floors shall be kept 6" minimum above ground; excavate as necessary.

3.03 EXPANSION JOINTS:

- A. Furnish and install expansion loops or joints in the steam or water lines as required with anchors and guides as required for the proper operation of the expansion loops or joints.

3.04 FILTERS:

- A. Mount filters in airtight frames furnished by the filter manufacturer, and install in accordance with manufacturer's recommendations.
- B. Provide temporary filters for all fans that are operated during construction; after all construction dirt has been removed from the building install new filters at no additional cost to the Owner.
- C. Identify each filter access door with 1/2" high minimum stenciled letters.

3.05 SHEET METAL WORK:

- A. Construct and install all sheet metal in accordance with latest SMACNA recommendations for 2" static pressure. Provide variations in duct size, and additional duct fittings as required to clear obstructions and maintain clearances, as approved by the Architect, at no extra cost to Owner.
- B. Provide drive slip or equivalent flat seams for ducts exposed in the conditioned space or where necessary due to space limitations. On ducts with flat seams, provide standard reinforcing on inside of duct. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.
 - 1. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers.
 - 2. All ductwork, adhesives, lining, sealants, flex duct and the like shall have a flame spread of 25 or less and developed smoke rating of 50 or less when tested in accordance with ASTM E84.
- C. Round ducts with equivalent effective cross sectional area as determined by ASHRAE Guide, latest edition, may be used in lieu of concealed rectangular ducts shown, space permitting. Round and oval sheet metal ducts shall be spiral lock seam or longitudinal construction seam construction. Fittings shall be continuous weld and seal. United Sheet Metal, SEMCO, or equal.
- D. The throat radius of all bends shall be 1-1/2 times the width of the duct wherever possible and in no case shall the throat radius be less than one width of the branch duct. Provide square elbows with Titus or HEP double thickness turning vanes where space does not permit the above radius, or where square elbows are shown.
- E. The slopes of transitions shall be approximately one to five unless shown otherwise, and no abrupt changes or offsets of any kind in the duct system shall be permitted.
- F. Provide sheet metal angle frame at all duct penetrations to wall, floor, or ceiling.

Seal ductwork watertight at equipment room floor.

- G. All round ductwork shall be United Sheet Metal spiral duct and fittings. Assemble with USM duct sealer and sheet metal screws.
- H. Exposed round ducts shall be United Sheet Metal spiral duct and fittings, 22 gauge minimum for duct, 20 gauge minimum for fittings. Assemble with USM duct sealer and SM screws.
- I. Provide Ventlon flexible connections on inlet and outlet of AC Unit, air handler, and heating/evaporative cooler unit. Provide galvanized weather hood over flexible connections exposed to the weather.
- J. Duct size shown on lined duct is the outside dimension.
- K. Paint inside of ducts, visible through grille, dull black.
- L. Flexible ducts shall be Thermaflex M-KE secured with worm gear bands. Maximum length of flexible duct shall be 8'-0". Support flexible ducts at 30" maximum with 1-1/2" x 24 gauge straps. Factory-made air ducts shall be approved for the use intended or shall conform to the requirements of CMC Standard No. 6-1. Each portion of a factory-made air duct system shall be identified by the manufacturer with a label or other suitable identification indicating compliance with CMC Standard No. 6-1 and its class designation. These ducts shall be UL listed Class 1, 25/50 smoke and flame spread and shall be installed in accordance with the terms of their listing. Omit external insulation. Make connection to duct with spin-in fittings, with air scoop and balance damper.
- M. Provide lateral bracing per Section 230500.
- M. Ducts shall clear combustible construction by 1" minimum.
- O. Seal airtight transverse seams of all supply and return ducts with 6 oz. canvas dipped in Arabol; seal insulated ducts before insulating.
- P. Provide Ventlok #699 test hole fittings where indicated or specified.
- Q. Ducts under the first floor shall clear the dirt by 3" minimum.
- R. All materials except sheet metal including duct liner shall be approved before installation.

3.06 DAMPERS:

- A. All dampers automatically controlled by damper motors are specified under "Temperature Control System" except those specified with items of equipment.

- B. Provide opposed blade manual air dampers at each branch duct connection and at locations indicated on the drawings and where necessary to control air flow for balancing system. Provide Ventlok regulators. Provide an opposed blade balancing damper in each zone supply duct. Damper blades shall be 16 gauge minimum galvanized steel with 3/8" minimum shaft, and 10" maximum blade width. Provide an access panel or Ventlok flush-type damper regulator on ceiling or wall for each concealed damper.
- C. Install fusible link fire dampers full size of duct at points where shown or required.
- D. Provide 18" x 12" minimum access doors in ductwork and furring for easy access to each fire damper; insulated access doors in insulated ducts. Label access doors with 1/2" high red letters.
 - 1. Provide Ventlok access doors with Series 100 hardware for convenient access to all automatic dampers and other components of the system, insulated type in insulated ducts. Provide Ventlok #202 for light duty up to 2" thick doors, #260 heavy duty up to 2" thick doors and #310 heavy duty for greater than 2" thick doors. Provide #260 hinges on all hinged and personnel access doors, include gasketing.

3.07 AIR INLETS AND OUTLETS:

- A. Provide all air inlets and outlets with gaskets and install so that there will be no streaking of the walls or ceilings due to leakage. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange. Support each ceiling diffuser with four wires from overhead construction per Title 24 and secure to ceiling framing system with two concealed screws at opposite sides.
- B. Furnish all air inlets and outlets with a baked prime coat unless otherwise noted. Provide off-white baked enamel finish on ceiling-mounted air inlets and outlets. Exposed mounting screws shall be painted to match the material being secured.
- C. Air inlets and outlets shall match all qualities of those specified including appearance, throw, noise level, adjustability, etc.

3.08 FANS:

- A. Each ceiling-mounted fan shall have multi-speed switch and integral backdraft damper.
- B. Provide access doors for fans or motors mounted in ductwork.
- C. Mount all fans so that they are completely isolated from building.
- D. Fan motors mounted in air-stream to be totally enclosed.

- E. Completely line supply, return or exhaust fan cabinets with 1" thick, 3/4 lbs. density acoustic insulation securely cemented in place.
- F. Roof fans shall be mounted level.

3.09 TEMPERATURE CONTROL SYSTEM:

- A. General:
 - 1. Coordinate with the requirements of Section 230513.

3.10 EQUIPMENT CHECK, TEST AND START:

- A. The check, test and start of each air conditioning unit, make-up air unit, air handler unit and gas unit heater shall be performed by a specialized company, Aircon Service, Commercial Air, or equal, acting as a subcontractor to the air conditioning contractor. The company selected shall have had experience on similar projects and shall have demonstrated by past performance that the personnel are qualified to do such work. The firm selected shall have approval of the Architect prior to start of work.
- B. The company shall provide all personnel, test instruments, and equipment to properly perform the check, test and start.
- C. The check, test and start of each item of equipment shall be in accordance with manufacturer's printed instructions. Three (3) copies of the completed check, test and start report of each item of equipment shall be bound with the operating and maintenance instructions.
- D. Upon completion of the work, provide a schedule of planned maintenance indicating frequency of service for all equipment components. Post schedule where directed under plastic.

3.11 TESTING AND BALANCING:

- A. Obtain the service of an independent test and balance agency that specialized in, and whose business is limited to, testing and balancing of air conditioning systems.
- B. Coordinate work done by testing and balancing agency with work of other trades.
- C. Testing and balancing agency, as a part of its contract, shall act as authorized inspection agency and shall report any discrepancies or items not installed in accordance with Contract Drawings and/or Specifications pertaining to air and water distribution, and exhaust systems.
- D. Contractor shall provide for adjustments and/or additions or modifications to fan

and motor sheaves, belts, damper linkages and the like to achieve proper air balance at no additional cost.

- E. Testing and balancing shall be performed in complete accordance with AABC National Standards for Field Measurement and Instrumentation, Volume Four. Testing and balancing shall be performed on air distribution system, chilled water system, condenser water system, heating water system, and domestic water system.
- F. Balance air quantities of supply and exhaust to achieve those given on Drawings. Measure the total air quantity at each fan. Measure the total air quantity at each supply fan with maximum outside air and with minimum outside air. Measure the ampere reading of each motor input after final adjustments have been made. Provide static pressure profile for each air moving equipment. Upon satisfactory completion of balance and operational test, submit three (3) sets of reports to the Architect on balance final readings, summary of fan CFM delivery rates, static pressure ratings, motor ampere input, and general summary of test results. Specified ratings and motor nameplate ratings shall be listed with measured readings.
- G. Instruments used for testing and balancing of systems shall have been calibrated within a period of six (6) months and shall be checked for accuracy prior to start of work.
- H. Three (3) copies of complete test report shall be submitted prior to final acceptance of project.
- I. Tabulate magnetic starters size, type, and manufacturer with heater strip size, type and rating along with motor nameplate data.
- J. Air balance shall be achieved using variable fan speeds.
- K. Adjust single or double deflection registers and variable pattern diffusers to evenly distribute air within the conditioned space. The terminal air velocity at 5' above the floor shall not exceed 50 FPM in normal air conditioned spaces.
- L. Measure the ampere reading of each motor input after final adjustments have been made.
- M. Hydronic System Balancing
 - 1. Calibration and testing of hydronic system in conformance with AABC recommendations.
 - 2. Complete air balance prior to hydronic system balancing.

3. Water Balance Procedures: Set combination chilled/hot water, and condenser water and hot water pumps to design GPM quantities.
4. Check and adjust water temperature and GPM flow characteristics at all cooling and heating coils.
5. Upon completion of flow ratings and coil adjustments, mark all settings and record all data.
6. Recorded data shall include:
 - a. Inlet and leaving temperatures at all coils and heating and cooling equipment.
 - b. Pressure drop at each coil including coil bypass.
 - c. Pump operating suction and discharge pressure and final total dynamic pump head.
 - d. Rated and actual running amperage of pump motors.
7. Venturies and calibrated orifices with portable or permanent flow meters shall be used to balance the waterflows. When above equipment is not installed, obtain waterflow balance by measurement of temperature differential across the various coils or elements.

3.12 EQUIPMENT MOUNTING:

- A. Mounting and anchorage of equipment shall be in strict compliance with drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

END OF SECTION

LOW-VOLTAGE DISTRIBUTION SWITCHBOARDS (GROUP MOUNTED)**PART 1 GENERAL****1.1 SCOPE**

- A. The Contractor shall furnish and install, where indicated, a free-standing, dead-front type low-voltage distribution switchboard, utilizing group mounted circuit protective devices as specified herein, and as shown on the contract drawings.

1.2 RELATED SECTIONS

- A. Section 26 05 73 – Overcurrent Protection

1.3 REFERENCES

- A. The low-voltage distribution switchboards and all components shall be designed, manufactured and tested in accordance with the latest applicable following standards:

1. NEMA PB-2
2. UL Standard 891.

1.4 SUBMITTALS -- for Review/approval

- A. Submit under provisions of Section 01330.
- B. The following information shall be submitted to the Engineer:
 1. Master drawing index
 2. Front view elevation showing all equipment dimensions.
 3. Floor plan showing all equipment and pad dimensions and required clearances.
 4. Top view showing all equipment dimensions.
 5. Single line
 6. Schematic diagram for all controls.
 7. Nameplate schedule
 8. Component list
 9. Conduit entry/exit locations
 10. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current

11. Major component ratings including:
 - a. Voltage
 - b. Continuous current
 - c. Interrupting ratings
 12. Cable terminal sizes.
 - C. Where applicable, the following additional information shall be submitted to the Engineer:
 1. Busway connection
 2. Connection details between close-coupled assemblies
 3. Composite floor plan of close-coupled assemblies
 4. Key interlock scheme drawing and sequence of operations.
 5. Submit seven (7) copies of the above information.
- 1.5 SUBMITTALS -- for Information
- A. When requested by the Engineer, the following product information shall be submitted:
 1. Descriptive bulletins
 2. Product sheets.
- 1.6 SUBMITTALS -- for Closeout
- A. The following information shall be submitted for record purposes:
 1. Final as-built drawings and information for items listed in section 1.04
 2. Wiring diagrams
 3. Certified production test reports
 4. Installation information
 5. Seismic certification and equipment anchorage details.
 - B. Submit ten (10) copies of the above information.
- 1.7 QUALIFICATIONS
- A. The manufacturer of the assembly shall be the manufacturer of the circuit protective devices within the assembly.
 - B. For the equipment specified herein, the manufacturer shall be ISO 9000, 9001 or 9002 certified.

- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

- D. The switchboard shall be suitable for and certified to meet all applicable seismic requirements of the California Building Code (CBC) for zone 4 application. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The test response spectrum shall be based upon a 5% minimum damping factor, [CBC: a peak of 1.8g, and a ZPA of 0.45g]. The tests shall fully envelope this response spectrum for all equipment natural frequencies up to at least 35 Hz.

1.8 REGULATORY REQUIREMENTS

- A. The low-voltage switchboard shall be UL labeled.

1.9 Delivery, Storage and Handling

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.10 OPERATION AND MAINTENANCE MANUALS

- A. Five (5) copies of the equipment operation and maintenance manuals shall be provided.

- B. Operation and maintenance manuals shall include the following information:
 - 1. Instruction books and/or leaflets
 - 2. Recommended renewal parts list
 - 3. Drawings and information required by section 1.06.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Square D
- B. Cutler Hammer
- C. General Electric
- D. Or equal

2.2 RATINGS

- A. The assembly shall be rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault

current (100,000) amperes symmetrical at rated voltage.

B. Voltage rating to be as indicated on the drawings.

2.3 CONSTRUCTION

A. Switchboard shall consist of the required number of vertical sections bolted together to form a rigid assembly. The sides and rear shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Provide adequate ventilation within the enclosure.

B. All sections of the switchboard shall be front and rear aligned with depth as shown on drawings. All protective devices shall be group mounted. Devices shall be front removable and load connections front and rear accessible. Rear access shall be provided.

C. The assembly shall be provided with adequate lifting means.

D. The switchboard shall be equal Square D type I Line utilizing the components herein specified and as shown on the drawings.

2.4 BUS

A. All bus bars shall be tin-plated aluminum. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on NEMA standard temperature rise criteria of 65 degrees C over a 40 degrees C ambient (outside the enclosure).

B. Provide a full capacity neutral bus where a neutral bus is indicated on the drawings.

C. A copper ground bus (minimum 1/4 x 2 inch), shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchboard.

D. All hardware used on conductors shall be high-tensile strength and zinc-plated. All bus joints shall be provided with conical spring-type washers.

2.5 WIRING/TERMINATIONS

A. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished as required. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

B. Mechanical-type terminals shall be provided for all line and load terminations suitable for copper or aluminum cable rated for 75 degrees C of the size as indicated on the drawings.

C. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

D. All control wire shall be type SIS, bundled and secured with nylon ties. Insulated

locking spade terminals shall be provided for all control connections, except where saddle type terminals are provided integral to a device. All current transformer secondary leads shall first be connected to conveniently accessible short-circuit terminal blocks before connecting to any other device. All groups of control wires leaving the switchboard shall be provided with terminals blocks with suitable numbering strips. Provide wire markers at each end of all control wiring.

2.6 PROTECTIVE DEVICES

A. Main Protective Devices.

2.7 MOLDED CASE PROTECTIVE DEVICES

- A. Feeder protective devices shall be molded case circuit breakers with inverse time and instantaneous tripping characteristics and shall have ground fault protection where indicated or as required by NEC. Molded case breakers shall be Square D or approved equal.
- B. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make/quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy, and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
- C. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the drawings.
- D. Where indicated circuit breakers shall be UL listed for series application.
- E. Where indicated circuit breakers shall be current limiting.
- F. Circuit breakers 400-ampere frame and below shall be Square D with thermal-magnetic trip units and inverse time-current characteristics.
- G. Circuit breakers 600-ampere through 1200-ampere frame shall be Square D with microprocessor-based RMS sensing trip units.
- H. Circuit breakers 1600-ampere through 2500-ampere frame shall be Square D with microprocessor-based RMS sensing trip units.
- I. Where indicated, provide circuit breakers UL listed for application at 100% of their continuous ampere rating in their intended enclosure.

2.8 ACCESSORIES

A. Provide shunt trips, bell alarms and auxiliary switches as shown on the contract drawings.

2.9 MISCELLANEOUS DEVICES

A. Key interlocks shall be provided as indicated on the drawings.

B. Control power transformers with primary and secondary protection shall be provided,

as indicated on the drawings, or as required for proper operation of the equipment.

2.10 CUSTOMER METERING

- A. Where indicated on the drawings, provide a separate customer metering compartment with front hinged door and include the following:
- B. Current transformers for each meter. Current transformers shall be wired to shorting-type terminal blocks.
- C. Potential transformers including primary and secondary fuses with disconnecting means for metering as shown on the drawings.

2.11 ENCLOSURES

- A. NEMA 3R Enclosure or as noted on plans.

2.12 NAMEPLATES

- A. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, black characters on white background. Characters shall be 3/16-inch high, minimum. Nameplates shall give item designation and circuit number as well as frame ampere size and appropriate trip rating. Furnish master nameplate giving switchboard designation, voltage ampere rating, short-circuit rating, manufacturer's name, general order number, and item number.
- B. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

2.13 FINISH

- A. All exterior and interior steel surfaces of the switchboard shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of the switchboard shall be ANSI 61 light gray.

PART 3 EXECUTION

3.1 FACTORY TESTING

- A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
 - 1. The switchboard shall be completely assembled, wired, adjusted, and tested at the factory. After assembly, the complete switchboard will be tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of all equipment. The main circuits shall be given a dielectric test of

2200 volts for one (1) minute between live parts and ground, and between opposite polarities. The wiring and control circuits shall be given a dielectric test of 1500 volts for one (1) minute between live parts and ground.

- B. The manufacturer shall provide three (3) certified copies of factory test reports.
- C. Factory tests as outlined above shall be witnessed by the owner's representative.
 - 1. The manufacturer shall notify the owner two (2) weeks prior to the date the tests are to be performed.
 - 2. The manufacturer shall include the cost of transportation and lodging for up to three (3) owner's representatives. The cost of meals and incidental expenses shall be the owner's responsibility.

3.2 INSTALLATION

- A. The Contractors shall install all equipment per the manufacturer's instructions, contract drawings and California Electrical Code.

- B. The assembly shall be provided with adequate lifting means and shall be capable of being moved into installation position and bolted directly to [the floor without the use of floor sills provided the floor is level to 1/8 inch per 3-foot distance in any direction]. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

3.3 FIELD ADJUSTMENTS

- A. The Contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. The settings shall be in accordance with the approved short-circuit study, protective device evaluation study and protective device coordination study.
- B. Necessary field settings of devices and adjustments and minor modifications to equipment to accomplish conformance with an approved short circuit and protective device coordination study shall be carried out by the Contractor at no additional cost to the owner.

3.4 MANUFACTURER'S CERTIFICATION

- A. A certified test report of all standard production tests shall be available to the Engineer upon request.

3.5 TRAINING

- A. The Contractor shall provide a training session for the owner's representatives for two normal workdays at a jobsite location determined by the owner.
- B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of instruction on operation of the assembly, circuit

breakers, fused switches, and major components within the assembly.

END OF SECTION