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Las Positas College Aquatics Center

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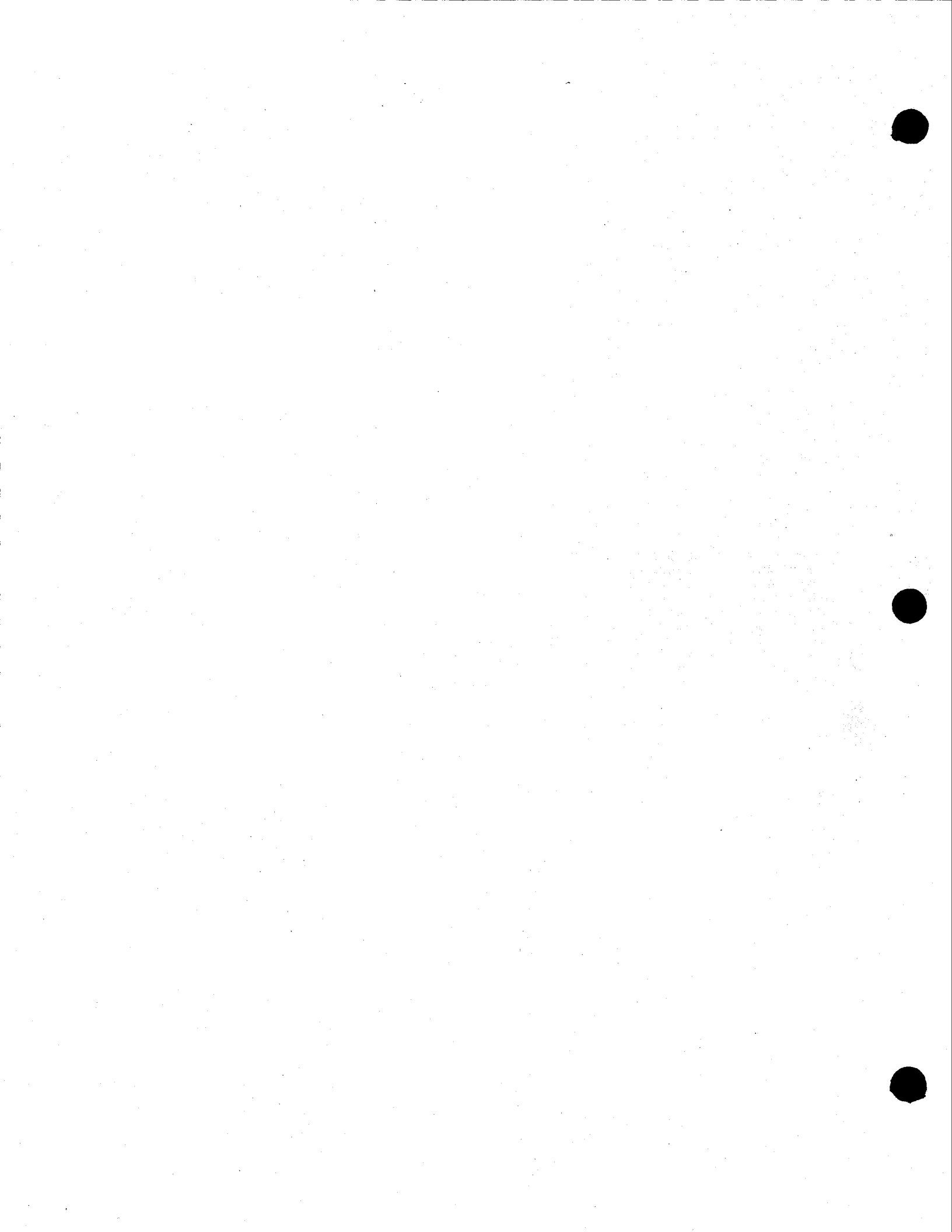
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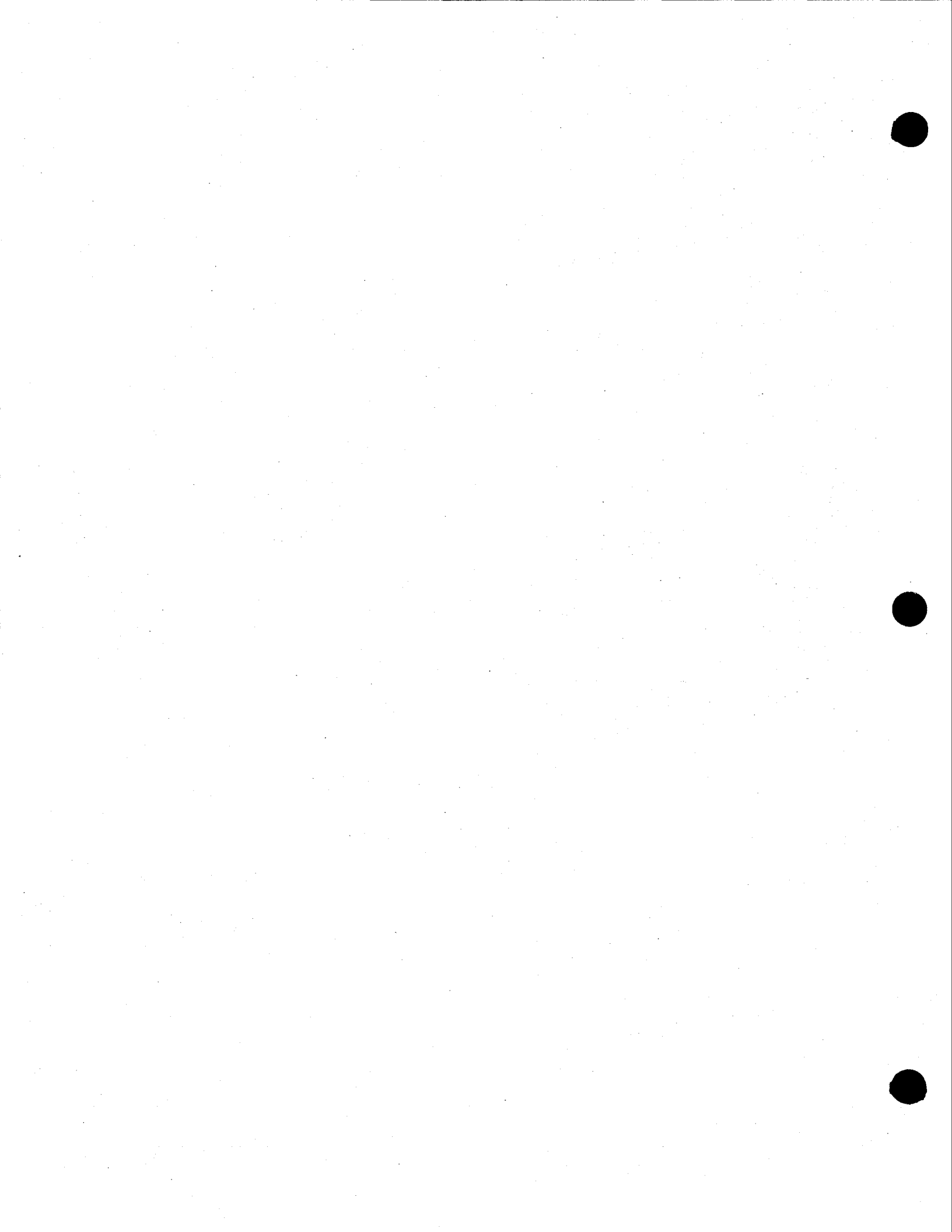
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SECTION 02230

SITE CLEARING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Remove surface debris.
- B. Remove indicated paving, curbs, access ramps, handrails, gates, and all associated components.
- C. Clear site of plant life and grass.
- D. Remove trees and shrubs.
- E. Remove root system of trees and shrubs.
- F. Recycle "Green Materials" consisting of trees, stumps, roots, trimmings and other organic land debris.
- G. Remove (2) pole mounted lights
- H. Remove existing irrigation lines
- I. Stockpiling of existing topsoil for future use.

1.2 REGULATORY REQUIREMENTS

- A. Conform to local code for disposal of debris.
- B. Coordinate clearing work with utility companies.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that existing plant life and features designated to remain are tagged or identified.

3.2 PROTECTION

- A. Protect utilities that remain, from damage.
- B. Protect trees, plant growth, and features designated to remain as final landscaping.
- C. Protect bench marks and existing structures from damage or displacement.

3.3 CLEARING

- A. Clear areas required for access to site and execution of work.
- B. Clear undergrowth and deadwood without disturbing subsoil.

3.4 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Remove paving, curbs, and gutters. Neatly saw cut edges at right angle to surface.
- C. Remove pole mounted lights and pull or cut wires back to junction box.
- D. Remove existing irrigation piping and properly cap at point of origin.

3.5 SALVAGE

- A. Salvage light posts and turn over to Owner's Representative
- B. Stockpile approximately 10 cubic yards of topsoil on site for reuse at Garden Roof.

END OF SECTION

SECTION 02300

EARTHWORK

1 PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavation and/or embankment from existing ground to subgrade, including soil sterilant, driveways, walks, paths, or trails and any other site improvements called for on the Plans.

1.2 SECTION EXCLUDES

- A. Earthwork related to underground utility installation, see Section 02310.

1.3 RELATED SECTIONS

- A. Section 02230 Site Clearing
- B. Section 02310, Utility Trenching and Backfill.

1.4 RELATED DOCUMENTS

- A. Geotechnical Report: "Geotechnical Investigation and Geologic Hazards Report Las Positas College Proposed Aquatic Center, Child Development Center and Two Soccer Fields, Livermore California" dated December 2nd 2005.
- B. ASTM:
 - 1. D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
 - 2. D 1586, Method for Penetration Tests and Split-Barrel Sampling of Soils.
 - 3. D 2487, Classification of Soils for Engineering Purposes.
 - 4. D 3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 - 5. D 4318. Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 - 6. E 329, Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
 - 7. E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.
- C. California Administrative Code, Title 24, Part 2 - Basic Building Regulations, Chapter 24, Excavations, Foundations, and Retaining Walls.
- D. Caltrans Standard Specifications:
 - 1. Section 17, Watering.
 - 2. Section 19, Earthwork.
- E. CAL/OSHA, Title 8.

1.5 DEFINITIONS

- A. Borrow: Approved soil material imported from off-site for use as Structural Fill or Backfill.
 - 1. Salvage and stockpile 10 cubic yards of topsoil for reuse.

- B. Excavation: Removal of material encountered above subgrade elevations.
 - 1. Authorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions as shown on plans or authorized by the Geotechnical Consultant.
 - 2. Unauthorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions without authorization by the Geotechnical Consultant. Unauthorized excavation shall be without additional compensation.
- C. Geotechnical Testing Agency: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- D. Structural Backfill: Soil materials approved by the Geotechnical Consultant and used to fill excavations resulting from removal of existing below grade facilities, including trees. See Section 02310 for trench backfill.
- E. Engineered Fill: Soil materials approved by the Geotechnical Consultant and used to raise existing grades.
- F. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material $\frac{3}{4}$ -cubic yards or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2-inches.
- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below grade.
- H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials.
- I. Unsuitable Material: Any soil material that is not suitable for a specific use on the Project. The Geotechnical Consultant will determine if a soil material is unsuitable.
- J. Utilities: onsite underground pipes, conduits, ducts and cables.

1.6 SUBMITTALS

- A. Follow submittal procedure outlined in Section 01330
- B. Samples:
 - 1. If required by the Geotechnical Consultant, provide 40-pound samples sealed in airtight containers, tagged with source locations and suppliers of each proposed soil material from on-site or borrow sources. Do not import materials to the Project without written approval of the Geotechnical Consultant.
 - 2. Provide materials from same source throughout work. Change of source requires approval of the Geotechnical Consultant.
- C. Material Test Reports: Provide, from a qualified testing agency, the following test results showing compliance with the project requirements:
 - 1. Classification according to ASTM D 2487 of each onsite or borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve in conformance with ASTM D 1557 for each onsite or borrow soil material proposed for fill and backfill.

1.7 QUALITY ASSURANCE

- A. Provide an independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Consultant.
- C. Conform all work to the appropriate portion(s) of Caltrans Standard Specifications, Section 17 and 19.
- D. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.
- E. Perform excavation, filling, compaction and related earthwork under the observation of the Geotechnical Consultant. Materials placed without approval of the Geotechnical Consultant will be presumed to be defective and, at the discretion of the Geotechnical Consultant, shall be removed and replaced at no cost to the Owner. Notify the Geotechnical Consultant at least 24-hours prior to commencement of earthwork and at least 48 hours prior to testing.
- F. The Geotechnical Consultant will perform observations and tests required to enable him to form an opinion of the acceptability of the Project earthwork. Correct earthwork that, in the opinion of the Geotechnical Consultant, does not meet the requirements of these Technical Specifications and the Geotechnical Report.
- G. Upon completion of the construction work, certify that all compacted fills and foundations are in place at the correct locations, and have been constructed in accordance with sound construction practice. In addition, certify that the materials used are of the types, quality and quantity required by these Technical Specifications and the Geotechnical Report. The Contractor shall be responsible for the stability of all fills and backfills constructed by his forces and shall replace portions that in the opinion of the Geotechnical Consultant have been displaced or are otherwise unsatisfactory due to the Contractor's operations.
- H. Finish soil grade tolerance at completion of grading:
 - 1. Building and paved areas: +0.05
 - 2. Other areas: ± 0.10 feet.

1.8 PROJECT CONDITIONS

- A. Promptly notify the Owner's Representative of surface or subsurface conditions differing from those disclosed in the Geotechnical Report. First notify the Owner's Representative verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents and disclosed in the Geotechnical Report will be allowed unless the Contractor has notified the Owner's Representative in writing of differing conditions prior to the Contractor starting work on affected items.
- B. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.
- C. Prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.
- D. Temporarily stock-pile fill and topsoil material in an orderly and safe manner and in a location approved by the Owner's Representative.
- E. Provide dust and noise control in conformance with Section 01010.
- F. Environmental Requirements: When unfavorable weather conditions necessitate interrupting earthwork operation, areas shall be prepared by compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage to prevent erosion. After interruption, compaction specified in last layer shall be re-established before resuming work.

2 PART 2 PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from on-site excavations.
- B. Obtain approval of on-site soil materials and borrow materials to be used for structural fill or structural backfill from the Geotechnical Consultant.
- C. On-Site Engineered Fill and Structural Backfill: Apart from the highly expansive clay topsoil at the site essentially all other onsite soils can, preferably after blending, be used as engineered fill material. Specific requirements for on-site engineered fill should meet the requirements set forth in Table 2 of the Geotechnical Report.
- D. Imported Engineered Fill and Structural Backfill: Conform to the requirements of on-site structural fill as well as those for Class 3 Subbase in the State of California Standard Specifications. Any imported fill should be sampled by the project Geotechnical Engineer prior to being imported to evaluate its suitability.

2.2 SOIL STERILANT

- A. Commercial chemical for weed control, registered by EPA. Provide granular, liquid or wet-able powder form.

3 PART 3 EXECUTION

3.1 GENERAL

- A. Conform to Section 19, Earthwork, Caltrans Standard Specifications as modified by the Contract Documents.
- B. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.
- C. The use of explosives will not be permitted.

3.2 CONTROL OF WATER AND DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding the site and surrounding area. Provide dewatering equipment necessary to drain and keep excavations and site free from water.
- B. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.
- C. Obtain the Geotechnical Consultant's approval for proposed control of water and dewatering methods.
- D. Protect subgrades from softening, undermining, washout and damage by rain or water accumulation.
- E. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations.
- F. Maintain dewatering system in place until dewatering is no longer required.

3.3 WET WEATHER CONDITIONS

- A. Do not prepare subgrade, place or compact soil materials if above optimum moisture content.
- B. If the Geotechnical Consultant allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the Geotechnical Consultant.

3.4 BRACING AND SHORING

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Owner's Representative, submit details and calculations to the Owner's Representative. The Owner's Representative may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Owner's Representative.
- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

3.5 EXCAVATION

- A. Excavate earth and rock to lines and grades shown on drawings and to the neat dimensions indicated on the Plans, required herein or as required to satisfactorily compact backfill.
- B. Remove and dispose of large rocks, pieces of concrete and other obstructions encountered during excavation.
- C. Where forming is required, excavate only as much material as necessary to permit placing and removing forms.
- D. Provide supports, shoring and sheet piles required to support the sides of excavations or for protection of adjacent existing improvements.

3.6 REMOVAL OF EXISTING FILLS AND UNSUITABLE MATERIAL

- A. Over-excavate areas of existing fills and other unsuitable material encountered during mass grading as directed by the Geotechnical Consultant.
- B. Compensation for increased removal widths and depths that are not required by the Geotechnical Consultant will not be considered, except when such increase is necessary for protection of life and property as determined by and approved by the Owner.
- C. The Geotechnical Consultant will provide written approval for each excavation prior to placement of fill. Allow adequate time after excavation and before filling for the Geotechnical Consultant's review and written approval and, if necessary, time for the Owner's Representative to conduct as built survey prior to placing fill. Basis for calculating the quantity of material excavated or placed may be the difference between the grading shown on the Plan and an as built survey of the grading.

3.7 GRADING

- A. Uniformly grade the Project to the elevations shown on plans
- B. Finish ditches, gutters and swales to the sections, lines and grades indicated and to permit proper surface drainage.
- C. Round tops and bottoms of slopes as indicated or to blend with existing contours.

3.8 SUBGRADE PREPARATION

- A. Install underground utilities and service connections prior to final preparation of subgrade and placement of base materials for final surface facilities. Extend services so that final surface facilities are not disturbed when service connections are made.
- B. Prepare subgrades under paved areas, curbs, gutters, walks, structures, other surface facilities and areas to receive structural fill.
- C. Prepare subgrades for by scarifying surface at least 12 inches below final subgrade elevations and 5-feet beyond edge of pavement unless specified otherwise by the Geotechnical Consultant. Uniformly moisture condition to obtain moisture content of no less than two percent above optimum moisture content, and then compact to no less than 90 percent relative compaction based on the ASTM D1557 test method latest edition. Where clay topsoil is encountered and is to remain in place, it should be scarified, its moisture content raised to no less than 5 percent greater than the optimum moisture content, and compacted to between 88 and 92 percent relative compaction according to ASTM D1557. Break clods and condition surface by harrowing or dry rolling. Remove boulders, hard ribs and solid rock. Prepare earth uniform for full depth and width of subgrade.
- D. Protect utilities from damage during compaction of subgrades and until placement of final pavements or other surface facilities.
- E. Obtain the Geotechnical Consultant's approval of subgrades prior to placing pavement.

3.9 PLACEMENT OF STRUCTURAL FILL

- A. Obtain the Geotechnical Consultant's approval of surface to receive structural fill prior to placement of structural fill material.
- B. Place structural fill on prepared subgrade.
- C. Spread structural fill material in uniform lifts not more than 8-inches, moisture conditioned to at least 2% above the optimum moisture content and compacted to no less than 90 percent of maximum dry (laboratory) density based on the ASTM D1557 test method latest edition.
- D. Place structural fill material to suitable elevations above grade to provide for anticipated settlement and shrinkage.
- E. Overbuild fill slopes, as required by the Geotechnical Consultant, to obtain required compaction. Remove excess material to lines and grades indicated.
- F. Do not drop fill on structures. Do not backfill around, against or upon concrete or masonry structures until structure has attained sufficient strength to withstand loads imposed and the horizontal structural system had been installed.

3.10 KEYWAYS AND BENCHES

- A. Provide keyways as indicated for fill slopes steeper than 6 horizontal to 1 vertical. Extend keyway 5-foot minimum into competent, undisturbed soil or 3-foot minimum into competent, undisturbed rock as directed by the Geotechnical Consultant.
- B. Place subsurface drains in bottom of keyway in conformance with Section 02620,
- C. Bench subgrade as indicated above toe of fill.
- D. Place subsurface drains at benches every 20 vertical feet or as directed by the Geotechnical Consultant.

3.11 LOT FINISH GRADING

- A. Blade finish lots to lines and grades indicated.

3.12 COMPACTION AND TESTING

- A. Do not compact by ponding, flooding or jetting.
- B. Compact soils at optimum water content. Aerate material if it is too wet. Add water to material if it is too dry. Thoroughly mix lifts before compaction to ensure uniform moisture distribution.
- C. Perform compaction using rollers, pneumatic or vibratory compactors or other equipment and mechanical methods approved by the Geotechnical Consultant.
- D. Compaction requirements:
 - 1. Compact structural fills less than 5-feet thick to 90 percent compaction.
 - 2. Compact structural fill 5-feet thick or greater to 95 percent compaction.
 - 3. Compact the upper 6 inches of subgrade soils beneath pavements, curbs and gutters to 95 percent compaction. Extend compaction 5-feet beyond pavement edges unless specified otherwise by the Geotechnical Consultant.
 - 4. Compact the upper 6-inches of subgrade soils under walks, structures and areas to receive structural fill to 90 percent compaction.

3.13 SOIL STERILIZATION

- A. Apply soil sterilant to areas indicated, such as beneath asphalt concrete pavement, brick pavement, concrete pavement and at grade concrete slabs, including sidewalks, curbs and gutters. Also where indicated apply soil sterilant below expansion and control joints and at areas where pipes, ducts or other features penetrate slabs.
- B. Apply soil sterilant uniformly and at the rates recommended by the manufacturer.
- C. Apply soil sterilant to prepared subgrade, or after installation of aggregate base as recommended by the manufacturer.

3.14 DISPOSAL

- A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

END OF SECTION



SECTION 02310

UTILITY TRENCHING AND BACKFILL

1 PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavation, bedding, and backfill of underground storm drain, sanitary sewer and water piping and associated structures.

1.2 SECTION EXCLUDES

- A. Drainage fill material and placement around subdrains. See Section 02620.
- B. Trenching and backfill for other utilities such as underground electric, telephone, gas, cable TV, etc.

1.3 RELATED SECTIONS

- A. Section 02300, Earthwork.
- B. Section 02510, Water Distribution.
- C. Section 02530, Sanitary Sewer System.
- D. Section 02630, Storm Drainage System.

1.4 RELATED DOCUMENTS

- A. Geotechnical Report: "Geotechnical Investigation and Geologic Hazards Report Las Positas College Proposed Aquatic Center, Child Development Center and Two Soccer Fields, Livermore California" dated December 2nd 2005.
- B. ASTM:
 - 1. C 33, Specification for Concrete Aggregates.
 - 2. C 150, Specification for Portland Cement.
 - 3. C 260, Specification for Air-Entraining Admixtures for Concrete.
 - 4. C 618, Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
 - 5. D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
 - 6. D 2321, Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
 - 7. D 2487, Classification of Soils for Engineering Purposes.
 - 8. D 3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 - 9. E 329, Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
 - 10. E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.
- C. California Administrative Code, Title 24, Part 2 - Basic Building Regulations, Chapter 24, Excavations, Foundations, and Retaining Walls.

- D. Caltrans Standard Specifications:
 - 1. Section 19, Earthwork.
 - 2. Section 26, Aggregate Bases.
 - 3. Section 68, Subsurface Drains.
 - 4. Section 88, Engineering Fabrics.

E. CAL/OSHA, Title 8.

1.5 DEFINITIONS

- A. AC: Asphalt Concrete.
- B. ASTM: American Society for Testing and Materials.
- C. Bedding: Material from bottom of trench to bottom of pipe.
- D. CDF: Controlled Density Fill.
- E. DIP: Ductile Iron Pipe.
- F. Initial Backfill: Material from bottom of pipe to 12-inches above top of pipe.
- G. PCC: Portland Cement Concrete.
- H. RCP: Reinforced Concrete Pipe.
- I. Pipe zone backfill: The material beneath the pipe and in the immediate vicinity of the pipe.
- J. Trench zone backfill: The material between the pipe zone and the finished subgrade.
- K. Springline of Pipe: Imaginary line on surface of pipe at a vertical distance of $\frac{1}{2}$ the outside diameter measured from the top or bottom of the pipe.
- L. Subsequent Backfill: Material from 12-inches above top of pipe to subgrade of surface material or subgrade of surface facility or to finish grade.
- M. Trench Excavation: Removal of material encountered above subgrade elevations and within horizontal trench dimensions.
 - 1. Authorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions as shown on plans or authorized by the Geotechnical Consultant.
 - 2. Unauthorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions without authorization by the Geotechnical Consultant. Unauthorized excavation shall be without additional compensation.
- N. Utility Structures:
 - 1. Storm drainage manholes, catch basins, drop inlets, curb inlets, vaults, etc.
 - 2. Sanitary sewer manholes, vaults, etc.
 - 3. Water vaults, etc.

1.6 SUBMITTALS

- A. Follow submittal procedure outlined in Section 02000.
- B. Product Data:
 - 1. Grading and quality characteristics showing compliance with requirements for the Work.
 - 2. Certify that material meets requirements of the Project.
- C. Samples:
 - 1. If required by the Geotechnical Consultant, provide 40-pound samples of all imported trench bedding and backfill material sealed in airtight containers, tagged with source locations and suppliers of each proposed material. Do not import materials to Project without written approval of the Geotechnical Consultant.
 - 2. Provide materials from same source throughout work. Change of source requires approval of the Geotechnical Consultant and the Owner's Representative's.
- D. Material Test Reports: Provide, from a qualified testing agency, the following test results showing compliance with the project requirements:
 - 1. Classification according to ASTM D 2487 of each imported trench bedding and backfill material.
 - 2. Laboratory compaction curve in conformance with ASTM D 1557 for each imported trench bedding and backfill material

1.7 QUALITY ASSURANCE

- A. Provide an independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Consultant.
- C. Conform all work to the appropriate portion(s) of the Caltrans Standard Specifications, Section 19.
- D. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.
- E. The Geotechnical Consultant will perform observations and tests required to enable him to form an opinion of the acceptability of the trench backfill. Correct the trench backfill that, in the opinion of the Geotechnical Consultant, does not meet the requirements of these Technical Specifications and the Geotechnical Report.

1.8 PROJECT CONDITIONS

- A. Promptly notify the Owner's Representative of surface or subsurface conditions differing from those disclosed in the Geotechnical Report. First notify the Owner's Representative verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents and disclosed in the Geotechnical Report will be allowed unless Contractor has notified the Owner's Representative in writing of differing conditions prior to contractor starting work on affected items.
- B. Protect open, trenches, and utility structure excavations with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage..
- C. Stockpile on-site and imported backfill material temporarily in an orderly and safe manner.
- D. Provide dust and noise control in conformance with Section 01010, Supplemental General Requirements for Civil Improvements.

2 PART 2 PRODUCTS

2.1 PIPE BEDDING AND INITIAL BACKFILL

- A. Pipe zone backfill should consist of native or imported materials less than one inch in maximum dimension.
- B. Trench zone backfill should consist of native soil meeting requirements of engineered fill as described in Section 02300, Earthwork.
- C. Trenches should be backfilled with onsite soil placed and compacted as recommended for engineered fill.

2.2 WARNING TAPE

- A. See Section 02510.

2.3 SUBSEQUENT BACKFILL

- A. Conform to on-site or imported structural backfill in Section 02300, Earthwork.

2.4 CONTROLLED DENSITY FILL (CDF) (IN TRENCHES)

- A. Provide non-structural CDF, from bottom of trench to finish subgrade of subbase or base material, that can be excavated by hand and produce unconfined compressive 28-day strengths from 50-psi to a maximum of 150-psi. Provide aggregate no larger than 3/8-inch top size. The 3/8-inch aggregate shall not comprise more than 30% of the total aggregate content.
- B. Cement: Conform to the standards as set forth in ASTM C-150, Type II Cement.
- C. Fly Ash: Conform to the standards as set forth in ASTM C-618, for Class F pozzolan. Do not inhibit the entrainment of air with the fly ash.
- D. Air Entraining Agent: Conform to the standards as set forth in ASTM C-260.
- E. Aggregates need not meet the standards as set forth in ASTM C-33. Any aggregate, producing performances characteristics described herein will be accepted for consideration. The amount of material passing a #200 sieve shall not exceed 12% and no plastic fines shall be present.
- F. Provide CDF that is a mixture of cement, Class F pozzolan, aggregate, air entraining agent and water. CDF shall be batched by a ready mixed concrete plant and delivered to the job site by means of transit mixing trucks.
- G. The Contractor shall determine the actual mix proportions of the controlled density fill to meet job site conditions, minimum and maximum strengths, and unit weight. Entrained air content shall be a minimum of 4.0%. The actual entrained air content shall be established for each job with the materials and aggregates to be used to meet the placing and unit weight requirements. Entrained air content may be as high as 20% for fluidity requirements.
- H. Mix design shall meet the Geotechnical Consultant's approval.

2.5 CONCRETE STRUCTURE BEDDING AND BACKFILL

- A. Precast Structures: Same materials to the same heights as specified for pipe bedding and backfill, or other material approved by the Geotechnical Consultant.
- B. Poured-in-Place Structures:
 - 1. Bedding: Bedding shall meet the approval of the Geotechnical Consultant. In general, bedding is not required, pour bases against undisturbed native earth in cut areas and against engineered fill compacted to 90% relative compaction in embankment areas.
 - 2. Side Backfill: On-site or imported structural fill meeting the requirements given in Section 02300.

2.6 FILTER FABRIC

A. Filter Fabric:

1. Mirifi 140N (Mirifi Inc., Charlotte, NC) (Tel. 800-438-1855) or equal.

3 PART 3 EXECUTION

3.1 TRENCHING AND EXCAVATION

- A. Existing PCC or AC Areas: Cut PCC or AC to full depth at a minimum distance of 12-inches beyond the edge of the trench.
- B. Excavate by hand or machine. For gravity systems begin excavation at the outlet end and proceed upstream. Excavate sides of the trench parallel and equal distant from the centerline of the pipe. Hand trim excavation. Remove loose matter.
- C. Excavation Depth for Bedding: Minimum of 4-inches below bottom of pipe or as otherwise allowed or required by the Geotechnical Consultant, except that bedding is not required for nominal pipe diameters of 2-inches or less.
- D. Excavation Width at Springline of Pipe:
 1. Up to a nominal pipe diameter of 24-inches: Minimum of twice the outside pipe diameter, or as otherwise allowed or required by the Geotechnical Consultant.
 2. Nominal pipe diameter of 30-inches through 36-inches: Minimum of the outside pipe diameter plus 2-feet, or as otherwise allowed or required by the Geotechnical Consultant.
 3. Nominal pipe diameter of 42-inches through 60-inches: Minimum of the outside pipe diameter plus 3-feet, or as otherwise allowed or required by the Geotechnical Consultant.
- E. Over-Excavations: Backfill trenches that have been excavated below bedding design subgrade, with approved bedding material.
- F. Comply with the Owner's Representative's limitations on the amount of trench that is opened or partially opened at any one time. Do not leave trenches open overnight without the approval of the Owner's Representative.
- G. Where forming is required, excavate only as much material as necessary to permit placing and removal of forms.
- H. Bottoms of trenches will be subject to testing by Geotechnical Consultant. Correct deficiencies as directed by the Geotechnical Consultant.
- I. Grade bottom of trench to provide uniform thickness of bedding material and to provide uniform bearing and support for pipe along entire length. Remove stones to avoid point bearing.

3.2 CONTROL OF WATER AND DEWATERING

- A. Be solely responsible for dewatering trenches and excavations and subsequent control of ground and surface water. Provide and maintain such pumps or other equipment as may be necessary to control ground water and seepage to the satisfaction of the Geotechnical Consultant and the Owner's Representative until backfilling is completed.
- B. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.
- C. Obtain the Geotechnical Consultant's approval for proposed control of water and dewatering methods.

- D. Reroute surface water runoff away from open trenches and excavations. Do not allow water to accumulate in trenches and excavations.
- E. Maintain dewatering system in place until dewatering is no longer required.

3.3 BRACING AND SHORING

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the pipes and appurtenances being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Owner's Representative, submit details and calculations to the Owner's Representative. The Owner's Representative may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations in trench section or around structures shall precede a response to the submittal by the Owner's Representative.
- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the line, grade, or backfill compaction or operation of the utility being installed or adjacent utilities and facilities.

3.4 PIPE BEDDING

- A. Obtain approval of bedding material from the Geotechnical Consultant.
- B. Accurately shape bedding material to the line and grade called for on the Plans. Carefully place and compact bedding material to the elevation of the bottom of the pipe in layers not exceeding 8-inches in loose thickness.
- C. Pipe bedding fill should meet the requirements of Engineered Fill as specified in the earthwork section 02300. Fill in the pipe zone backfill area should have a maximum dimension of one inch. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of bedding material will not be permitted.
- D. Upon completion of bedding operations, and prior to the installation of pipe, notify the Geotechnical Consultant, who will inspect the bedding layer. Do not commence pipe laying until the Geotechnical Consultant has approved the bedding.

3.5 WARNING TAPE

- A. Install in accordance with Section 02510.

3.6 BACKFILLING

- A. Obtain approval of backfill material from Geotechnical Consultant.
- B. Bring initial backfill up simultaneously on both sides of the pipe, so as to prevent any displacement of the pipe from its true alignment. Carefully place and compact initial backfill material to an elevation of 12-inches above the top of the pipe in layers not exceeding 8-inches in loose thickness. Compact bedding material according to Engineered Fill specifications in the Earthwork section unless specified otherwise on the Plans or by the Geotechnical Consultant. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of initial backfill material will not be permitted.
- C. Bring subsequent backfill to subgrade or finish grade as indicated. Carefully place and compact subsequent backfill material to the proper elevation in layers not exceeding 8-inches in loose thickness. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of subsequent backfill material will not be permitted.

- D. Do not use compaction equipment or methods that produce horizontal or vertical earth pressures which may cause excessive pipe displacement or damage the pipe.
- E. Utility backfill shall be inspected and tested by the Geotechnical Consultant during placement. Cooperate with the Geotechnical Consultant and provide working space for such tests in operations. Backfill not compacted in accordance with these specifications shall be re-compacted or removed as necessary and replaced to meet the specified requirements, to the satisfaction of the Geotechnical Consultant and the Owner's Representative prior to proceeding with the Project.

3.7 CLEANUP

- A. Upon completion of utility earthwork all lines, manholes catch basins, inlets, water meter boxes and other structures shall be thoroughly cleaned of dirt, rubbish, debris and obstructions of any kind to the satisfaction of the Owner's Representative.
- B. See Section 02000 for further cleanup requirements.

END OF SECTION



SECTION 02510

WATER SYSTEM

1.1 1 GENERAL

1.2 SECTION INCLUDES

- A. Site water distribution system for domestic and fire protection service up to 5 feet of any on-site commercial building being served.
- B. Domestic potable water transmission or distribution system.
- C. Fire water and irrigation water is recycled.

1.3 RELATED SECTIONS

- A. Section 02310, Utility Trenching and Backfill.
- B. Section 03301 Portland Cement Concrete.

1.4 RELATED DOCUMENTS

A. ASTM:

- 1. A 536: Specification for Ductile Iron Castings.
- 2. B 88: Specifications for Seamless Copper Water Tube.
- 3. D 1785: Specifications for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- 4. D 2564: Specifications for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.

B. AWWA:

- 1. C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- 2. C105: Polyethylene Encasement for Ductile-Iron Pipe Systems.
- 3. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water.
- 4. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- 5. C115: Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
- 6. C150: Thickness Design of Ductile Iron Pipe.
- 7. C151: Ductile-Iron Pipe, Centrifugally Cast, for Water.
- 8. C153: Ductile-Iron Compact Fittings for Water Service.
- 9. C200: Steel Water Pipe-6 In. (150 mm) and larger.
- 10. C203: Coal-Tar Protective Coatings and Linings for Steel Water Pipelines-Enamel and Tape-Hot Applied.
- 11. C205: Cement-Mortar Protective Lining and Coating for Steel Water Pipe- 4 In. and Larger-Shop Applied.
- 12. C207: Steel Pipe Flanges for Waterworks Service-Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
- 13. C208: Dimensions for Fabricated Steel Water Pipe Fittings.
- 14. C209: Cold Applied Tape Coatings for the Exterior of Special Sections, Connections and Fittings for Steel Water Pipelines.

15. C210: Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
16. C213: Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
17. C214: Tape Coating Systems for the Exterior of Steel Water Pipelines.
18. C218: Coating the Exterior of Aboveground Steel Water Pipelines and Fittings.
19. C219: Bolted, Sleeve-type Couplings for Plain-End Pipe.
20. C500: Metal-Seated Gate Valves for Water Supply Service.
21. C502: Dry-Barrel Fire Hydrants.
22. C503: Wet Barrel Fire Hydrants.
23. C504: Rubber Seated Butterfly Valves.
24. C507: Ball Valves 6 In. Through 8 In. (150 mm Through 1,200 mm).
25. C508: Swing-check Valves for Waterworks Service, 2 In. (50mm) Through 24 In. (600 mm) NPS.
26. C509: Resilient-Seated Gate Valves for Water Supply Service.
27. C510: Double Check Valve Backflow-Prevention Assembly.
28. C511: Reduced-Pressure Principle Backflow-Prevention Assembly.
29. C512: Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
30. C550: Protective Epoxy Interior Coatings for Valves and Hydrants.
31. C600: Installation of Ductile-Iron Water Mains and Their Appurtenances.
32. C605: Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings.
33. C606: Grooved and Shouldered Joints.
34. C651: Disinfecting Water Mains.
35. C800: Underground Service Line Valves and Fittings.
36. C900: Polyvinyl Chloride (PVC) Pressure Pipe and Fittings, 4 In. Through 12 In. (100mm Through 300mm) for Water Distribution.
37. C901: Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13mm) Through 3 In. (76mm) for Water Service.
38. C905: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm) for Water Transmission and Distribution.
39. C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) through 63 In (1,575 mm), for Water Distribution and Transmission.
40. C907: Polyvinyl Chloride (PVC) Pressure Fittings for Water – 4 In. through 8 In. (100 mm Through 200 mm).
41. C908: PVC Self-Tapping Saddle Tees for Use on PVC Pipe.
42. M11: Steel Pipe - A Guide for Design and Installation.
43. M23: PVC Pipe – Design and Installation.
44. M41: Ductile-Iron Pipe and Fittings.

1.5 DEFINITIONS

- A. AASHTO: American Association of State Highway and Transportation Officials.
- B. ASTM: American Society for Testing Materials.
- C. AWWA: American Waterworks Association
- D. DI: Ductile iron.
- E. DIP: Ductile iron pipe.
- F. FM: Factory Mutual.
- G. NFPA: National Fire Protection Association.
- H. NSF: National Sanitation Foundation.
- I. PCC: Portland cement concrete.
- J. PE: Polyethylene.
- K. PVC: Polyvinyl Chloride.
- L. UL: Underwriters Laboratory.

1.6 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Internal Pressures
 - 1. Working Pressures: 150-psi.
 - 2. Test Pressure: 200-psi.
- B. External Load: Earth load indicated by depth of cover plus AASHTO H20 live load unless indicated otherwise.

1.7 SUBMITTALS

- A. Follow Submittal procedure outlined in Section 01330.
- B. Product Data: For the following:
 - 1. Piping materials and fittings.
 - 2. Pipe couplings.
 - 3. Flexible pipe fittings.
 - 4. Restrained pipe fittings.
 - 5. High deflection fittings/ball joints.
 - 6. Expansion joints.
 - 7. Flexible expansion joints.
 - 8. Gate valves.
 - 9. Butterfly valves.
 - 10. Check valves.
 - 11. Air and vacuum relief valves.

12. Blow-off valves.
 13. Pressure reducing valves.
 14. Pressure sustaining valves.
 15. Ball valves.
 16. Fire hydrants.
 17. Post indicator valves.
 18. Fire department connections.
 19. Backflow preventers.
 20. Precast valve boxes and box covers.
- C. Shop drawings: Include plans, elevations, details and attachments.
1. Precast and cast in-place vaults and covers.
 2. Wiring diagrams for alarm devices.
- D. Field test reports: Indicate and interpret test results for compliance with the Project requirements.

1.8 QUALITY ASSURANCE

- A. Comply with requirements of utility supplying water. Do not operate existing valves or tap existing piping without written permission and/or presence of utility company representative.
- B. Comply with the following requirements and standards:
1. NSF 61: "Drinking Water System Components-Health Effects" for materials for potable water.
 2. NFPA 24: "Installation of Private Fire Service Mains and Their Appurtenances" for materials, installations, tests, flushing, and valve and hydrant supervision.
 3. NFPA 70: "National Electric Code" for electrical connections between wiring and electrically operated devices.
- C. Provide listing/approval stamp, label, or other marking on piping and specialties made to a specified standard.

1.9 MATERIAL DELIVERY, STORAGE AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
1. Ensure that valves are dry and internally protected against rust and corrosion.
 2. Protect valves against damage to threaded ends and flange faces.
 3. Set Valves in best position for handling. Set valves closed to prevent rattling.
- B. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage and handling to prevent pipe end damage and to prevent entrance of dirt, debris and moisture.
- C. Handling: Use slings to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

- D. During Storage: Use precautions for valves, including fire hydrants according to the following.
 - 1. Do not remove end protectors, unless necessary for inspection, then reinstall for storage.
 - 2. Protection from Weather: Store indoors and maintain temperature higher than ambient dew-point temperature. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- E. Do not store plastic pipe and fittings in direct sunlight.
- F. Protect pipe, fittings, flanges, seals and specialties from moisture, dirt and damage.
- G. Protect linings and coatings from damage.
- H. Handle precast boxes, vaults and other precast structures according to manufacturer's written instructions.
- I. Protect imported bedding and backfill material from contamination by other materials.

1.10 COORDINATION

- A. Coordinate connection to existing water mains with water utility supplying water.
- B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building domestic water distribution piping and fire protection piping.

2 PART 2 PRODUCTS

2.1 SMALL SIZE SERVICE PIPES

- A. Copper Pipe: Sizes ¾-inch through 2-inch.
 - 1. Pipe and Fittings: ASTM B 88, Type K, seamless water tube, annealed.
 - 2. Joints: Restrain by couplings.
- B. PE Plastic Pipe: Sizes ½-inch through 3-inch.
 - 1. Pipe and Fittings: AWWA C901.
 - 2. Joints: Restrain with clamps or heat-fusion.
- C. PVC Pipe: Sizes 1/8-inch through 3 inch.
 - 1. Pipe and Fittings: ASTM D 1785, Schedule 40.
 - 2. Joints: Restrain with solvent cement. Do not use threaded pipe.
 - 3. Solvent Cement: ASTM D2564.

2.2 LARGE SIZE SERVICE AND DISTRIBUTION PIPES

- A. PVC Pipe: Sizes 4-inch through 48-inch.
 - 1. Pipe:
 - a. 4-inch through 12-inch: AWWA C900.
 - b. 14-inch through 48-inch: AWWA C905.
 - 2. Fittings: DI conforming to 2.2A above.
 - 3. Unrestrained Joints:
 - a. Push-On Bell and Spigot Joint: AWWA C900.

4. Restrained Joints:
 - a. Push-On Bell and Spigot Joint: Harness assembly as manufactured by Ebaa Iron (Eastland, Tx) (Tel. 800-433-1716) or approved equal.
 - b. Plain End PVC to DI Mechanical Joint: Ebaa Iron (Eastland, Tx) (Tel. 800-433-1716) or approved equal.
5. Steel or Ductile Iron Couplings:
 - a. Plain End Pipe to Plain End Pipe: Ductile iron or steel bolted couplings, manufacturer's shop coating with stainless steel bolts and nuts. Steel couplings to conform to AWWA C219. Smith-Blair, Inc, (Texarkana, AR) (Tel. 501-773-5127), Dresser (Bradford, PA) (Tel.-814-368-3131) or approved equal.
 - b. Plain End Pipe to DI or Steel Flanged Pipe: Ductile iron or steel bolted flanged coupling adapters, manufacturer's shop coating with stainless steel bolts and nuts. Steel flanged couplings to conform to AWWA C219.
6. PVC Couplings
 - a. Unrestrained Plain End to Plain End Pipe: AWWA C900, as manufactured by CertainTeed (Valley Forge, PA) (Tel. 610 341-6820) or approved equal.
 - b. Restrained Plain End to Plain End Pipe: AWWA C900, "Certa-Lock" as manufactured by CertainTeed (Valley Forge, PA) (Tel. 610 341-6820) or approved equal.

2.3 HIGH DEFLECTION FITTINGS/BALL JOINTS

- A. Plain End Pipe: extra Flex Restrained Joint High Deflection Fittings, 4-inch through 24-inch, U. S. Pipe, (Birmingham, AL) (Tel. 205-254-7442) or approved equal.
- B. Mechanical or Flanged Joint: Flex 900, 4-inch through 12-inch, Ebaa Iron Sales, (Eastland, TX) (Tel. 800-433-1716) or approved equal.

2.4 EXPANSION JOINTS

- A. TR Flex Joints: TR Flex Telescoping Sleeve, 4-inch through 64 inch, U. S. Pipe, (Birmingham, AL) (Tel. 205-254-7442).
- B. Mechanical or Flanged Joint: Ex-Tend 200, 4-inch through 36-inch, EBAA Iron Sales, (Eastland, TX) (Tel. 800-433-1716) or approved equal.

2.5 FLEXIBLE EXPANSION JOINTS

- A. Plain End to Plain End Pipe: "Xtra Flex," sizes 4-inch through 24-inch, U. S. Pipe, (Birmingham AL) (Tel. 205-254-7442) or approved equal.
- B. Flanged or mechanical Joint: "Flex-Tend," sizes 3-inch through 48-inch, Ebaa Iron (Eastland TX) (Tel. 800-433-1716) or approved equal.
- C. Flanged Joint: Starflex, Series 500, Star Pipe Products, (Tel. 800-999-3009) or approved equal.

2.6 GATE VALVES

- A. Provide on lines 10-inch and smaller. [Valves larger than about 10-inch are usually butterfly valves. Check with the owner of the system as to the maximum size of gate valve allowed.]
- B. Valves, 3-Inch through 20-Inch: AWWA C509, resilient-seated, non-rising stem, gray or ductile-iron body and bonnet, with bronze or gray or ductile-iron gate, bronze stem and square stem operating nut unless noted otherwise. *[Metal seated, AWWA C500, and rubber seated, AWWA C504, are also available.]* All bolts, nuts and washers, except operating nut, shall be stainless steel. Stem operating nut to be 2-inches square and open counter-clockwise. Stem extensions shall be installed to bring the stem operating nut to within 2-feet of finish grade where the depth from finish grade to the stem operating nut exceeds 4-feet.

Equip valves in pump stations and other interior or vault installations with hand-wheels. Provide protective epoxy interior and exterior coating according to AWWA C550 and manufacturer's recommendations.

- C. Service Line Valves and Fittings, 2-Inch and Smaller: AWWA C800
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
 - 1. Mueller Company (Decatur, IL) (Tel.800-423-1323).
 - 2. M&H Valve Company (Anniston, AL) (Tel. 205-237-3521).
 - 3. Crane Company (New York, NY).
- E. Valve Box and Cover: 9-inch minimum diameter PCC box with extensions of length required for depth of bury of valve, and cast iron or ductile iron cover with lettering "WATER". Both the box and the cover shall be rated for AASHTO H20 loading.

2.7 BUTTERFLY VALVES

- A. Provide on lines larger than 10-inch.
- B. Valves, 3-Inch through 72-Inch: AWWA C 504, rubber seated, Class 150B cast iron body, cast or ductile iron discs, stainless steel shafts, adjustable field replaceable rubber seats mating against stainless steel seat rings and field-replaceable seals. Flanged or mechanical joint end connections. No wafer type valves allowed. Traveling nut type valve actuators designed for buried service unless noted otherwise. All bolts, nuts and washers, except wrench nut, shall be stainless steel. Wrench nut to be 2-inches square and open counter-clockwise. Stem extensions shall be installed to bring the wrench nut to within 2-feet of finish grade where the depth from finish grade to the wrench nut exceeds 4-feet. Equip valves in pump stations and other interior or vault installations with hand-wheels. Provide protective epoxy interior and exterior coating according to AWWA C550 and manufacturer's recommendations.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
 - 1. Mueller Company (Decatur, IL) (Tel.800-423-1323).
 - 2. M&H Valve Company (Anniston, AL) (Tel. 205-237-3521).
 - 3. Crane Company (New York, NY).
- D. Valve Box and Cover: 9-inch minimum diameter PCC box with extensions of length required for depth of bury of valve, and cast iron or ductile iron cover with lettering "WATER". Both the box and the cover shall be rated for AASHTO H20 loading.

2.8 AIR RELEASE, AIR/VACUUM AND COMBINATION AIR VALVES

- A. AWWA C512, specific type of valve, size, details and valve box as indicated.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
 - 1. Apco Valves, Valve and Primer Corporation (Schaumburg, IL) (Tel. 708-529-9000).
 - 2. Crispin.

2.9 BLOW-OFF VALVES

- A. Blow-off valve assemblies, details and boxes as indicated.

2.10 SWING CHECK VALVES

- A. Valves 2-Inch through 24-Inch: AWWA C508, details as indicated.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
 - 1. Mueller Company (Decatur, IL) (Tel.800-423-1323).
 - 2. M&H Valve Company (Anniston, AL) (Tel. 205-237-3521).

2.11 BALL VALVES

- A. Valves 6-Inch through 48-Inch: AWWA C507, details as indicated.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
 - 1. Crane Company (New York, NY).

2.12 PRESSURE-REGULATING VALVES

- A. Valve: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. 250-psi Working-pressure, bronze pressure-reducing pilot valve and tubing, and means for discharge pressure adjustment. Details as indicated.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
 - 1. Cla-Val Company (Newport Beach, CA) (Tel. 714-548-2201).
 - 2. Bermad (Porterville, CA) (Tel. 209-781-6630).
 - 3. Ames Company (Woodland, CA) (Tel. 916-666-2493).

2.13 FLOW-REGULATING VALVES

- A. Valve: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. 250-psi working-pressure, bronze pressure-reducing pilot valve and tubing, and means for flow adjustment. Details as indicated.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
 - 1. Cla-Val Company (Newport Beach, CA) (Tel. 714-548-2201).
 - 2. Bermad (Porterville, CA) (Tel. 209-781-6630).
 - 3. Ames Company (Woodland, CA) (Tel. 916-666-2493).

2.14 SERVICE CONNECTIONS AND WATER METERS

- A. Service connections and water meter details and boxes as indicated.

2.15 FIRE HYDRANTS

- A. Wet Barrel: AWWA C503, details as indicated
- B. Dry Barrel: AWWA C502, details as indicated

2.16 REDUCED-PRESSURE-PRINCIPLE BACKFLOW PREVENTER

- A. Provide as indicated and as required by State or local agency.
- B. General: AWWA C511, with OS gate valve on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air gap fitting located between 2 positive-seating check valves for continuous-pressure application.
- C. Body:
 - 1. 2-Inch and Smaller: Bronze with threaded ends.
 - 2. 2-1/2-Inch and Larger: Bronze, cast iron steel, or stainless steel with flanged ends.
- D. Interior Lining: AWWA C550, epoxy coating for cast iron or steel bodies.
- E. Interior Components: Corrosion-resistant materials.
- F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
 - 1. Cla-Val Company (Newport Beach, CA) (Tel. 714-548-2201).
 - 2. Ames Company (Woodland, CA) (Tel. 916-666-2493).
 - 3. Febco, CMB Industries, Inc. (Fresno, CA) (Tel. 559-252-0791).
 - 4. Hersey Products, Inc. (Dedham, MA) (Tel. 617-326-9400).

2.17 POST INDICATOR VALVE

- A. General: UL 789, FM approved, vertical-type, cast-iron body with operating wrench extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve. Review fire department connection with agency having jurisdiction. Check hose threads and all sizes with fire department.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
 - 1. Mueller Co. (Decatur, IL) (Tel. 800-423-1323).
 - 2. Clow Corporation (Oskaloosa, IA).

2.18 FIRE DEPARTMENT CONNECTION

- A. Exposed, Freestanding Fire Department Connection: UL 405, cast brass body with threaded inlets according to NFPA 1963 and matching local fire department hose threads and threaded bottom outlet. Include lugged caps, gaskets and chains; lugged swivel connections and drop clapper for each hose-connection inlet; 18-inch high brass sleeve; and round escutcheon plate. Two 2-1/2-inch NPS inlets and 4-inch NPS outlet.

2.19 UNDERGROUND VAULTS/PITS

- A. General: Portland cement concrete, precast or cast-in-place as indicated.
- B. Portland Cement Concrete and Reinforcing Steel: Section 03301.
- C. Access Openings: As indicated.
- D. External Load: Earth load plus AASHTO H20 live load if located in traffic area.

2.20 TRACER WIRE

- A. General: Minimum #12 AWG stranded copper wire with blue THW, THWN, or THHN rated insulation.

2.21 WARNING TAPE

- A. General: Non-detectable 3-inch warning tape made of solid blue film with continuously printed black-letter message reading "CAUTION—WATER LINE BURIED BELOW."

2.22 PCC THRUST BLOCKS

- A. Portland Cement Class B Concrete and Reinforcing Steel: Section 03301.

2.23 CORROSION PROTECTION

- A. All buried ductile iron pipes, steel or ductile iron connection fittings, and metal valves shall be corrosion protected by the installation of corrosion protection wrapping/coatings Polyken 930 tape and mastic or approved equal. Corrosion protection shall be installed in accordance with manufacturer's instructions.

3 PART 3 EXECUTION

3.1 PIPE INSTALLATION

- A. General: Install pipe, fittings, and appurtenances utilizing best practices, manufacturer's instructions, and in accordance with the following:
 - 1. DIP: AWWA M41 and AWWAC600.
 - 2. PVC pipe: AWWA M23 and AWWA C605.
 - 3. Steel Pipe: AWWA M11.
- B. Pipe Depth and Trench Configuration: Conform to elevations, profiles and typical trench section(s) indicated.
- C. Excavation, Bedding, Backfill, and Compaction: Section 2310.
- D. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with manufacturer's recommendations.
- E. Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Lay pipe on a bed of bedding material specified and prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout it's entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by blocking or wedging. After final positioning, hold pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations as required to hold the pipe section in place.
- F. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. If necessary, use shorter than the standard lengths of pipe to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.
- G. Closure: Close open ends of pipes and appurtenance openings at the end of each days work or when work is not in progress.

3.2 CONNECTING TO EXISTING MAINS

- A. Pressure Tap Connections: Perform in accordance with the requirements of the owner of the system being tapped. Maintain a positive pressure flow from the main being tapped to the tapping device to flush plastic chips, metal ribbons, etc. into the tapping devise and not into the pipe being tapped.
- B. Other Connections: As indicated and in accordance with the requirements of the owner of the line being connected to.

3.3 ANCHORAGE INSTALLATION

- A. Mechanically Restrained Joints: Install where indicated for lengths indicated in accordance with manufacturer's instructions.
- B. PCC Thrust Blocks: Install where required and as indicated. Bearing area indicated is to be against undisturbed earth. Allow a minimum of 24-hours curing time before introducing water into the pipeline and allow a minimum of 7-days curing time before pressure testing.

3.4 HIGH DEFLECTION FITTINGS/BALL JOINTS, EXPANSION JOINTS, AND FLEXIBLE EXPANSION JOINTS

- A. Install as indicated and in accordance with the manufacturers recommendations.

3.5 VALVE INSTALLATION

- A. Install all valves in accordance with the manufacturer's instructions and the following:
 - 1. General:
 - a. Gate Valves: Appendix A of AWWA C509.
 - b. Butterfly Valves: Appendix A of AWWA C504.
 - 2. Joints:
 - a. Valves on DI, PE and PVC Pipe: Mechanical joint valves for buried locations. Flanged-end valves for installation in vaults/pits.
 - b. Valves on Steel Pipe: As indicated for buried locations. Flanged-end valves for installation in vaults/pits.

3.6 SERVICE CONNECTIONS INSTALLATION

- A. Install as indicated and in accordance with the requirements of the owner of the system.

3.7 WATER METER INSTALLATION

- A. Install as indicated and in accordance with the requirements of the owner of the system.

3.8 FIRE HYDRANT INSTALLATION

- A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

3.9 REDUCED-PRESSURE PRESSURE BACKFLOW PREVENTER INSTALLATION

- A. Install as indicated and in accordance with the requirements of the owner of the system and the local health department requirements.

3.10 DOUBLE CHECK DETECTOR ASSEMBLY INSTALLATION

- A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

3.11 POST INDICATOR VALVE INSTALLATION

- A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

3.12 FIRE DEPARTMENT CONNECTION INSTALLATION

- A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

3.13 UNDERGROUND VAULT/PIT INSTALLATION

- A. Install as indicated.
- B. Excavation and Backfill: Section 02310.

3.14 TRACER WIRE INSTALLATION

- A. Install on trench bottom under the vertical projection of the pipe to protect it in all installations.
- B. Form a mechanically and electrically continuous line throughout the pipeline, extending to the nearest valve or other pipeline appurtenance designated by the owner of the system or the Owner's Representative. Extend the wire up the outside of the valve box/riser and cut a hole that is 8-inches from the top, extend a 12-inch wire lead to the inside of the box. At other pipeline appurtenances, designated by the owner of the system or the Owner's Representative, terminate the 12-inch wire lead inside the enclosure.
- C. Splice wire with a splicing device consisting of and electro-tin plated seamless copper sleeve conductor. Install as recommended by the manufacturer. Wrap splices and damaged insulation with electrician's tape.

3.15 WARNING TAPE INSTALLATION

- A. Install tape approximately 1-foot above and along the centerline of the pipe.
- B. Where tape is not continuous, lap tape ends a minimum of 2-feet.

3.16 HYDROSTATIC PRESSURE AND LEAKAGE TEST

- A. General:
 - 1. Provide all necessary materials and equipment, including water.
 - 2. Backfill all trenches sufficient to hold pipe firmly in position.
 - 3. Allow time for thrust blocks to cure prior to testing.
 - 4. Flush all pipes prior to testing to remove all foreign material.
 - 5. Perform pressure and leakage test concurrently.
 - 6. Test pressure: See Subsection titled "System Performance Requirements."
 - 7. Apply test pressure by means of a pump connected to the pipe.
 - 8. Base test pressure on the elevation of the lowest point in the line.
 - 9. Fill each closed valve section or bulk-headed section slowly. Expel air from section being tested by means of permanent air vents installed at high points or by means of temporary corporation cocks installed at such points. Remove and plug the temporary corporation cocks at the conclusion of the test.
 - 10. Allow water to stand in the pipe for 24 hours before test pressure is applied.
 - 11. Allow the system to stabilize at the test pressure before conducting the leakage test.
 - 12. Do not operate valves in either the opening or closing direction at differential pressures above the valves rated pressure.
 - 13. Maintain test pressure as specified for type of pipe being tested.
 - 14. Pressure Test: Examine any exposed pipe, fittings, valves, hydrants and joints during the test, if no leaks are observed the section of line has passed the pressure test. If leaks are observed, repair any damaged or defective pipe, fittings, valves, or hydrants, and repeat the pressure test.
 - 15. Leakage Test: Perform as specified hereafter for the type of pipe being installed.

B. PVC Pipe Leakage Test: Perform in accordance with AWWA M23. Selected requirements of AWWA M23 are repeated as follows:

1. Maintain the test pressure, +/- 5 psi, for a minimum of two hours.
2. No piping will be accepted if the leakage is greater than that determined by the following formula:
3. $L = (N \times D \times P^{1/2}) / 7,400$
4. L = Allowable leakage, gallons per hour.
5. N = Number of joints in the length of the pipeline tested.
6. D = Nominal diameter of pipe, inches.
7. P = Average test pressure during the leakage test, pounds per square inch (gauge).

3.17 DISINFECTION

A. All New Pipelines shall be disinfected in accordance with one of the three methods specified in AWWA C651 and the following:

1. Disinfect after pressure and leakage test have been performed and accepted.
2. The method used shall be at the Contractor's option, unless specified by the owner of the water system.
3. Engage the services of a commercial testing laboratory, approved by the owner of the water system, to perform the bacteriological tests specified in Section 5.1 of AWWA C651. Direct the testing laboratory to send the original report of the bacteriological testing to the owner of the water system. Should the laboratory report show that any sample taken was not acceptable, repeat the sterilization process shall until a satisfactory sterilization is accomplished.
4. Lawfully dispose of the chlorinated water.

END OF SECTION



SECTION 02520

SITE CONCRETE

1. PART 1 GENERAL

1.1 DESCRIPTION

A. Provide Portland cement concrete site work complete, including the following principal items:

1. seat walls, site walls and stairs.
2. Curbs, walks and pavements, including aggregate bases.
3. Footings for posts and structures.
4. Curb ramps per ADA Requirements

B. Related requirements specified elsewhere include:

1. Section 02300 - Earthwork.

1.2 QUALITY ASSURANCE

A. Reference and Standards

1. Soils Reports: Reports of geotechnical investigations by CTS CONSTRUCTION TESTING SERVICES, dated December 2, 2005.
2. Perform work in accordance with all applicable laws, codes and regulations required by the City of Livermore
3. Reference to "Standard Specifications" shall mean the current Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS.
4. The American Concrete Institute (ACI): "Manual of Concrete Practice," Parts 1, 2 and 3.
5. "Recommended Practice for Concrete Formwork" (ACI 347R)
6. United States Voluntary Product Standard for Construction & Industrial Plywood (PS 1-95).
7. American Plywood Association's "Guide to Plywood Grades" (APA).
8. West Coast Lumber Inspection Bureau's "Standard Grading Rules No. 16" (WCLIB)
9. Concrete Reinforcing Steel Institute (CRSI): "Manual of Standard Practice" and "Recommended Practice for Placing Reinforcing Bars".
10. American Welding Society: AWS A5.1 and AWS D1.4.
11. Americans with Disabilities Act (ADA), Federal ADA/State of California Title 24 Standards.
12. California Code of Regulations, Title 24, 2001 Edition, also known as California Building Code (CBC).

B. Stipulations

1. Finish Surface Tolerance: 1/4-inch maximum variation in 10 feet.
2. At no point shall paving surface fail to drain.
3. Finish Concrete Surface Slip Resistance: Shall have a minimum slip resistance coefficient of 0.74.
4. Walls retaining soil that retain 30 inches or more of soil shall include a subsurface drain behind wall per Section 68 of the Standard Specifications and as accepted by the Owner's Representative.

C. Testing and Inspection, per Section 01458.

D. Conform to ACI 305 during hot weather and to ACI 306 during cold weather.

E. Requirements of ACI 301 shall govern work, materials and equipment related to this Section; specifications herein set minimum results required, and references to procedures are intended to establish minimal guides.

F. The Contractor shall be responsible for quality of concrete in place and shall bear burden of proof that concrete meets minimum requirements.

- G. Placing of concrete by means of pumping will be an acceptable method of placement providing that the Contractor can demonstrate that:
1. Specified concrete strengths will be met.
 2. Equipment has a record of satisfactory performance under similar conditions and using a similar mix.
 3. Trial batches have been successfully made.
- H. Installer Qualifications: Concrete work shall be by firm with 5 years experience with work of similar scope and quality.
- I. Formwork Design Criteria: Formwork shall conform to ACI 347 and CBC Section 1906A.
1. Formwork:
 - a. Shall prevent leakage or washing out of cement mortar.
 - b. Shall resist spread, shifting, and settling.
 - c. Shall reproduce accurately required lines, grades and surfaces within tolerances specified.
 2. Safety: The Contractor shall be responsible for adequate strength and safety of all formwork including falsework and shoring.
 3. Formwork allowable tolerances: Formwork shall produce concrete within tolerance limits recommended in ACI 347, unless otherwise noted.

1.3 TESTS

- A. The Owner will select a qualified testing laboratory to take samples for testing during the course of the work as considered necessary. Costs for such tests will be paid by the Owner. Contractor shall cooperate in making tests and shall be responsible for notifying the designated laboratory in sufficient time to allow taking of samples at time of pour.
- B. Should tests show that concrete is below specified strength, Contractor shall remove all such concrete, as directed by the Owner. Full cost of removal of low strength concrete, its replacement with concrete of proper specified strength and testing, shall be borne by Contractor.

1.4 COORDINATION: Coordinate items of other trades. Contractor shall be responsible for the proper installation of all accessories embedded in the concrete and for the provision of holes, openings, etc., necessary to the execution of the work of the trades.

1.5 SUBMITTALS, per Section 01330.

- A. Samples of all materials under this Division shall be supplied for testing as requested by the Owner.
- B. Submit two full-scale mock-up (minimum 3' by 3') sample panels of all concrete finishes and color (with curing compound if any to be used and score joints) indicated on the drawings. Approved samples shall be kept at the job site to serve as a prerequisite for all finishes until acceptance of the Work.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Supply ready mixed concrete throughout. Batch, mix and transport in accordance with ASTM C-94, "Specifications for Ready Mixed Concrete."
- B. Mix and deliver concrete in quantities that will permit immediate use only.
- C. Indiscriminate addition of water for any reason will be cause for rejection of the load.

2. PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Cement and aggregates shall have proven history of successful use with one another. Sources of cement and aggregate shall remain unchanged throughout work.

B. Mixes:

1. Ready-mixed concrete shall meet requirements of ASTM C94.
2. The Contractor shall perform tests or assemble the necessary data indicating conformance with specifications.
3. For each mix, submit data showing that proposed mix will attain the required strength in accordance with requirements of CBC Section 1905A.3.
4. Instruct Laboratory to base mix design on use of materials specified and approved by the Owner's Representative.
5. Mix design shall include compression strength test reports per CBC Section 1905A.3.1.
6. Insure mix designs will produce concrete to strengths specified and of uniform density without segregation.
7. If mix yield exceeds 1-cubic yard, modify mix design to no more than one cubic yard, without changing cement content.
8. Introduction of calcium chloride will not be permitted.
9. Mix design shall be in accordance with CBC Section 1905A2.3 Method B.

2.2 FORMWORK MATERIALS

- A. Panel or board forms for Exposed Finish Concrete: Minimum 5/8-inch thick exterior grade plywood with sealed edges, PS 1 grade Plyform Class I and II B-B Exterior. For Exposed Smooth Form-finished Concrete (seatwalls and site walls) use Medium Density (or better) Overlaid Concrete Form Exterior (MDO), to provide continuous straight, smooth, exposed surfaces without grain patterns. Furnish in largest practicable sizes to minimize number of joints and to conform to a joint system as approved by Owner's Representative. Curbs may be formed with approved metal form systems.
- B. Chamfer Strips: Burke Concrete Accessories, PVC type CSF 1/2-inch or as otherwise shown, all exposed corners.
- C. Form Release Agent: Must not stain or otherwise adversely affect architectural concrete surfaces. "Nox-Crete Form Coating"; Industrial Synthetics Corp.'s "Synthex"; or equal.
- D. Form Ties: Burke "Penta-Tie," or equal, cone and rod type with 1-inch break-back.

2.3 REINFORCING MATERIALS

- A. Bar Reinforcement: ASTM A615.
 1. #3 and smaller: Grade 40.
 2. #4 and larger: Grade 60.
- B. Wire Fabric Reinforcement: ASTM A185. Size (6" by 6" / W1.4 By W1.4 (#10 ga. by #10 ga.)

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type II. Use one brand of cement throughout project.
- B. Aggregates: ASTM C33, materials from established sources with proven history of successful use in producing concrete with minimum shrinkage.
- C. Water: Clear and potable, free from deleterious impurities.
- C. Admixtures:
 1. Admixtures are optional; however, a water reducer or plasticizing admixture shall be included in the concrete mix and it must be compatible with color pigments where color pigments are required. Any proposed admixture shall comply with State Section 2603(b) 5 of Part 2, Title 24 CCR.
 2. Where more than one admixture is proposed, include statement from admixture manufacturer indicating that admixtures proposed for use are compatible, such that desirable effects of each admixture will be realized.

3. Accelerating admixtures and admixtures containing more than 0.05 percent chloride ions are not permitted. If an accelerator is used, it shall be a non-chloride accelerator.
4. Liquid admixtures shall be considered part of the total water.
5. Refer to Color Additives/Pigments herein for color admixtures.

E. Lamp Black: As supplied by batch plant for plain non-colored concrete work.

2.5 CONCRETE MIXES

- A. Concrete mixes shall be approved and shall be in accordance with Caltrans Standard Specifications Section 90. Unless otherwise noted, mix shall be Class "A," 3,000 psi, Type II Portland cement and 3/4-inch maximum aggregate.
- B. Lampblack: Concrete for non-colored pavements shall be darkened by the addition of approved agents at the mixer. The proportion of lampblack or other approved colorant shall be that required to properly darken the concrete to reduce glare, and shall be subject to the approval of the Owner's Representative.

2.6 ANCILLARY MATERIALS

- A. Aggregate Base: Class II aggregate base conforming to Section 26 of the Standard Specifications and Subgrade Specifications herein.
- B. Expansion Joint Material
 1. Fiber Expansion Joint: A non-extruding resilient filler, saturated with high quality bituminous materials having preserving characteristics. Conform to ASTM-D994-71.
 2. Caulked Expansion Joint: "Sonolastic Sealant Two-Part" as manufactured by Sonneborn-Contech, Building Products Division, Contech, Inc.; or approved equal. Joint caps or bond breaker tape to be as recommended by sealant manufacturer. Color shall be light gray.
- C. Dampproofing: Per CALTRANS Standard Specifications, Section 54.
- D. Subsurface Drain behind Retaining-Type Walls: All concrete walls that retain 30 inches of soil or more shall include a subsurface drainage system to relieve water pressure in accordance with Section 68 of the CALTRANS Standard Specifications and as shown. If no subsurface drain is shown, provide corrugated polyethylene plastic tubing per 68-1.02K surrounded with an envelope of Class 2 permeable material per 68-1.025 and wrapped with filter fabric per 68-1.028.
- E. Curing Materials for non-colored Concrete:
 1. Waterproof Paper: ASTM C171, Type 1, regular. Same as Sisalkraft Division of St. Regis Paper Co.'s "Orange Label", or equivalent.
 2. Impervious sheeting: 4 mil white polyethylene laminated to 10 oz. Burlap, ASTM C171, Type 1.1.3, fungus-resistant.
 3. Curing Compound: ASTM C309. Type 1-D, Class B; dissipating resin. Product: Sealtight 1100 Clear-Series by WR Meadows, Burke Azua Resin Cure by Edocol, or equal that will not discolor concrete or affect bonding of other finishes applied thereafter, and which restricts loss of water to not more than 0.500 grams per sq. centimeter of surface when tested per ASTM C156, "Test Method for Water Retention by Concrete Curing Materials."
- F. Grout: Premixed high strength non-shrink grout requiring only addition of water at the site. Burke's "Non-Ferrous, Non-Shrink Grout"; Master Builders "Masterflow 928 Grout", or equal.
- G. Patching Mortar: Mix in proportions by volume of one part cement to two parts fine sand.

3. PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Install all concrete work true to line and grade as indicated on the drawings.
- B. Correct irregularities to the satisfaction of the Owner's Representative.
- C. Plain non-colored, exposed concrete shall contain lampblack, approximately 2 pounds of per cubic yard, as accepted by Owner's Representative.

3.2 PREPARATION

- A. Provide subgrade preparation and the base material installation complete, including clearing, grading, excavation, and filling and dewatering. Take every precaution to obtain a subgrade of uniform bearing power compacted to a minimum of 90% relative compaction as determined by the ASTM D1557 laboratory test procedure and in Sections 19 and 20 of the Caltrans Standard Specifications.
- B. Subgrade shall be kept moist and shall not be allowed to dry out before placement of concrete. Place no material on muddy subgrade.
- C. Aggregate base, where indicated, shall be placed and compacted in conformance with Caltrans Standard Specifications 26-1.04 and 26-1.05.
- D. Obtain approval of subgrade from Owner's Representative prior to placing steel and concrete.

3.3 FORMS

- A. Forms shall be constructed in accordance with ACI 347 and shall be of sufficient strength and sufficiently tight to prevent visible distortion or leakage of mortar and fines.
- B. Forms for exposed surfaces shall be constructed to protect intended finish. Deflection of facing material between studs shall not exceed 0.0025 of the span. Facing material and pattern of joints shall be as approved by the Owner's Representative.
- C. For vertical surface of wall footings below grade, clean cut trench may be used in lieu of form if character of soil will permit installation without sluffing and width of concrete is increased at least 1 inch beyond indicated dimension of each face poured against earth.
- D. Curb and pavement edge forms shall extend full depth of concrete and shall be coordinated with installation of planting root barriers where required. Curves shall be formed with flexible metal or wood made up of thin laminations. Curve forms shall extend one stake space straight beyond tangent point. Where curbs and pavement are adjacent to areas to receive root barriers, provide smooth uniform edges. Remove any excess concrete as required to allow installation of root barriers without gaps between curbs and/or pavement and barriers.
- E. Maintain forms within the following tolerances.
 - 1. Top of Form: Plus or minus 1/8 inch in 10 feet and no abrupt variations; at required elevation to plus 3/8 inch.
 - 2. Face of Form: Plus or minus 1/4 inch in 10 feet longitudinal and no abrupt variations; perpendicular to surface plus or minus 1/8 inch.
- F. Form Ties: Align form ties as accepted by Owner's Representative. Obtain approval of form work from Owner's Representative prior to placing concrete.
- G. Forms may be reused upon cleaning and coating with parting compound to ensure separation from concrete without damage.
- H. After concrete is placed, the following minimum times shall elapse before removal of forms.
 - 1. Walls and benches: 48 hours.
 - 2. Footing sides: 24 hours.
 - 3. Curbs: 1 hour

3.4 REINFORCEMENT

- A. All concrete shall be steel reinforced unless specifically noted to be "not reinforced." If no reinforcement is shown, reinforce in same manner as that shown in similar places.
- B. Fabricate and place reinforcement as indicated on the Drawings and in accordance with ACI "Detailing Manual" SP-66. No reinforcement shall be placed prior to distribution of the approved shop drawings.
- C. Secure reinforcement in position by suitable supports and by wiring at intersections with tie wire. Supports shall be of sufficient number and strength to resist crushing or displacement under full load. Metal shall not extend to surface of concrete.
- D. At time of placing concrete, reinforcing shall be free of excessive rust, mill scale, or other bond reducing matter. Immediately before placing concrete, check and adjust position, support and anchorage.

3.5 CLEANING, PATCHING AND DEFECTIVE WORK

- A. Where concrete is under strength, out of line, level or plumb, or shows objectionable cracks, honeycombing, rock pockets, voids, spalling, exposed reinforcement, signs of freezing or is otherwise defective, and, in the Owner's Representative's judgment, these defects impair proper strength or appearance of the work, the Owner's Representative will require its removal and replacement at the Contractor's expense.
- B. Immediately after stripping and before concrete is thoroughly dry, patch minor defects, form-tie holes, honeycombed areas, etc., with patching mortar colored and textured to match concrete. Remove ledges and bulges.
- C. Compact mortar into place and neatly file defective surfaces to produce level, true planes. After initial set, dress surfaces of patches mechanically or manually to obtain same texture as surrounding surfaces.
- D. Rock Pockets:
 - 1. Cut out to full solid surface and form key.
 - 2. Thoroughly wet before casting mortar.
 - 3. Where the Owner's Representative deems rock pocket too large for satisfactory mortar patching as described, cut out defective section to solid surface, and replace.
- E. Cleaning
 - 1. Insure removal of bituminous materials, form release agents, bond breakers, curing compounds, if permitted and other materials employed in work of concreting that would otherwise prevent proper application of sealants, liquid waterproofing, and other delayed finishes and treatments.
 - 2. Where cleaning is required, take care not to damage surrounding surfaces or leave residue from cleaning agents.

3.6 MIXING AND PLACING CONCRETE

- A. Conform to applicable requirements set forth in Caltrans Standard Specifications Section 90.
- B. Mixes for integrally colored concrete shall have pigment added early enough to ensure complete dispersal and uniform color, but not less than 15 minutes before placing.

3.7 JOINTS AND GROOVES

- A. Plane of joints shall be perpendicular to surface. Where new pavements join existing, joints shall align.
- B. Sawn Contraction Joints:
 - 1. General: Provide where shown. Saw cut straight, true, and uniform, 1/4-inch-wide and not less than 1/4 of slab thickness in depth, unless otherwise noted. Cut with a power saw fitted with an abrasive or diamond blade.
 - 2. Commence saw cutting operations after concrete has cured long enough to resist damage by the saw cutting operations and early enough to avoid random contraction cracks.

3. Contractor shall coordinate form removal and sequencing of adjacent concrete placement to minimize unnecessary saw cutting of adjacent surfaces.
4. Contractor shall plan for the use of varying types of saw cutting apparatus to provide acceptable finishes in areas limited in accessibility.
5. Fill saw cut over-runs and inadvertent saw cutting of adjacent surfaces with cement mortar to match color and finish of sawn pavement.
6. If joint pattern not shown, provide joints not exceeding 15 feet in either direction and located to conform to column centerlines, wall corners, etc. as accepted by Owner's Representative.

C. Tooled Joints / Score Joints

1. Form joints in fresh concrete using a jointer to cut the groove so that a smooth, uniform impression is obtained to 1/3 depth of pavement unless shown otherwise.
2. All joints shall be struck before and after brooming. Tool concrete both sides of joint.

D. Expansion Joints and Edging: Provided at the location and intervals as shown on the drawings, and at all locations where concrete paving abuts buildings, curbs or other structures, and not more than 18 feet on center. Specified and shown joint material shall be placed with top edge 1/8" below the paved surface, and shall be securely held in place to prevent movement. Joint and other edges shall be formed in the fresh concrete using an edging tool to provide a smooth uniform impression. All edges shall be struck before and after brooming.

E. Sealed Joints: After the curing period, expansion joints shall be carefully cleaned and filled with approved joint sealant to just below adjacent paved surface in such a manner as to avoid spilling on paved surfaces or overflowing from joint.

3.8 TOOLED SCORING AND FINISH OF CONCRETE TREADS

- A. General: Provide field scoring of all exterior stair treads, including edges of slabs adjacent to the highest tread in a run of stairs at floor levels and intermediate landings.
- B. Layout: Provide matching pattern at all locations, including setback from nosing, setback at sides and width, score depth, and scoring pattern.
 1. Setback from Nosing: 1-inch maximum.
 2. Setback from Sides: 2 inches maximum.
 3. Overall Width: 4 inches.
 4. Spacing of Score Lines: 1/2-inch on center maximum.
 5. Depth: 1/8-inch minimum.

C. Finish: Medium broomed lengthwise for a non-slip finish.

D. Step Striping: Paint the scored area with contrasting colored masonry paint, black color unless required otherwise. Paint stripe shall be neat and uniform and shall be at least as slip resistant as the pavement surface.

3.9 FINISHING

A. Flatwork and Curbs

1. Surface Finishes

- a. Medium Broom Finish: Obtain by drawing a stiff bristled broom across a floated finish for a nonslip surface. Perform brooming while concrete is still wet enough to receive broom marks to match approved sample. Direction of brooming to be perpendicular to direction of work or as otherwise shown on the drawings.
- b. Brush Finish (typical for curbs): After the front form is removed, exposed surface shall be troweled smooth and then given a uniform light texture with fine brush parallel to line of curb, to match approved sample.
- c. Steel Trowel Finish: After surface water disappears and floated surfaces sufficiently hardened, steel trowel and retrowel to smooth surface. After concrete has set enough to ring trowel, retrowel to a smooth uniform finish free of trowel marks or other blemishes. Avoid excessive troweling that produces burnished areas.

- d. Sandblast Finish: Perform in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish.

Use an abrasive grit of the proper type and gradation to expose the aggregate and surrounding matrix surfaces to match sample panel, as follows:

Light Cut:	approximately 1/16" depth
Medium Cut:	approximately 1/8" to 3/16" depth
Heavy cut:	approximately 1/2" to 3/4" depth

Blast corners and edge of patterns carefully, using backup boards in order to maintain a uniform corner of edge line.

Use same nozzle, nozzle pressure and blasting technique as used for sample panel.

Maintain control of abrasive grit and concrete dust in each area of blasting. Clean up and remove all expended abrasive grit, concrete dust and debris at the end of each day of blasting operations.

- 3.10 DAMPPROOFING: Mop apply one heavy coat of asphalt to a minus 2 inches below finished soil grade on soil side of retaining walls and planters.

3.11 CURING

- A. Cure non-colored exposed concrete in accordance with Caltrans Standard Specifications Section 90.
- B. When applying Curing Compound, apply after initial set of fresh concrete when bleed water has evaporated from surface using a "Hudson-type" airless sprayer in accordance with manufacturer's specifications.
- D. Only water or curing compounds which impart no permanent color or gloss shall be used for curing concrete.

- 3.12 CLEANUP: Per Section 01740.

END OF SECTION

SECTION 02530

SANITARY SEWER SYSTEM

1 PART 1 GENERAL

1.1 Section Includes

- A. Roadway and/or site sanitary gravity sewers and force mains up to 5 feet of any on-site building.

1.2 related sections

- A. Section 02310, Utility Trenching and Backfill.
- B. Section 03300, Portland Cement Concrete

1.3 RELATED DOCUMENTS

A. AASHTO:

1. M 199: Precast Reinforced Concrete Manhole Sections.
2. M 252: Corrugated Polyethylene Drainage Tubing.
3. M 294: Corrugated Polyethylene Pipe, 12 to 24-inch Diameter.

B. ASTM:

1. A 615/A615M: Deformed and Billet-Steel Bars for Concrete Reinforcement.
2. A 674 Practice for Polyethylene Encasement for Ductile Iron Pipe for Water and Other Liquids.
3. 443: Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
4. C 478: Precast Reinforced Concrete Manhole Sections.
5. C 1173: Flexible Transition Couplings for Underground Piping Systems.
6. C 1244: Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test.
7. D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
8. D 2235: Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
9. D 2321: Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
10. D 2564: Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
11. D 2751: Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
12. D 3034: Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
13. D 4101: Propylene Injection and Extrusion Materials.
14. F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
15. F 656: Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
16. F 679: Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings.
17. F-1336: Poly(Vinyl Chloride) (PVC) Gasket Sewer Fittings.

C. AWWA:

1. C104: Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. C105: Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water.
4. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. C150: Thickness design of Ductile Iron Pipe.
6. C151: Ductile-Iron Pipe, Centrifugally Cast, for Water.
7. C153: Ductile-Iron Compact Fittings for Water Service.
8. M41: Ductile Iron Pipe and Fittings.

D. Caltrans Caltrans Standard Specifications.

1. Section 51, Concrete Structures.
2. Section 65, Reinforced Concrete Pipe
3. Section 75 Miscellaneous Metal.

1.4 DEFINITIONS

- A. AASHTO: American Association of State Highway and Transportation Officials.
- B. ABS: Acrylonitrile-butadiene-styrene.
- C. ASTM: American Society for Testing Materials.
- D. AWWA: American Water Works Association.
- E. HDPE: High-density polyethylene.
- F. PE: Polyethylene.
- G. DIP: Ductile iron pipe.
- H. PVC: Polyvinyl Chloride.
- I. RCP: Reinforced concrete pipe.
- J. NPS: Nominal pipe size.

1.5 SUBMITTALS

- A. Follow submittal procedure outlined in Section 01330.
- B. Product data for the following:
 1. Piping materials and fittings.
 2. Special pipe couplings.
 3. Joint sealants.
 4. Cleanout plugs or caps.
 5. Sewage air relief valves.

- C. Shop drawings: Include plans, elevations, details and attachments for the following:
 - 1. Precast concrete manholes, frames and covers.
 - 2. Precast concrete clean out boxes and box covers.
 - 3. Force main piping access openings.
- D. Design Mix Reports and Calculations: For each class of cast in place concrete.
- E. Field Test Reports: Indicate and interpret test results for compliance with performance.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Do not store plastic pipe and fittings in direct sunlight.
- B. Protect pipe, fittings, and seals from dirt and damage.
- C. Handle precast concrete pipe, manholes and other precast structures according to manufacturer's written instructions.
- D. Protect imported bedding and backfill material from contamination by other materials.

2 PART 2 PRODUCTS

2.1 PIPING MATERIALS FOR GRAVITY FLOW

- A. ABS Pipe and Fittings: 4-inch through 12 inch, ASTM D 2751, SDR 35. [Check external load and laying condition, SDR 23.5 is also available if stronger pipe is required]. Bell and spigot joints.
 - 1. Bell and Spigot Joint Gasket: Elastomeric seal, ASTM F 477.
- B. PVC Pipe:
 - 1. Pipe:
 - a. 4-inch through 15-inch: ASTM D 3034, SDR 35. Bell and spigot joints.
 - b. 18 inch through 36-inch: ASTM F 679, T-1 wall. Bell and spigot joints.
 - 2. Fittings:
 - a. 4-inch through 27-inch: ASTM F 1336.
 - b. 30-inch through 36-inch: ASTM D 3034, SDR 35
 - 3. Joint Gasket: Elastomeric seal, ASTM F 477.

2.2 SPECIAL PIPE COUPLINGS

- A. Gravity Piping: ASTM C 1173. Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.

2.3 Gravity pipe CLEANOUTS

- A. Piping: Same as sanitary sewer line if possible.
- B. Top Cap: Threaded and of same material as piping if possible.
- C. Box Size: As required to provide access and allow easy removal and reinstallation of cap.