



## OPEN THIS DOCUMENT FIRST: Design Standards Process

### Overview:

SCCD has established standards for design and construction to ensure equity and consistency in facilities and for efficiency in operations and maintenance. The Standards consist of **Design Standards** that are directives and information that Design Consultants should incorporate into their contract documents (drawings and specifications). A few disciplines have also provided **Construction Specifications** and **Typical Details**, which should be customized to the design project.

These Standards were developed by the District, with intensive input from District Facilities, Maintenance and Operations personnel, in addition to IT personnel and the Security shared governance Committee for relevant sections. The Standards are based on prior experience at the District and the best practices from other California Community Colleges, and the products selected were carefully evaluated based on criteria that included aesthetics & user comfort, durability, ease of maintenance, sustainable properties/practices and cost.

### Purpose:

These Design Standards are a tool to clarify direction and streamline project execution for design professionals, construction managers and other participants in capital improvement projects. They represent the District's "strong preference" and should be applied, when possible, without compromising the creativity of the overall design. Final disposition, color, size, product choice etc. should conform to the best extent possible where equivalent substitutes are allowed in the Design Standard. If equivalent substitutes are allowed only "if performance and quality equivalency can be evidenced" or the consultant wishes to deviate from the written design standards for other reasons, then the consultant needs to provide evidence/justification and seek District approval as outlined below.

In all cases the written design standards do not diminish or eliminate the standard of care owed by the consultant to SCCD or relieve, in any manner whatsoever, a consultant from any professional responsibility, duty or due diligence required toward that work.

These Design Standards should be incorporated into all Solano Community College ("SCC", the "College") projects. Projects include but are not limited to new construction, Tenant Improvements (TI) projects, remodels, and renovations. It is understood that the College could not attempt to upgrade and retrofit all campus facilities in a single massive construction project; such a process would be prohibitively costly and disruptive. Rather, the strategy is for installations to be implemented continually and concurrently in a phased manner, over time and as funding allows, toward a goal of all campuses and campus buildings eventually meeting the same consistent Design Standards.



## Design Standards Process:

The following Design Standards Process Guidelines incorporation and approval process provides procedural guidelines to ensure that project-specific design and contractor teams submit and receive approval by authorized SCCD departmental and administrator personnel at defined milestones. This allows for SCCD review, input, and approval as well as documentation of any approved deviations or variances to the Design Standards early in the design process.

Approved deviations and variances from the Design Standards should be conscious and justifiable, provide a solution for a site-specific need or replace outdated/obsolete requirements, and be compatible with other Design Standards. **Proposed deviations shall be submitted to SCCD in writing for review and approval prior to incorporation into the project.** Approved deviations may be project-specific or permanent; if an approved deviation or variance is intended to be permanent the change should be reflected in the associated Design Standard.

### Review and Approval

Review and approval by SCCD is required at the conclusion of each of the design phases listed below prior to progressing to the next phase. Documentation required for review includes project drawings and specifications; manufacturer cutsheets, diagrams, and other product data; associated progress cost estimates and written identification of deviations/variances from District Standards. Not all projects will include all phases.

### Schematic Design

Design professionals should become familiar with the **Architectural, Landscape, Sustainability and other Guidelines** (found in Book 1 of the Facilities Master Plan) and the **District Standards** (found in Book 2 of the Facilities Master Plan and on Facilities Website) prior to initiating the design process. While most of the specifics within the District Standards will be reflected in future design phases, there are some aspects reflected in the District Standards that require consideration from the onset of the design process. If any deviations/variations are apparent at this early phase, bring them to District attention for consideration.

Deliverables of this phase are as stipulated in the Contract with the District. In addition for system designs such as Electronic Security and Safety, Fire Alarm etc. provide the following: a written design narrative which describes planned system elements by function and overall design. The narrative should include conceptual device and system floor plan, site layout drawings and functional/operational project planning.

### Design Development

This is the phase where the specifics within the Design Standards will need to be reflected and coordinated within the specific project, and any required deviations/variances should be apparent during this phase. Bring all deviations/variances to District attention, in written format, for



evaluation and action as soon as they are determined. Do not assume deviations/variations will be apparent to District personnel during their documentation review towards the end of this phase.

Deliverables of this phase are as stipulated in the Contract with the District. In addition for system designs such as Electronic Security and Safety, Fire Alarm etc. provide the following: refinement of schematic design conceptual elements to provide a greater level of detail of system floor plan, functional/operational project planning and site layout drawings as well as required supporting components such as physical, electrical, MEP, data network, etc.

### **Construction Documents**

By this phase the deviations/variances should have already been resolved. If coordination and detailing efforts during this phase require previously unknown deviations/variances from District Standards, bring them to District attention, via written format, for evaluation and action as soon as they are determined.

Deliverables of this phase are as stipulated in the Contract with the District. In addition for system designs such as Electronic Security and Safety, Fire Alarm etc. provide the following: design drawings indicating location, installation details, cabling and interfaces for elements approved in the schematic design and design development phases. This phase includes written device and systems specifications in the current MasterFormat edition as issued by the Construction Specifications Institute. These specifications should clearly describe interfaces between systems or assemblies and interfaces to any other equipment and systems under other Design Standards.

### **Project Close-Out**

Deliverables of this phase are as stipulated in the Contract with the District. District should endeavor to update District Standards for any deviations or variances that were approved as permanent during that particular project.

End of Document

# 31 00 00

## EARTHWORK AND GRADING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to on-site earthwork. Any work within the public right-of-way shall be constructed to the standards of Solano County, and the State of California Department of Transportation. Earthwork includes, but is not limited to, the following:
1. Grading.
  2. Material.
  3. Excavation.
  4. Filling and backfilling.
  5. Soil Sterilant.
  6. Termiticide.
- B. Provide labor, material and equipment and services necessary to complete the excavations, recompaction and finish grading as specified and indicated on Plans.
1. Obtain permit from local authorities.
  2. Provide surveying for grading operations.
  3. Provide shoring design.
  4. Provide dewatering operations.
  5. Provide Site grading, cut, fill and finish.
  6. Provide excavation and backfill for filling construction, including trenches within building lines.
  7. Preparation for subgrade for building slabs, walks, pavements, and landscaping.
  8. Provide distribution of stockpiled topsoil.
  9. Provide sub-base course for walks and pavements.
  10. Provide sand and gravel for capillary break/moisture barrier under building slabs.
  11. Provide sub-surface drainage backfill for walls and trenches.
  12. Provide Engineered fills for building slabs and foundations.
- C. The work includes removal and legal disposal off the site of debris, rubbish and other materials resulting from clearing and grubbing operations.
- D. Work specified in Related Sections:
1. Section 31 10 00 – SITE PREPARATION.
  2. Section 31 23 33– TRENCHING, BACKFILLING, & COMPACTING.

#### 1.2 DEFINITIONS

- A. Engineered Fill:
1. Soil or soil-rock material approved by Project Manager and transported to the site by the Contractor in order to raise grades or to backfill excavations.
  2. The District's Testing Agency will make sufficient tests and/or observations for the purpose of issuing a written statement that specification requirement.
- B. On-site Material: Soil or earth material obtained from required on-site excavation.
- C. Excavation: Consists of the removal of material encountered to subgrade elevations and the re-use or disposal of materials removed.
- D. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.

- E. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- F. Base Course: The layer placed between the sub-base and surface pavement in a paving system.
- G. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure American Society for Testing and Materials (ASTM) D1557.
- H. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below top soil, rock base course, or drainage fill.

### 1.3 SYSTEM DESCRIPTION

- A. Requirements:
  - 1. Grades and elevations are to be established with reference to bench marks referenced on Plans.
  - 2. Maintain Engineering markers such as monuments, bench marks and location stakes. If disturbed or destroyed, replace.
- B. Criteria:
  - 1. The character of the material to be excavated or used for subgrade is not necessarily as indicated.
  - 2. Ground water elevations indicated are those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
  - 3. Blasting will not be permitted.
  - 4. Remove material in an approved manner.
- C. Shoring Design: Where shoring is required by State Law or determined by the Contractor to be necessary, provide proposed excavation shoring method for review prior to commencement of excavation requiring shoring. Include the following information:
  - 1. Basic design assumptions.
  - 2. Design Calculations.
  - 3. Describe materials or shoring system to be used.
  - 4. Indicate whether or not any components will remain after filling or backfilling.
  - 5. The shop plans for the proposed shoring system.
  - 6. Coordinate with the Construction Documents and identify any proposed modifications or deviations.
  - 7. Certification of the above by a registered professional civil or structural Project Manager licensed by the State of California.
- D. Dewatering Plan: Based upon site surface and subsurface conditions, including available geotechnical and hydrological data, provide a system to perform the following:
  - 1. Lower the ground water level two feet below the bottom of excavation.
  - 2. Relieve the hydrostatic pressure below the subgrade to prevent uplift.
  - 3. Prevent surface drainage from accumulating within work area.
  - 4. Legally discharge and dispose of excess water.
  - 5. Submit description of basic components of proposed dewatering system and its planned method of operation.
- E. Safety:
  - 1. The Contractor shall take all necessary precautions to eliminate the exposure of workers, students, staff and the public to asbestos fibers, including but not limited to: dust control measures and measures included in Section 93106 and Section 93105 of California Code of Regulations, Title 17.

## 1.4 SUBMITTALS

- A. Comply with provisions of Section SUBMITTAL PROCEDURES.
- B. Product Data: Manufacturer's literature and data, including, where applicable, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:
  - 1. Imported materials.
  - 2. Class II aggregate base (CDT Section 26).
  - 3. Storm Water Pollution Prevention / Erosion Control Plans.
  - 4. Permit/Notice of Intent (N.O.I.), for discharge of storm run-off from the construction site.
  - 5. Soil Sterilant.
  - 6. Termiticide.
- C. Test Reports: Submit following reports for import material directly to Project Manager from the Contractor's testing services:
  - 1. Test reports on borrow material.
  - 2. Density test reports.
  - 3. One optimum moisture-maximum density curve for each type of soil encountered.
  - 4. Report of actual unconfined compressive strength and/or results of bearing test of each strata tested.
  - 5. At least one laboratory optimum moisture - maximum dry density curve for each type of soil encountered.
- D. Shoring Design: Submit 4 copies of shoring design and shop plans; none will be returned unless a concern is observed.
- E. Submit description of dewatering methods proposed for use.
- F. Submit description of vibratory compactors proposed for use when requesting placement of backfill and fill materials in layers greater than 6 inches thick.
- G. Samples:
  - 1. 20-lb. Samples, sealed in air-tight containers, of each proposed fill and backfill soil material from on-site or borrow sources.
  - 2. 12-by-12 inch sample of filter fabric.

## 1.5 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
  - 1. Comply with State of California Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."
  - 2. Comply with State of California Code of Regulations (CCR).
  - 3. Comply with State of California Construction Safety Orders, Latest Edition (CAL/OSHA).
  - 4. San Mateo Department of Public Works, Standards and Specifications and Plans.
- B. Soil Testing:
  - 1. District will engage a geotechnical testing agency, to include testing soil materials proposed for use in the work and for quality control testing during excavation and fill operations.
  - 2. Test results will be distributed in compliance with Section TESTING AND INSPECTION.
- C. Codes and Standards:
  - 1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
  - 2. Storm Water Pollution Prevention and Monitoring Plan to be prepared by others.
  - 3. Statewide General Permit to Discharge Storm Water associated with construction activity.

- D. Comply with the latest editions of the following Standards and Regulations:
1. American Society for Testing and Materials (ASTM):
    - a. C33: Concrete Aggregates.
    - b. C125: Standard Terminology Relating to Concrete and Concrete Aggregates.
    - c. C136: Sieve Analysis of Fine and Coarse Aggregates.
    - d. C566: Total Evaporable Moisture Content of Aggregate by Drying.
    - e. D421: Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
    - f. D422: Particle Size Analysis of Soil.
    - g. D854: Specific Gravity of Soils.
    - h. D1556: Density of Soil by the Sand Cone Method.
    - i. D1557: Laboratory Compaction Characteristics of Soil Using Modified Effort
    - j. D2216: Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
    - k. D2487: Classification of Soils for Engineering Purposes.
    - l. D2922: Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
    - m. D2937: Density of Soil in Place by Drive Cylinder Method.
    - n. D3017: Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
    - o. D4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
  2. California Code of Regulations, Title 24, Part 2 - Basic Building Regulations, Chapter 24 - Excavations, Foundations, and Retaining Walls.
  3. California Department of Transportation (CDT) Standard Specifications:
    - a. Section 17:
    - b. Section 18:
    - c. Section 19: Earthwork.
  4. CAL/OSHA, Title 8.
  5. Other authorities having jurisdiction
- E. Geotechnical Engineering Services:
1. Geotechnical Engineer will observe grading observations during preparation onsite, excavation, and compaction of fill materials.
  2. Make visits to site to familiarize himself generally with progress and quality of work.
  3. Make field observations and tests to enable him to form opinions regarding adequacy of site preparation, acceptability of fill materials and extent to which earthwork construction and relative compaction comply with specifications requirements.
  4. Examine conditions exposed in foundation excavations.
- F. Site Information:
1. Soil borings and other exploratory operations may be made by Contractor at no cost to District. Submit proposed boring locations for review prior to performing the work.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials of this section before, during and after installation; objects designated to be retained; and the installed work of other trades.
- B. In the event of damage to any of these items, immediately make repairs or replacements necessary to the acceptance of the Project Manager and at no additional cost to the District.
- C. Comply with provisions of Section 01500 - TEMPORARY FACILITIES AND CONTROLS where necessary to control dust and noise on and near the work caused by operations during performance of the Work.

## 1.7 PROJECT CONDITIONS

- A. Environmental Requirements:
  - 1. When unfavorable weather conditions necessitate interrupting filling and grading operations, prepare areas by compaction of surface and grading to avoid collection of water.
  - 2. Provide adequate temporary drainage to prevent erosion.
  - 3. After interruption, reestablish compaction specified in last layer before resuming work.
  - 4. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to District.
  - 5. Protect existing streams, ditches and storm drain inlets from water-borne soil by means of straw bale dikes, filter fiber dams, or other methods as approved by the Project Manager.
  
- B. Barricade open excavations and post with warning lights.
  - 1. Comply with requirements of Section TEMPORARY FACILITIES AND CONTROLS.
  - 2. Operate warning lights as recommended by authorities having jurisdiction.
  - 3. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout and other hazards.
  
- C. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.
  
- D. At Contractor's option, a working pad of granular material may be laid to protect footing and floor subgrade soils from disruption by traffic during wet conditions.
  
- E. Transport all excess soils materials by legally approved methods to disposal areas.
  - 1. Coordinate with the Project Manager.
  - 2. Sufficient topsoil and fill material shall be retained from the site to complete project requirements.
  - 3. Any additional topsoil and fill requirements shall be the responsibility of the Contractor.
  
- F. Use of explosives will not be permitted.
  
- G. Dust Control Requirements: At all times during earthwork operations and until final completion and acceptance of the earthwork, the Contractor shall prevent the formation of an airborne dust and dirt nuisance from interfering with the surrounding normal operations. The Contractor shall effectively stabilize the site of work in such a manner that it will confine dust particles to the immediate surface of the work and to obtain a minimum of 40 percent emissions reduction by applying a dust palliative. The dust palliative shall be non-petroleum based. Water alone is not considered to be a dust palliative. The dust palliative shall be applied at the rate and method in conformance with Section 18, "Dust Palliative," of the CDT Standard Specifications and as recommended and/or specified by the manufacturer. Contractor shall assume liability for all claims related to dust and dirt nuisances.

## 1.8 Existing Utilities

- A. The Contractor shall contact local utility agencies prior to construction and arrange for the shut-off of all utilities serving the buildings to be demolished. Coordinate work required to abandon active lines with the Project Manager and the District.
  
- B. Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during excavation operations.
  
- C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility Project Manager immediately for directions.
  - 1. Cooperate with the District and public and private utility companies in keeping their respective services and facilities in operation.
  - 2. Repair damaged utilities to the satisfaction of the utility District.



- D. Do not interrupt existing utilities serving facilities occupied and used by the District or others, except when permitted in writing by Project Manager and then only after acceptable temporary utility services have been provided.

## 1.9 SEQUENCING AND SCHEDULING

- A. The sequence of operations shall be reviewed by the Project Manager prior to commencement of any work.
- B. Coordinate operations with relocation of existing utilities.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General:
  - 1. Fill material will be subject to approval of the Geotechnical Engineer.
  - 2. For approval of imported fill material, notify the Project Manager at least 7 days in advance of intention to import material, designate proposed borrow area, and permit the Geotechnical Engineer to sample as necessary from borrow area for purpose of making acceptance tests to prove quality of material.
  - 3. The Geotechnical Engineer's report on acceptability shall be final and binding.
  - 4. During grading operations, soil types other than those analyzed in the geotechnical report for the project, may be encountered.
  - 5. Consult the Geotechnical Engineer to determine the suitability of these soils.
- B. Engineered Fill Material: Soil excavated from site or imported conforming to requirements for fill material.
  - 1. Imported materials should have a plasticity index not less than 5 nor greater than 15, as determined by ASTM D4318; and expansion index not exceeding 20, as determined by UBC Specification 29-2; and a particle size not exceeding 3 inches as determined by ASTM D422.
- C. Topsoil: Friable clay loam surface soil found in a depth of not less than 10 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2 inches in diameter, and without weeds, roots and other objectionable material.
  - 1. Use topsoil for top 2 feet of fill against exterior walls, except at paving, sidewalks, and slabs.
  - 2. Topsoil may also be used beyond the area within 5 feet of building, except under paving and sidewalks.
  - 3. Confirm suitability of stockpiled materials.
- D. Sand: Clean, well-graded fine to coarse sand with not more than 2 percent passing the #200 sieve based on wet sieve analysis.
  - 1. Provide 2-inch layer under building slabs on grade or as specified by the geotechnical report for this project.
  - 2. Provide at other locations indicated.
  - 3. Where coarse sand is required, provide sand no finer than No. 40 sieve.
- E. Graded Rock Base:
  - 1. Bedding for utility piping: Washed, uniformly graded mineral aggregate ASTM D448 with percentage composition of dry weight conforming with following limits:
    - a. Passing 1-inch Sieve: 100 percent.
    - b. Passing 3/4-inch Sieve: 90-100 percent.
    - c. Passing No. 4 Sieve: 0-10 percent.
  - 2. Base at Slab-on-Grade: As specified in the geotechnical report for this project.
  - 3. Absorption of water to saturated-surface dry condition shall not exceed 3 percent of oven-dry weight of a sample.

- F Backfill material for use behind retaining walls shall be a granular material consisting of sand, broken rock, or a mixture of sand and gravel containing no size larger than 2 ½ inches and not more than 15 percent passing the No. 200 sieve.
- G Imported Fill Requirements: Imported fill, where required, shall be non expansive granular soil, free of organic matter and deleterious substances. Imported fill material shall conform to the following requirements:
1. Grading:
 

<u>U. S. Sieve Size</u>	<u>Percentage Passing Sieve</u>
2 ½ inch	100
No. 8	25-45
No. 200	0-10
  2. Be thoroughly compactable without excessive voids.
  3. Meet the following plasticity requirements:
    - a. Maximum Plasticity Index of 12, as determined by ASTM D4318.
    - b. Maximum Liquid Limit of 35, as determined by ASTM D4318
- H. Imported Fill for Planting Areas: Imported fill for use in planting areas shall be sandy loam weed free soil. Submit analysis from certified Soil and Plant Lab. Coordinate with Landscape Engineer.
- J. Pea Gravel: 3/8 inch to ½ inch washed, uncrushed gravel. Use at drainage pipe and at other locations indicated.
- K. Filter Fabric: Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D4759 and the referenced standard test method in parentheses.
1. Grab Tensile Strength (ASTM D4632): 100 lb.
  2. Apparent Opening Size (ASTM D4751): #100 U.S. Standard sieve.
  3. Permeability (ASTM D4491): 150 gallons per minute per square foot.
- L. Drainage Pipe:
1. Perforated corrugated plastic drainage tubing meeting ASTM F405, with continuous integral nylon filter screen.
  2. Acceptable Manufacturers and Products: Advanced Drainage Systems “DrainGuard,” Hancor “Agri-Flow.”
  3. Provide couplings, elbows and other fittings as recommended by pipe manufacturer.
- M. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

## 2.2 SOIL STERILANT

- A. Soil Sterilant shall be Treflan E.C. or approved equivalent.

## 2.3 TERMITICIDE

- A. Termiticide shall be Permethrin, Denon, or approved equivalent.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Prior to commencement of earthwork, become thoroughly familiar with site conditions.
- B. In the event discrepancies are found, immediately notify the Project Manager in writing, indicating

the nature and extent of differing conditions.

- C. No earthwork shall be performed without physical presence or acceptance of the Geotechnical Engineer.
- D. The Geotechnical Engineer's acceptance is required by these specifications; notify the Project Manager at least 48 hours prior to commencing any phase of earthwork.
  - 1. No phase of work shall proceed until prior phase has been accepted by the Geotechnical Engineer.
  - 2. Work shall not be covered up or continued until acceptance of the Geotechnical Engineer shall give written notice of conformance with the specifications upon completion of grading.
- E. Compacting:
  - 1. Compact by power tamping, rolling or combinations thereof as accepted by the Geotechnical Engineer.
    - a. Where impractical to use rollers in close proximity to walls, stairs, etc., compact by mechanical tamping.
    - b. Scarify and recompact any layer not attaining compaction until required density is obtained.
  - 2. Compaction by flooding, ponding or jetting will not be permitted, unless specifically accepted by the Geotechnical Engineer.
- F. Hazardous Materials
  - 1. If any materials are encountered that may be hazardous (as defined in Section 25117 of the California Health and Safety Code), inform the Project Manager verbally within 24 hours and in writing within 2 business days. Upon discovery, material is to remain undisturbed until investigation by Project Manager is complete. The removal and disposal of hazardous materials, if discovered, is not part of the scope of work of this Division for this project.

### **3.2 SITE PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities which are to remain from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations. Set up tree protection measures prior to commencing grading or demolition operations.
- B. Clearing and Grubbing:
  - 1. Remove from area of designated project earthwork all improvements and obstructions, including designated concrete curbs or slabs, asphaltic concrete, all tree and shrub roots, any buried utility and irrigation lines, and other matter determined by the Geotechnical Engineer to be deleterious.
    - a. In all new planting areas, remove existing base material.
    - b. Use only hand methods for grubbing inside the drip line of trees indicated to be left standing.
  - 2. Retain on the site all trees and shrubs, unless otherwise indicated on the plans as existing trees to be removed.
  - 3. Remove or fill existing basements left from removed structures as appropriate to areas. Compact in accordance with requirements of these specifications.
  - 4. Removed material shall become property of the Contractor and shall be removed from site, unless otherwise indicated on the plans or specified herein.
  - 5. Holes resulting from removal of underground obstructions that extend below finish grades shall be cleared and backfilled with Engineered fill.
  - 6. Existing Trees to remain:
    - a. Verify the locations of existing trees to be preserved.
    - b. Replace existing trees to remain that are damaged during construction at no additional

- cost to the District and provide replacement specimens of same species per coordination with the Project Manager.
- c. Carefully make clean cuts at roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction. Paint cuts over ½ inch in size with tree pruning compound.
7. Contact District Arborist 48 hours prior to cutting any trees
- C. Topsoil:
1. Strip topsoil to whatever depths encountered in manner to prevent intermingling with the underlying subsoil or other objectionable material.
  2. Remove heavy growths of grass from areas before stripping. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to the main root system.
  3. Stockpile topsoil in storage piles to freely drain surface water.
  4. Cover storage piles if required to prevent windblown dust.

### **3.3 EXISTING UTILITIES**

- A. Protect existing utilities that are to remain in operation as specified.
- B. Demolish and completely remove from the site existing underground utilities indicated and/or required to be removed in order to complete the work. See Section 02200 – SITE PREPARATION.
- C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at contractor's risk.
- D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.
  1. Use hand or light equipment for excavating immediately adjacent to or for excavations exposing a utility or buried structure.
  2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
  3. Preserve and irrigate removed sections of existing turf for salvage and/or replacement and restoration.
  4. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
  5. Report damage of utility line or subsurface structures immediately to Project Manager

### **3.4 PREPARATION OF SUBGRADE**

- A. Expansive soils are anticipated to basement depth.
  1. Review the necessity for overexcavation of expansive soils.
- B. Scarify building pad, exterior flatwork and pavement subgrade to a depth of at least 8 inches and work until uniform and free from large clods.
  1. Bring expansive subgrades to 2 to 5 percentage points above the optimum moisture content and compact to 90 percent of the maximum laboratory dry density, in accordance with ASTM D1557.
  2. Bring nonexpansive subgrades to or slightly above the optimum moisture content and compact to 90 percent of the maximum laboratory dry density in accordance with ASTM D1557.

3. Increase compaction of the upper 12 - 18 inches of pavement subgrades to 95 percent of the maximum laboratory dry density per ASTM D1557 for nonexpansive subgrades.

### **3.5 DEWATERING**

- A. Do not allow water from surface drainage or underground sources to accumulate in excavations, unfinished fills, or other low areas.
- B. Provide and maintain ample means and devices to remove water promptly and dispose properly of water entering excavations or other parts of the work to prevent softening of exposed surfaces.
- C. Dewater by methods which will ensure dry excavation and preservation of finish lines and grades of excavation bottoms.
- D. Prior to excavating below ground water level, place dewatering system in operation.
  1. Lower the ground water level a minimum of 2 feet below the bottom of the excavation.
  2. Relieve the hydrostatic pressure in pervious zones below the subgrade elevation to prevent uplift.
  3. Use screens and gravel packs as necessary to prevent removal of fines from the soil.
- E. Operate the dewatering system continuously, 24 hours a day, 7 days a week until construction work below existing ground water level is completed.
  1. Measure and record the performance of the dewatering system.
    - a. Perform at the same time each day.
    - b. Use piezometers and observation wells.
  2. After placement of initial slabs and backfill, the ground water level may be allowed to rise.
  3. At no time allow ground water to rise higher than 1 foot below the prevailing level of excavation or backfill.
  4. Have a back-up pump and system available for immediate use.
- F. Dispose of water away from the work in suitable manner without damage to adjacent property or menace to public health.
- G. Do not drain water into work being built or under construction without prior acceptance of the Project Manager.
- H. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.

### **3.6 SITE EXCAVATION**

- A. General
  1. All supports, shoring, and sheet piling required for the sides of excavations or for protection of adjacent existing improvements shall be provided and maintained by the Contractor. The adequacy of such systems shall be the complete responsibility of the Contractor.
  2. Earth and rock, regardless of character and subsurface conditions, shall be excavated to depths shown on plans and to the neat dimensions of the footings wherever practicable, to permit pouring of footings and grade beams without use of side forms, except at slab perimeters.
  3. Large rocks, pieces of concrete or other obstructions, if encountered during the excavation/scarifying operations, shall be removed and disposed of by the Contractor off the site in a legal manner.
  4. Where footing excavation is too deep, backfill shall be concrete. Where footings are over-dug laterally, side forms shall be employed for backfill with rock fill or concrete backfill shall be used (Contractor's option).
  5. Where forming is required, only that excavation necessary to permit placing and removal of forms shall be done.

6. Bottoms of all footings and foundations trenches shall be subject to testing by the Geotechnical Engineer. Corrective measures as directed by the Project Manager shall be executed promptly.
- B. Excavate subgrade as required to allow for finish grades shown on plans, as required for structural fill or otherwise required for proper completion of the work.
- C. Remove and replace subgrade materials designated by Geotechnical Engineer as unsuitable.

### **3.7 FILL AND COMPACTING**

- A. See Section 31 23 33 – TRENCHING, BACKFILLING, & COMPACTING for fill and compacting requirements.

### **3.8 MOISTURE CONTROL**

- A. Do not place, spread or roll fill material during unfavorable weather conditions or when fill material is excessively wet.
- B. Do not resume operations until moisture content and fill density are satisfactory to the Geotechnical Engineer.
- C. Provide berms or channels to prevent surface water from flooding excavations. Promptly remove water collecting in depressions.
- D. Where soil has been softened or eroded by flooding or by placement during unfavorable weather, remove damaged areas and recompact as described for fill and compaction.
  1. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material.
  2. Prevent free water appearing on surface during or subsequent to compaction operation.
  3. Remove and replace, or scarify and air dry, soil material too wet to permit compaction to specified density.
  4. Soil material removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

### **3.9 GRADING**

- A. General: Uniformly grade areas of work including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
  1. All areas covered by the project, including excavated and filled areas and adjacent transition areas, shall be uniformly graded so that finished surfaces are at the elevations established by the plans. Planter areas to receive future topsoil shall be graded below finished grade to allow for such material.
  2. Finished surfaces and surfaces to receive paving and aggregate base shall be smooth, compacted, and free from irregular surface drainage.
  3. Ditches, gutters, and swales shall be finished to permit proper surface drainage.
  4. All surface areas, except paved and sloped embankments exceeding 8:1, shall be hydroseeded.
- B. Grading Tolerances:
  1. Excavations shall not exceed 0.10-foot variation from dimensions and elevations shown or noted, unless otherwise approved by Project Manager.
  2. Fill and backfill shall be placed with tolerance of plus or minus 0.10 foot if placed in layers.
  3. Grading shall be done within plus or minus 0.10 foot typically; areas under slabs, walks or pavements shall be graded within tolerance of 0 to 0.10 foot.

4. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
  5. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
  6. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than ½ inch above or below required subgrade elevation.
- C. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

### **3.10 SOIL STERILIZATION**

- A. General: Soil sterilant shall be applied to prepared subgrade or after installation of rock or aggregate base as recommended by the manufacturer. Sterilant shall be applied uniformly at the rate recommended by the manufacturer to all areas beneath asphalt concrete pavement, brick pavement, concrete pavement, or on-grade concrete slabs including sidewalks, curbs, and gutters and areas between the inner and outer security fences. In addition to ground areas treated, sterilant shall be applied below expansion or control joints, and at all areas where pipe, ducts, or other features penetrate slabs.

### **3.11 TERMITICIDE**

- A. Termiticide shall be applied to soils as recommended by the manufacturer. Termiticide shall be applied uniformly at the rate recommended by the manufacturer to all areas beneath and around wood frame structures.

### **3.12 DISPOSAL OF EXCESS AND WASTE MATERIALS**

- A. Removal of Excess Excavated Material: Excess material shall be removed by the Contractor off the site in a legal manner.
- B. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
1. Perform field in-place density tests according to ASTM D1556 (sand cone method), ASTM D2167 (Rubber Balloon Method), or ASTM D2937 (Drive Cylinder Method), as applicable.
    - a. Field in-place density tests may also be performed by the nuclear method according to ASTM D2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D1556. With each density calibration check, check the calibration curves furnished with the moisture gauges according to ASTM D3017.
    - b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gauges at beginning of work on each different type of material encountered, and at intervals as directed by the Project Manager.
  2. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verifications and approval of other footing subgrades may be based on a visual comparison of each subgrade with related tested strata when acceptable to the Project Manager.
  3. Paved and Building Slab Areas; At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 square feet or less of paved area or building slab, but in no case fewer than three tests.
  4. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.

5. Trench Backfill: In each compacted initial and final backfill layer, perform at least one filed in-place density test for each 150 feet or less of trench, but not fewer than two tests.
- C. Number and location of test shall be at option of the Geotechnical Engineer.
  - D. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.
  - E. After grading is completed and the testing agency has completed observation of the work, permit no further excavation or filling, except as approved by Project Manager.

### **3.13 PROTECTION**

- A. Protect newly graded areas from traffic and erosion. Install erosion control mat and straw wattles as directed by the Project Manager. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

### **3.14 CLEAN-UP**

- A. Comply with requirements of Section CLEANING.

End of Document



**Section 31 10 00**  
**SITE PREPARATION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This section describes general requirements, products, and methods of execution relating to site preparation, unless otherwise noted. This section applies to:
1. Surface and subsurface demolition.
  2. Backfilling of excavations and depressions.
  3. Coordination, demolition and/or relocation of existing utilities.
  4. Prior to start of demolition of facilities, shut-off, disconnect, cut, and cap where required, underground utility services to facilities.
  5. Removal of A.C. pavement driveway and concrete pavement, concrete pads, and A.C. curbing.
  6. Removal of cyclone wire, wood fences and barricades.
  7. Removal of storm drainage piping, catch basins, and manholes.
  8. Removal of vegetation and trees as specified herein.
- B. Contractor shall provide labor, material and equipment required for demolishing, cutting, removing and disposing of existing construction as designated and shown on the Plans for the following as required, unless otherwise noted.
- C. Related Sections:
1. Section 31 10 00- EARTHWORK AND GRADING.
  2. Section 31 23 33- TRENCHING, BACKFILLING, AND COMPACTING.

**1.2 SUBMITTALS**

- A. Comply with requirements of Section SUBMITTAL PROCEDURES.
- B. Submit all permits and certificates required for the project, for record purposes.
- C. Demolition schedule and proposed methods and operations.
- D. Permits and notices authorizing demolition.
- E. Letter or certificates of severance of utilities services from the affected agencies or utilities.
- F. Proposed haul route(s) from the demolition worksite to an authorized disposal site.
- G. Permit for transport and disposal of debris.
- H. Make arrangements of disposing of waste and excess materials at a legally licensed landfill/disposal facility outside worksite and pay cost thereof.

- I. Photograph existing conditions of existing structure surfaces, equipments, and adjacent improvements that might be misconstrued as damage related to removal operations. File photographs with Project Manager prior to start of work.
- J. Submit Proposed dust control measures.
- K. Submit Proposed noise control measures.
- L. Work Schedule: Submit a proposed schedule of work items to be performed, and a description of how the work is to be accomplished, for the Project Manager's review.
- M. Report of inspections conducted with the Project Manager before and after performing work.

### **1.3 QUALITY ASSURANCE**

- A. Comply with the following Standards: American National Standards Institute, Inc. "American National Standard Safety Requirements for Demolition" (ANSI A10.6 and A10.8).
- B. Regulatory Agencies:
  - 1. Comply with rules and regulations of State of California, California Code of Regulations, Title 8, Industrial Relations, Chapter 4, Subchapter 4, "Construction Safety Order."
  - 2. Comply with applicable local and state agencies having jurisdiction.
  - 3. Comply with governing EPA notification regulations.
- C. Secure all required Permits or Certificates for demolition or discontinuance of utilities, prior to beginning the work.

### **1.4 PROJECT CONDITIONS**

- A. Disposition of Existing Improvements:
  - 1. All materials indicated to be removed shall become the property of the Contractor; dispose of these outside the project site.
    - a. Do not dispose of removed materials to the general public by sale, gift or in any other manner at the Site.
    - b. These provisions shall not be construed as limiting or prohibiting sale or disposal of such materials at the Site to duly licensed Contractors or material suppliers, provided materials are removed from the construction site by the Contractor.
  - 2. All removal of debris from the site, including removal of inventory to site of storage, is part of this Contract and shall be done by Contractor's employees and no others.
- B. Salvage and Reuse:
  - 1. Where units or items of existing work are designated to be removed and reused in the new work or are to become salvage, remove such units or items

carefully.

- a. Use tools and methods that will not damage such units or items.
- b. Protect underlying or adjoining work from damage.
- c. Salvaged items shall be cleaned by the Contractor.

C. Protection:

1. Erect and maintain temporary bracing, shoring, lights, barricades, except construction barricades for subsequent new construction, warning signs, and guards necessary to protect public, the District's employees, finishes, improvements to remain and adjoining property from damage, all in accordance with applicable regulations.
2. Wet down areas affected by this work as required preventing dust and dirt from rising.

D. Scheduling:

1. Coordinate with the District in scheduling noisy or dirty work.
2. Schedule work at the District's convenience to cause minimal interference with the District's normal operations.
3. Jackhammering shall be coordinated with the District and College to minimize disturbance of classes.

E. Traffic Circulations: Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.

1. Do not close or obstruct public thoroughfares without first obtaining the required permit or permission of the responsible jurisdiction.
2. Where closing of a vehicular or pedestrian traffic circulation route is necessary, provide adequate directional signs to minimize the potential for confusion.

## **PART 2 - PRODUCTS**

Not used.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas affected by work of this Section and verify following:
1. Disconnection of utilities as required.
  2. That utilities serving occupied portions of buildings on and off the site will not be disturbed or that temporary utility services have been provided.
  3. Removal by the District of the District's personal property, movable furniture and equipment items not designated for relocation.
- B. Where existing conditions conflict with representations of the Construction Documents, notify the Project Manager and obtain clarifications. Do not perform work affecting the conflicting conditions until clarification of the conflict is received.

### **3.2 PREPARATION**

- A. Verify that the area to be demolished or removed has been vacated, or adequate space made available to perform the work.
- B. Arrange for, and verify termination of utility services to include removing meters and capping of lines.
- C. Lay out cutting work at Job Site and coordinate with related work for which cutting is required.

### **3.3 DEMOLITION**

- A. If confirmed or suspected hazardous materials are encountered during operations, stop operations immediately and notify the Project Manager.
- B. Perform work in accordance with ANSI A10.6-1969 unless otherwise noted.
- C. Provide noise and dust abatement as required to prevent contamination of adjacent areas.
  - 1. Remove all materials not designated as salvage, in their entirety.
  - 2. Remove building foundations in their entirety, unless otherwise indicated on the plans.
- D. Fill voids in the land left by the removal of existing structures as follows:
  - 1. In accordance with the requirements of Section 31 00 00 – EARTHWORK AND GRADING. Grade finished remaining surface to the contours shown, or if not shown, to match the existing natural contours.
- E. Lower, or remove, heavy structural framing members by hoist or crane.
- F. Concrete and Masonry:
  - 1. Demolish concrete and masonry in sections, less than 3 feet in any direction.
  - 2. Method of cutting shall be limited to saw cutting and torch.

### **3.4 CUTTING**

- A. Make new openings neat.
- B. Do not cut or alter structural members and any utilities including appurtenances unless indicated to do so in the Construction Documents, or written approval is received from the Project Manager.
- C. Take care not to damage reinforcing or structural steel scheduled to remain in place.
- D. Concrete: Cut new openings in concrete by coring and saw cutting. Saw run-bys will not be permitted.

**3.5 PREPARATION FOR NEW FINISH WORK**

- A. Where demolished surfaces are scheduled to receive new finishes, Contractor shall restore such substrate to a condition ready to receive the scheduled new finishes, including grinding or leveling.

**3.6 DISPOSAL OF DEMOLISHED MATERIALS**

- A. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning of demolished materials off District's property in a legal manner.

**3.7 FIELD QUALITY CONTROL**

- A. The Project Manager will accompany the Contractor before and after performance of work to observe physical condition of existing structures or improvements involved.

End of Document

## **Section 31 23 33**

# **TRENCHING, BACKFILLING AND COMPACTING**

### **PART 1 – GENERAL**

#### **1.1 SUMMARY**

- A. Provide labor, material, equipment, and services necessary to complete the backfilling and compacting as necessary for this project. Section includes, but is not limited to:
  - 1. Select Backfill Material.
  - 2. Aggregate Base.
  - 3. Detectable Tape.
  - 4. Trench Excavation.
  - 5. Pipe Bedding.
  - 6. Trench Backfill.
  - 7. Trench Surfacing.
  
- B. Work specified in Related Sections:
  - 1. Section 31 10 00 – SITE PREPARATION
  - 2. Section 31 00 00 – EARTHWORK AND GRADING
  - 3. Section 33 10 00 – WATER SYSTEMS
  - 4. Section 33 30 00 – SANITARY SEWER
  - 5. Section 33 40 00 – STORM DRAINAGE

#### **1.2 DEFINITIONS**

- A. Engineered Fill:
  - 1. Soil or soil-rock material approved by the Project Manager and transported to the site by the Contractor in order to raise grades or to backfill excavations.
  - 2. Contractor shall provide sufficient tests, and a written statement that all materials brought onto the project site comply with specification requirements.
  
- B. Excavation: Consists of the removal of material encountered to subgrade elevations.
  
- C. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below base.
  
- D. Base: The layer placed between the subgrade and surface pavement in a paving system.
  
- E. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure American Society for Testing and Materials (ASTM) D1557.

#### **1.3 SYSTEM DESCRIPTION**

- A. Requirements:
  - 1. Comply with the recommendations of the Geotechnical Engineer .
  - 2. Protect existing trees to remain. No grading is permitted under the drip line of protected trees.
  - 3. Excavations for appurtenant structures, such as, but not limited to, manholes, transition structures, junction structure, vaults, valve boxes, catch basins, thrust blocks, and boring pits, shall be deemed to be in the category of trench excavation.
  - 4. Unless otherwise indicated in the Plans, all excavation for pipelines shall be open cut.

## 1.4 SUBMITTALS

- A. Comply with provisions of Section 01 32 19 – SUBMITTAL PROCEDURES.
- B. Test Reports: Submit the following report for import material directly to the Project Manager from the Contractor’s testing services:
  - 1. Compaction test reports for aggregate base.
- C. Submit description of compactors proposed for use when requesting placement of base material.

## 1.5 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
  - 1. Comply with State of California Business and Transportation Agency, Department of Transportation (Caltrans) latest edition of “Standard Specifications.” (CSS).
  - 2. Comply with State of California Code of Regulations (CCR).
  - 3. Comply with State of California Construction Safety Orders, Latest Edition (CAL/OSHA).
- B. Soil Testing:
  - 1. District to engage a geotechnical testing agency, to include compaction testing and for quality control testing during fill operations.
  - 2. Test results will be submitted to the Project Manager.
- C. Codes and Standards:
  - 1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
  - 2. California Department of Transportation (CDT):
    - a. Section 19: Earthwork.
    - b. Standard Test Methods: No. 202.
  - 3. American Society for Testing and Materials (ASTM):
    - a. D1556: Density of Soil by the Sand Cone Method.
    - b. D1557: Moisture Density Relations of Soils and Soil-Aggregate Mixtures

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Protect materials before, during and after installation.
- B. Comply with provisions of Section 01 51 00 - TEMPORARY FACILITIES AND CONTROLS where necessary to control dust and noise on and near the work caused by operations during construction activities.

## 1.7 PROJECT CONDITIONS

- A. Environmental Requirements:
  - 1. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.
  - 2. Protect existing streams, ditches and storm drain inlets during work on this project.
- B. Barricade open excavations and post with warning lights.
  - 1. Comply with requirements of Section 01 51 00 - TEMPORARY FACILITIES AND CONTROLS.
  - 2. Operate warning lights and barricades as required.
  - 3. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent

to excavations, from damages caused by settlement, lateral movement, undermining, washout, and other hazards.

- C. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.
- D. Transport all excess soils materials by legally approved methods to disposal areas.
  - 1. Coordinate with the Project Manager.
  - 2. Any additional fill requirements shall be the responsibility of the Contractor.

## 1.8 EXISTING UTILITIES

- A. Locate existing underground utilities in the areas of work. For utilities that are to remain in place, provide adequate means of protection during excavation operations.
  - 1. Locating of existing underground utilities shall include but not be limited to pot-holing prior to the start of construction.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Project Manager, Facilities, and/or utility agency immediately for directions.
  - 1. Cooperate with the Project Manager and public and private utility companies in keeping their respective services and facilities in operation.
  - 2. Repair damaged utilities to the satisfaction of the agency with jurisdiction.
- C. Do not interrupt existing utilities serving facilities occupied and used by the District or others, except when permitted in writing by the Project Manager and then only after acceptable temporary utility services have been provided.

## 1.9 SEQUENCING AND SCHEDULING

- A. The sequence of operations shall be reviewed by the Project Manager prior to commencement of any work.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. General:
  - 1. Import materials will be subject to approval of the Geotechnical Engineer.
  - 2. For approval of imported fill material, notify the Project Manager at least 7 days in advance of intention to import material.

- B. Select backfill material shall be gravel, free of clay or organic matter and shall conform to the following gradation:

<u>Sieve Size</u>	<u>Percentage Passing</u>
1 inch	100
¾ inch	90 – 100
No. 4	35 – 60
No. 200	2 - 9

- C. For gas pipe and fuel piping select backfill shall be clean, graded building sand conforming to the following gradation:

<u>Sieve Size</u>	<u>Percentage Passing</u>
No. 4	100
No. 200	0 - 5



- D. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

## **2.2 BURIED WARNING AND IDENTIFICATION TAPE**

- A. Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 75 mm 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.
1. Warning Tape Color Codes.  
Red: Electric.  
Yellow: Gas, Oil; Dangerous Materials.  
Orange: Telephone and Other Communications.  
Blue: Water Systems.  
Green: Sewer Systems.  
White: Steam Systems.  
Gray: Compressed Air.
  2. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.
  3. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 920 mm 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

## **2.3 DETECTION WIRE FOR NON-METALLIC PIPING**

- A. Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

### **PART 3 – EXECUTION**

#### **3.1 GENERAL**

- A. Prior to commencement of work, become thoroughly familiar with site conditions.
- B. In the event discrepancies are found, immediately notify the Project Manager in writing, indicating the nature and extent of differing conditions.
- C. Backfill excavations as promptly as work permits.
- D. Do not place Engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the Project Manager.
- E. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
- F. In excavations, use satisfactory excavated or borrow material.

- G. Under grassed areas, use satisfactory excavated or borrow material.

### **3.2 COMPACTING**

- A. Compact by power tamping, rolling or combinations thereof.
  - 1. Where impractical to use rollers in close proximity to walls, stairs, etc., compact by mechanical tamping.
  - 2. Scarify and recompact any layer not attaining compaction until required density is obtained.

### **3.3 SITE PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, which are to remain, from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.

### **3.4 EXISTING UTILITIES**

- A. Identify the location of existing utilities.
  - 1. Prior to trenching, the Contractor shall excavate at locations specifically indicated on the Plans, if any, and where new lines cross other utilities of uncertain depth and determine the elevation of the utility in question to ensure that the new line will clear the potential obstruction.
  - 2. The Contractor shall contact Underground Service Alert (USA) at 1-800-227-2600 for assistance in locating existing utilities.
  - 3. If, after the excavation, a crossing utility does present an obstruction, then the line and grade of the new line will be adjusted as directed by the Project Manager to clear the utility.
- B. Protect all existing utilities to remain in operation.
- C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at Contractor's risk.
- E. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.
  - 1. Use hand or light equipment for excavating immediately adjacent to known utilities or for excavations exposing a utility or buried structure.
  - 2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
  - 3. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
  - 4. Report damage of utility line or subsurface structures immediately to the Project Manager.
- F. Backfill trenches resulting from utility removal in lifts of 8 inches maximum.

### **3.5 TRENCH EXCAVATION**

- A. General
  - 1. Excavation shall include removal of all water and materials that interfere with construction. The Contractor shall remove any water which may be encountered in the trench by pumping or other methods during the pipe laying, bedding and backfill operations. Material shall be sufficiently dry to permit approved jointing.
  - 2. Excavation shall include the construction and maintenance of bridges required for vehicular and pedestrian traffic, support for adjoining utilities.

3. The Contractor shall be responsible to safely direct vehicular and pedestrian traffic through or around his/her work area at all times.
  4. The Contractor shall relocate, reconstruct, replace or repair, at his/her own expense, all improvements which are in the line of construction or which may be damaged, removed, disrupted or otherwise disturbed by the Contractor.
- B. Existing Paving and Concrete:
1. Existing pavement over trench shall be sawcut, removed, and hauled away from the job. Existing pavement shall be neatly sawcut along the limits of excavations.
  2. Existing concrete over the trench shall be sawcut to a full depth in straight lines either parallel to the curb or at right angles to the alignment of the sidewalk.
  3. Boards or other suitable material shall be placed under equipment outrigging to prevent damage to paved surfaces.
- C. Trench Width:
1. The maximum allowable trench widths at the top of the pipe shall be as follows:

<u>Pipe Type</u>	<u>Trench Width (Maximum)</u>
Copper	Outside diameter of barrel plus 18 inches
Plastic	"
Vitrified Clay	"
Ductile-Iron	"
Reinforced Concrete	"

    - a. The maximum trench width shall be inclusive of all shoring.
    - b. If the maximum trench width is exceeded, the State's representative may direct the Contractor to encase or cradle the pipe in concrete at no additional charge.
  2. For pipes 3 inch diameter and larger, the free working space on each side of the pipe barrel shall not be less than 6 inches.
- D. Open Trench:
1. The maximum length of open trench shall be 300 feet or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is greater. No trench shall be left open at the end of the day.
  2. Provisions for trench crossings and free access shall be made at all street crossings, driveways, water gate valves, and fire hydrants.
- E. Excavation Bracing:
1. The excavation shall be supported and excavation operations shall be conducted in accordance with the California Industrial Accident Commission and CAL/OSHA.
  2. The Contractor shall, at his/her own expense, furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of all excavations (whether above or below the pipe grade), and to prevent any movement which could in any way diminish the required trench section or otherwise injure or delay the work. The sheeting and bracing shall be withdrawn in a manner such as to prevent any earth movement that might overload the pipe.
- F. Excavated Material:
1. All excavated material not required for backfill shall be immediately removed and properly disposed of in a legal manner by the Contractor.
  2. Material excavated in streets and roadways shall be laid alongside the trench no closer than 2 feet from the trench edge and kept trimmed to minimize inconvenience to public traffic.
  3. Provisions shall be made whereby all storm and wastewater can flow uninterrupted in gutters or drainage channels.

### 3.6 PIPE BEDDING

- A. Bedding Excavation: The trench shall be excavated below the grade of the pipe bottom to the following minimum depths:

<u>Pipe Type</u>	<u>Depth</u>
Copper	6 inch
Reinforced Concrete	6 inch
Plastic: 2 inch diameter and smaller	6 inch
Plastic: over 2 inch diameter	6 inch
Ductile Iron	6 inch

1. Stabilization of Trench Bottom: When the trench bottom is unstable due to wet or spongy foundation, trench bottom shall be stabilized with gravel or crushed rock. The State’s inspector will determine the suitability of the trench bottom and the amount of gravel or crushed rock needed to stabilize a soft foundation. Soft material shall be removed and replaced with gravel or crushed rock as necessary.
2. Placement of Bedding Material: The trench bottom shall be cleaned to remove all loose native material prior to placing select backfill material. Sufficient select backfill material shall be placed in trench and tamped to bring trench bottom up to grade of the bottom of pipe. The relative compaction of tamped material shall be not less than 90 percent. It is the intention of these requirements to provide uniform bearing under the full length of pipe to a minimum width of 60 percent of the external diameter.

### 3.7 TRENCH BACKFILL

#### A. Initial Backfill:

1. Prior to trench backfill, the condition of the trench and laying of pipe must be inspected and approved by the Inspector of Record.
2. Select backfill material shall be used for initial backfill. After the pipe has been properly laid and inspected, select backfill material shall be placed on both sides of the pipe and compacted to final depth as follows:

<u>Pipe Type</u>	<u>Depth</u>
Copper	12 inches above top of pipe
Plastic: less than 3 inches diameter	12 inches above top of pipe
Plastic: 3 inches diameter and larger	12 inches above top of pipe
Ductile Iron	12 inches above top of pipe
Reinforced Concrete	12 inches above top of pipe

3. Compaction: Initial backfill compaction shall be by mechanical means. The initial backfill material shall be hand tamped in layers not exceeding 4 inches in uncompacted depth and shall be brought up uniformly on both sides of the pipe to avoid bending or distortion stress. After hand tamping, the relative compaction of the initial backfill material shall be not less than 90 percent.
4. Pipe Detection: In trenches containing pressurized plastic pipes, tracer wire shall be placed directly above the pipe and shall be connected to all valves, existing exposed tracer wires, and other appurtenances as appropriate.

#### B. Subsequent Backfill:

1. Above the level of initial backfill, the trench shall be backfilled with non-expansive native material from trench excavation or with imported select backfill material (Contractor’s option). Subsequent backfill shall be free of vegetable matter, stones or lumps exceeding 3 inches in greatest dimension, and other unsatisfactory material. The Inspector of Record shall approve the backfill material prior to placement.
2. Subsequent backfill compaction shall be by mechanical means with backfill material placed in layers not exceeding 8 inches in loose depth. Each layer shall be thoroughly compacted before succeeding layers are placed. The use of machine tampers, except manually held types, shall not be permitted.

3. Subsequent backfill shall be compacted to a relative compaction of not less than 90 percent except the relative compaction shall not be less than 95 percent within 2-1/2 feet of finished permanent surface grade or 1-1/2 feet below the finished subgrade, whichever is greater.
- C. Jetting and Ponding:
1. Jetting of trench backfill is not permitted.
- D. Compaction Testing:
1. Compaction testing shall be in accordance with California Test Method ASTM D1556 or D1557.

### 3.8 TRENCH SURFACING

- A. Unpaved Areas:
1. In unimproved areas, the trench surface shall be restored to its original condition. No mounds of earth shall be left along the trench. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
  2. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.
- B. Temporary Surfacing:
1. Temporary surfacing shall be a minimum of 2 inches of cutback asphalt on 10 inches of Class 2 aggregate base and shall be placed at all trench locations subject to vehicular or pedestrian traffic.
  2. Temporary surfacing shall be laid within one day after backfilling (except where the Contractor elects to place permanent surfacing within this time period).
  3. Before the trenching area is opened for traffic, all excess dirt, rock, and debris shall be removed, the street surface shall be swept clean and the pavement shall be washed down with a water truck and pressure nozzle.
  4. Temporary surfacing shall be maintained to prevent the occurrence of mudholes and prevent the surface from settling below 1 inch or rising more than 1 inch from the existing pavement grade.

### 3.9 FILL AND COMPACTING

- A. General Requirements:
1. Backfill excavations as promptly as work permits.
  2. Do not place Engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the Project Manager.
  3. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
  4. In excavations, use satisfactory excavated or borrow material.
  5. Under grassed areas, use satisfactory excavated or borrow material.
- B. After subgrade compaction has been approved by the Geotechnical Engineer , spread the Engineered fill materials in 6 to 8 inch loose lifts and uniformly mixed during the spreading operation.
1. Bring non-expansive fill materials to or slightly above the optimum moisture content and compacted to at least 85 percent of the maximum laboratory dry density, per ASTM D1557.
  2. Bring non-expansive aggregate fill materials to or slightly above the optimum moisture content and compacted to at least 95 percent of the maximum laboratory dry density, per ASTM D1557.
  3. Do not compact the top 12 inches of soil in the planting areas.
  4. Fill sections greater than 5 feet in depth shall be compacted to at least 95 percent.
- C. Repeat compaction procedure until proper grade is attained.

- D. Rocks generated during site earthwork may be used in fill when conforming to material specifications.

### **3.10 MOISTURE CONTROL**

- A. Do not resume operations until moisture content and fill density are satisfactory to the Inspector.

### **3.11 DISPOSAL OF EXCESS AND WASTE MATERIALS**

- A. Testing Services: Allow testing agency to test each backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
- B. When testing agency reports that backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

### **3.12 PROTECTION**

- A. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- B. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

### **3.13 CLEAN-UP**

- A. Remove all debris, equipment, tools and materials upon completion prior to final inspections to the satisfactions of the Project Manager.
- B. In unpaved areas without landscaping, cover with straw erosion control blanket. Follow manufacturer's recommendations for installation. Provide and place straw wattles or biodegradable fiber logs across the slope at the midpoint and along the downhill edge of site. No soil is to be left uncovered at the completion of construction.

End of Document

## Section 32 10 00 DEMOLITION

### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. Provide labor, material, and equipment required for demolishing, cutting, removing and disposing of existing construction as designated or required to provide for new work.
- B. Coordinate all work with capping or sealing of existing utilities.
- C. Related Sections:
  - 1. Section 31 10 00 - SITE PREPARATION
  - 2. Section 31 00 00 - EARTHWORK AND GRADING
  - 3. Section 31 23 33 - TRENCHING, BACKFILLING, AND COMPACTING

#### 1.2 SUBMITTALS

- A. Comply with requirements of the SUBMITTAL PROCEDURES and GENERAL CONDITIONS.

#### 1.3 QUALITY ASSURANCE

- A. Comply with the following Standards: American National Standards Institute, Inc. “American National Standard Safety Requirements for Demolition” (ANSI A10.6 and A10.8).
- B. Regulatory Agencies:
  - 1. Comply with rules and regulations of State of California, California Code of Regulations, Title 8, Industrial Relations, Chapter 4, Subchapter 4, “Construction Safety Order.”
  - 2. Comply with applicable local and state agencies having jurisdiction.
  - 3. Comply with governing EPA notification regulations.
  - 4. Comply with applicable state and local regulations regarding dust and noise mitigation during construction.
- C. Secure all required Permits or Certificates for demolition prior to beginning the work.

#### 1.4 PROJECT CONDITIONS

- A. District assumes no responsibility for actual condition of the site to be altered.
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by District as far as practical.
- B. Disposal of Existing Improvements:
  - 1. All materials removed shall become the property of the Contractor; dispose of these materials outside the project site.
    - a. Do not dispose of removed materials to the general public by sale, gift or in any other manner at the project site.
    - b. These provisions shall not be construed as limiting or prohibiting sale or disposal of such materials at the Site to duly licensed Contractors or material suppliers, provided materials are removed from construction site by the Contractor.
  - 2. All removal of debris from the site, including removal of inventory to site of storage, is part of this Contract and shall be done by Contractor’s employees and

no others.

- C. Salvage:
1. Recycle AC pavement and Class II AB where practical.
  2. Recycle concrete where practical.
  3. Items indicated to be salvaged shall be removed carefully, cleaned, and returned to the District. Coordinate with the Project Manager.
- D. Protection:
1. Erect and maintain temporary bracing, shoring, lights, barricades, except construction barricades for subsequent new construction, warning signs, and guards necessary to protect public, the District's employees, adjacent improvements to remain, and adjoining property from damage, all in accordance with applicable regulations.
  2. Wet down areas affected by this work as required to prevent dust and dirt from rising.
- E. Scheduling:
1. Coordinate with the Project Manager in scheduling noisy or dirty work.
  2. The Project Manager will supply a schedule of days on which no construction will be allowed.
  3. Contractor shall take College schedule into consideration during construction.
  4. Coordinate and schedule temporary water shut-downs and temporary water service with the Project Manager, Facilities, and the Water Department, and the Fire Department.
- F. Traffic Circulations: Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.
1. Minimize obstruction to thoroughfares by first obtaining the required approval or permission of the responsible jurisdiction.
  2. Where closing of a vehicular traffic circulation route is necessary, provide adequate directional signs to minimize the potential for confusion. Provide access at all times for emergency vehicles.
- G. Safety:
1. The Contractor shall take all necessary precautions to eliminate the exposure of workers, students, staff, and the public to asbestos fibers, including but not limited to: dust control measures and measures included in Sections 93106 and 93105 of California Code of Regulations, Title 17.

## **PART 2 – PRODUCTS**

Not Used

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION:**

- A. Where existing conditions conflict with representations of the Construction Documents, notify the Project Manager and obtain clarifications. Do not perform work affecting the conflicting conditions until clarification of the conflict is received.

### **3.2 PREPARATION**

- A. Verify that the area to be demolished or removed has been vacated, and adequate space has been made available to perform the work.



- B. Lay out saw cutting and coordinate with related work for which saw cutting is required.
- C. Contractor shall coordinate and arrange the shut down of utilities serving the site with Facilities, the Fire Department, and the Project Manager.

### **3.3 DEMOLITION**

- A. If known or suspected hazardous materials are encountered during operations, stop operations immediately and notify the Project Manager.
- B. Perform work in accordance with ANSI A10.6-1969 unless otherwise noted.
- C. Provide noise and dust abatement as required to prevent contamination of adjacent areas.
- D. Remove all materials not designated as salvage, in their entirety.
- E. If unknown items such as human remains are encountered during operations, stop operations immediately and notify the Project Manager.
- F. The Project Manager will provide a list of any items to be stockpiled for future use. Stockpile location will be a site on campus determined by the Project Manager.

### **3.4 DEMOLITION AND REMOVAL OF AC PAVEMENT:**

- A. Sawcut pavement at edge of demolition area.
- B. Break pavement and remove.
- C. Remove any base material, gravel, and/or or any other non-native soil.

### **3.5 SAW CUTTING:**

- A. Make new openings neat.
- B. Take care not to damage existing AC pavement to remain in place.

### **3.6 UTILITY REMOVAL:**

- A. Where utility removal is shown on the plans or required for construction, excavate to expose existing utility, demolish and remove the section of pipe or conduit. Cap section of pipe or conduit to remain. Mark end of utility with 12" piece of #4 rebar.
- B. Included in demolition are any appurtenances, including but not limited to valves, valve boxes, and irrigation system components.
- C. Backfill trench in accordance with requirements of Section 31 23 33 – TRENCHING, BACKFILLING, AND COMPACTING.

### **3.7 DISPOSAL OF DEMOLISHED MATERIALS:**

- A. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning of demolished materials is prohibited.

**3.8 FIELD QUALITY CONTROL:**

- A. The Project Manager will accompany the Contractor before and after performance of work to observe physical condition of existing structures or improvements involved.

End of Document

## **Section 32 12 33**

# **PAVING AND SURFACING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes (but is not necessarily limited to):
  - 1. Asphalt Concrete Paving.
  - 2. Concrete Paving.
  - 3. Liquid Asphalt and Asphalt Emulsion.
  - 4. Aggregate Base.
  
- B. Related work furnished under other sections but conforming to the provisions of this section:
  - 1. Subgrade preparation.
  - 2. Aggregate Base installation.
  
- C. Related Sections:
  - 1. Section 32 00 00 - DEMOLITION
  - 2. Section 31 17 23 - PAVEMENT MARKING.

#### **1.2 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. A615: Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - 2. C150: Portland Cement.
  - 3. D1557: Moisture Unit Weight Relations of Soils and Aggregate Mixtures Using a 10 lb (4.5 kg) Rammer and 18 in. (457 mm) Drop.
  - 4. D1682: Breaking Loads and Elongation of Textile Fabrics.
  
- B. California Code of Regulations (CCR): Title 24, Chapter 2-71, Site development Requirements for Handicapped Accessibility.
  
- C. California Department of Transportation (C.D.T.):
  - 1. Standard Specifications:
    - a. Section 26 Aggregate Bases.
    - b. Section 37 Bituminous Seals.
    - c. Section 39 Asphalt Concrete.
    - d. Section 51 Concrete Structures.
    - e. Section 52 Reinforcement.
    - f. Section 73 Concrete Curbs and Sidewalks.
    - g. Section 90 Portland Cement Concrete.
    - i. Section 92 Asphalts.
    - j. Section 93 Liquid Asphalts.
    - k. Section 94 Asphaltic Emulsions.
  - 2. Traffic Manual.
  - 3. Highway Design.
  
- D. Institute of Transportation Engineers: Transportation and Traffic Engineering Handbook.

#### **1.3 SUBMITTALS**

- A. Requirements: Refer to Section SUBMITTAL PROCEDURES.
  
- B. Asphalt Concrete Paving:

1. Provide two copies of material certificates signed by the material producer and the Contractor, certifying that each material item complies with or exceeds specified requirements.
  2. The Contractor shall furnish a certified weight or load slip for each load of material used in the construction of the asphalt concrete pavement.
- C. Concrete Paving: The Contractor shall furnish mill test reports on the cement, reinforcement bars, and aggregates, showing compliance with the respective specifications. The Testing Engineer may make concrete test cylinders and slump tests as deemed necessary to determine compliance with the Specifications.
- D. Liquid Asphalt.
- E. Pavement Reinforcement Fabric.
- F. Tack Coat.
- G. Pavement Reinforcement Mesh.
- H. Structural Geotextile Fabric.

#### **1.4 PROJECT CONDITIONS**

- A. Liquid Asphalt and Asphalt Emulsion:
1. Prime coat, seal coat, and paint binder shall be applied only when the ambient temperature is above 50° Fahrenheit and when temperature has not been below 35° Fahrenheit for 12 hours immediately prior to application.
  2. Prime coat, fog coat, seal coat, and paint binder shall not be applied when base or surfaces are wet or contain excess moisture.
- B. Asphalt Concrete Paving: Asphalt concrete surfaces shall be constructed only when ambient temperature is above 50° Fahrenheit and when base is dry.

#### **1.5 GENERAL DESIGN CRITERIA**

- A. Services Areas: Approach ramps, driveways, and paved work areas in excess of 4 percent slope shall be provided with a rough texture for non-skid surface.
- B. Walks and Paths: Concrete exterior slabs (walks, terraces, etc.) shall have a pitch of at least 1 percent.
- C. Pavement Markings: All traffic control striping and pavement markings shall conform to the standards illustrated in the C.D.T. Standard Plans Book issued May 2006, General Road Work Section.

### **PART 2 - PRODUCTS**

#### **2.1 PAVING MATERIALS**

- A. Aggregate Base: Aggregate base shall conform to Caltrans Class 2 (R value 78 min) aggregate base, 3/4" maximum size, as specified in Section 26 of the C.D.T. Standard Specifications.
- B. Asphalt Concrete Paving:
1. Paving asphalt to be mixed with aggregate shall be steam-refined asphalt, AR-4000, conforming to Section 92 of the C.D.T. Standard Specifications.

2. Mineral aggregate shall be Type B mineral aggregate as specified in Section 39 of the C.D.T. Standard Specifications.
  3. Maximum aggregate size shall be as follows:
 

<u>A.C. Thickness</u>	<u>Max. Ag.</u>
a. 3/4" - 1 1/2"	1/2"
b. 2 & 2 1/2"	1/2"
c. 3" & 4"	3/4"
  4. Liquid asphalt for prime coat shall be Grade SC-70 in conformance with Section 93 of the C.D.T. Standard Specifications.
  5. Asphaltic emulsion for paint binder, fog coat, and seal coat shall be emulsified asphalt, Type SS-1h, conforming to Section 94 of the C.D.T. Standard Specifications.
- C. Portland Cement Concrete:
1. Concrete shall be Class A concrete conforming to Section 90 of the C.D.T. Standard Specifications.
  2. Cement shall be Type II cement conforming to ASTM C150 as modified by Section 90 of the C.D.T. Standard Specifications.
  3. Aggregate shall be 3/4-inch maximum size conforming to Section 90 of the C.D.T. Standard Specifications.
  4. Water shall be potable and free of organic matter and injurious amounts of oil, acid, alkali, or other deleterious substances.
  5. Reinforcing bars shall be deformed and shall conform to ASTM A615.
  6. Filled joints, unless noted otherwise on the Drawings, shall be 1/4-inch thick, the full depth of the concrete section and conforming to Section 51 of the C.D.T. Standard Specifications.
  7. Joint filler shall conform to Section 51 of the C.D.T. Standard Specifications for pre-molded expansion joint filler and expanded polystyrene joint filler.
  8. No admixtures will be allowed without prior approval of the Project Manager.
- D. Pavement Reinforcement Fabric: Pavement reinforcement fabric shall meet Caltrans Section 88-1.02, BP Petromat or approved equivalent.
- E. Crack Sealant:
1. Crack sealant shall be rubberized hot-pour type and shall meet ASTM D 3405, Husky 1611 or approved equivalent.
  2. Blotting Agent shall be one of: Screened sand, cement, or fly ash.
- F. Tack coat: Tack coat shall meet Caltrans Section 39-4.02.
- G. Pavement reinforcement mesh: Pavement reinforcement mesh for use in Type 2 Overlay shall be Glasgrid Model 8501 or approved equivalent.
- H. Structural geotextile fabric: Structural geotextile fabric shall be Mirafi 500X or approved equivalent.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Subgrade and Aggregate Base:
1. Prepare a subgrade and over excavation paragraph reference 3.4 of Section 31 00 00-EARTHWORK AND GRADING.

2. Aggregate base shall be compacted to 95 percent ASTM D1557. Sections 26-1.04B and 26-1.05 of the C.D.T. Standard Specifications shall apply.
3. Soil sterilant shall be applied to prepared subgrade or after installation of rock or aggregate base uniformly at the rate recommended by the manufacturer.

B. Crack Sealing:

1. Before sealing, cracks shall be cleared of dirt, dust, and all other deleterious materials to a depth of 1/4-inch to 1/2-inch.
2. Cracks 1/8-inch in width and greater shall be sealed.
3. Application of crack sealer shall be in accordance with the manufacturer's recommendations unless otherwise directed.

### **3.2 ASPHALT CONCRETE PAVING**

A. General:

1. Asphalt concrete shall be proportioned, mixed, placed, spread, and compacted in conformance with Section 39 of the C.D.T. Standard Specifications.
2. Before placing asphalt concrete on untreated base, a liquid asphalt prime coat shall be applied to the base course in conformance with Section 39 of the C.D.T. Standard Specifications. Prime coat shall be applied at the rate of 0.25 gallons per square yard.
3. Before placing asphalt concrete, an asphalt emulsion tack coat shall be applied to all vertical surfaces of existing pavement, curbs, gutters, construction joints, and all existing pavement to be surfaced, in conformance with Section 39 of the C.D.T. Standard Specifications.
4. Spreading and compacting asphalt concrete shall be performed in accordance with Section 39 of the C.D.T. Standard Specifications.
5. Fog seal shall be applied to all finished surfaces of asphalt concrete pavement at a rate of 0.05 gallons per square yard, in accordance with Section 37 of the C.D.T. Standard Specifications.
6. After fog seal has been applied, ample time shall be allowed for drying before traffic is allowed on the pavement or paint striping is applied.

### **3.3 CONCRETE CONSTRUCTION**

A. General:

1. All concrete shall be mixed in accordance with applicable provisions of Section 90 of the C.D.T. Standards Specifications.
2. Construction of concrete substructures shall conform to applicable provisions of Section 51 of the C.D.T. Standard Specifications. Unless noted otherwise in the Specifications, all exposed surfaces of structure shall have Class 1 surface finish or finished to match existing adjacent paving.
5. No pigment shall be used in curing compounds for construction of concrete curbs, gutters, and structures.
6. All work shall be subject to field inspection. No concrete shall be placed until the Project Manager has approved the forms and reinforcement.
7. Expansion joints on curbs and gutters shall be placed 20 feet on centers, adjacent to structures, and at all returns, and shall be filled with joint filler. Control joints shall be formed 10 feet on centers. The score shall 1-inch deep minimum.
8. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than 6 feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

### **3.4 FIELD QUALITY CONTROL**

A. Asphalt Concrete Paving:

1. The specified thickness of the finished pavement shall be the minimum acceptable.
2. Conforms shall form a smooth, pond-free transition between existing and new pavement.
3. Depressions in paving between high spots are not to exceed 1/8-inch when measured below a

- 10 feet long straight edged placed anywhere on surface in any direction.
4. The finished asphalt pavement shall have positive drainage without ponding.

### **3.6 CLEANUP**

A. General:

1. Surplus material remaining upon completion of paving operations shall become the property of the Contractor, to be removed from the work site and disposed of in a lawful manner.
2. Surfaces shall be left in a clean, neat, and workmanlike condition, and all construction waste, rubbish, and debris shall be removed from the work site and disposed of in a lawful manner.

End of Document

## **Section 32 17 23**

# **PAVEMENT MARKING**

### **PART 1 – GENERAL**

#### **1.1 SUMMARY:**

- A. Provide requirements for materials, fabrications, and installation of traffic control and pavement markings.

#### **1.2 SUBMITTALS:**

- A. Submit manufacturer's product data describing application of products and compliance with VOC requirements.
- B. Shop Drawings: Show complete layout and location of pavement markings prior to demolition or obliteration of the existing markings.
- C. Submit samples as follows:
  - 1. Traffic paint.
  - 2. Pavement markers and adhesives.
  - 3. Reflectorized markers and posts.

#### **1.3 DELIVERY, STORAGE AND HANDLING:**

- A. Comply with Division 1 requirements, specifications, and the Project Manager.
- B. Deliver and store packaged products in original containers with seals unbroken and labels intact until time of installation.
- C. Provide proper facilities for handling and storage of products to prevent damage. Where necessary, stack products off ground on level platform, fully protected from weather.

### **PART 2 – PRODUCTS**

#### **2.1 MATERIALS:**

- A. Traffic Marking and Symbol Paint: Water-Born, Fast-Dry, Traffic Paint distributed by Fuller-O'Brien Corp. D.J. Simpson (#108-273, White); (#108-280, Blue); or approved equivalent.
- B. Handicapped Symbol Background Paint: Blue Color. Glidden Co. "Glid-Guard Lifemaster Finish No. 5200 /series, Color 1/M 79", or approved equivalent.
- C. Thermoplastic Stripes and Markings:
  - 4. Thermoplastic stripes and makings shall be hot applied conforming to CSS Section 84 and shall be Cataphote-Catatherm brand, Pavemark thermoplastic brand, or approved equal.
  - 5. Thermoplastic stripes and markings shall have a minimum skid friction value of BPN 35.
- D. Pavement Markers and Adhesives:
  - 6. Fire hydrant pavement markers shall be two-way retroreflective "Blue" markers and shall conform to the applicable requirements of CSS Section 85.
  - 7. Adhesive for pavement markers shall be standard set epoxy adhesive conforming to the requirements of CSS Section 95-2.05.

### **PART 3 - EXECUTION**



**3.1 INSPECTION:**

- A. Examine receiving surfaces and verify that surfaces are clean and proper for installation.
- B. Do not start work until unsatisfactory conditions have been corrected.

**3.2 APPLICATION:**

- A. Preparation:
  - 1. Clean and prepare surfaces to receive traffic paint in accordance with CSS Section 84-3.05 and these special provisions. Where required, remove existing striping and markings by wet blasting or equivalent method. Do not use dry sandblasting or other dust producing methods.
- B. Traffic Paint:
  - 1. Traffic paint shall be machine applied in accordance with CSS Section 84-3.04.
- C. Striping Layout:
  - 1. Traffic stripe shall be single and double, solid and broken, and of the color to match existing conditions.
  - 2. Traffic striping shall be placed in patterns to match existing conditions, contractor shall document.
- D. Thermoplastic Stripes and Markings:
  - 1. Thermoplastic stripes and markings shall be applied hot in conformance with manufacturer's recommended instructions and the applicable requirements of CSS Section 84-2.06.
- E. Pavement Markers:
  - 1. Blue pavement markers shall be installed to delineate the location of fire hydrants along campus roads or as shown on plans. No markers shall be installed until the surface has been approved by the Project Manager and until at least 10 days after the slurry seal on asphalt concrete has been placed. Place markers in accordance with CSS Section 85-1.06.
- F. Apply marking paint in accordance with approved manufacturer's recommendations.
- G. Density of paint coverage shall hide color and texture of substate.
- H. Parking Stripes: Paint four inches wide unless otherwise noted.
- I. Symbol Marking: Paint to match existing conditions.

**3.3 CLEANING AND PROTECTION:**

- A. Comply with requirements of Section CLEANING.
- B. Upon completion of work, remove surplus materials and rubbish and clean off spilled or splattered paint resulting from this work.
- C. Permit no surface traffic until pavement and symbol marking has dried thoroughly.

End of Document

## SECTION 32 32 13

## PORTLAND CEMENT CONCRETE RETAINING WALLS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to on-site Portland Cement Concrete Retaining Walls, unless otherwise noted:
  - 1. Concrete mix design.
  - 2. Formwork.
  - 3. Reinforcement.
  - 4. Removal of unused concrete and materials.
- B. Contractor shall provide all labor, equipment, materials, and testing services unless otherwise noted.
- C. Related Sections:
  - 1. Section 31 10 00 - SITE PREPARATION.
  - 2. Section 31 23 33 – TRENCHING, BACKFILLING, & COMPACTING.

## 1.2 SUBMITTALS

- A. Comply with requirements of Section 01 33 00 SUBMITTALS.
- B. Submit product data for proprietary materials and items, admixtures, joint systems, curing compounds, dry-shake finish materials, and others if requested by District.
- C. Submit design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- D. Submit laboratory test reports for evaluation of concrete materials and mix design tests.
- E. Provide material certificates in lieu of material laboratory test reports when permitted by Architect.
  - 1. Provide material certificates signed by manufacturer and Contractor certifying that each material item complies with or exceeds requirements.
  - 2. Provide certification from admixture manufacturers that chloride content complies with requirements.
- F. Shop Drawings: Submit shop drawings showing elevations, control joint layout, finish, and rebar schedule.

### 1.3 QUALITY ASSURANCE

- A. Comply with latest edition of the following standards and regulations:
  - 1. American Society for Testing and Materials (ASTM).
  - 2. California Department of Transportation (CALTRANS) Standard Plans (CSP) and Standard Specifications (CSS).
  - 3. American Concrete Institute (ACI).
  - 4. Local requirements where they are applicable.
- B. Prevent damage to adjacent concrete curbs, walks, utilities, walls, etc., during installation.
  - 1. Repair any damage to concrete edges or breaks in concrete at no cost to the District, by removal and replacement of complete sections.
  - 2. Patching will not be acceptable.
- C. The sequence of operations shall be reviewed by the District's Representative prior to commencement of any work.

### 1.4 SITE CONDITIONS

- A. Submit to District in writing any discrepancy between existing conditions and the Contract Documents.
- B. Commencement of any part of the work shall constitute acceptance of existing site conditions as satisfactory.
- C. Provide protection of materials if required by weather conditions so as not to compromise the quality of work.
- D. Provide protection of surfaces adjacent to work.
- E. Traffic Control: Maintain access for vehicular and pedestrian traffic as required by District.

## PART 2 - PRODUCTS

### 2.1 CONCRETE

- A. Provide concrete materials conforming to the applicable requirements for Portland Cement Concrete as specified in CSS Section 90 Portland Cement Concrete (P.C.C.) for ASTM Type II P.C.C., Class 1 Concrete.
  - 1. Concrete shall not contain less than 675 lb of Portland cement per cubic yard.
  - 2. Concrete shall have a 4000 psi, 28-day compressive strength.
  - 3. Concrete shall have a water-cement ratio of 0.44 maximum (non-air-entrained), or 0.35 maximum (air-entrained).
  - 4. Mix design adjustments may be requested when materials, job conditions,

weather, test results, or other circumstances warrant adjustment. Laboratory tests must be submitted to and accepted by the District's representative before using in work.

- B. Aggregate for normal weight concrete shall be free of deleterious material and conform to CSS Section 90-3.04, 1 inch maximum grading.
  - 1. Coarse Aggregate shall conform to CSS Section 90-2.02A.
  - 2. Fine Aggregate shall conform to CSS Section 90-2.02B.
- C. Water: Water shall be clean and potable.
- D. Admixtures: Admixtures may be used with approval of the Engineer. If more than one admixture is used, Contractor shall certify that all admixtures are compatible. Admixtures shall conform to CSS Section 90-4.
- E. Slump Limit: Slump shall be not less than 1 inch and not more than 4 inches.
- F. Patching Mortar: Mortar shall conform to CSS Section 51-1.135. Color shall match surrounding concrete.
- G. Grout: Non Shrink Grout shall be factory pre-mixed conforming to ASTM C1107, Grade B, capable of developing 2400 psi in 48 hours, 7000 psi in 28 days.

## 2.2 FORMS

- A. General: Provide forms of wood or steel, straight and of sufficient strength and stiffness to resist springing during depositing and consolidating concrete, of a height equal to the full depth of the finished concrete, and conforming to CSS Section 51.105 Forms, unless otherwise specified.
- B. Wood forms:
  - 1. Use minimum 5/8-inch thick plywood complying with U.S. Product Standard PS 1 for s for Concrete Form plywood for exposed surfaces.
  - 2. Wood forms for exposed surfaces shall be straight and free from warp, twist, loose knots, splits or other defects.
  - 3. Wood forms for unexposed surfaces shall be of sufficient strength and stiffness to hold concrete properly in place.
- C. Steel forms:
  - 1. Provide channel-formed sections with a flat top surface and with welded braces at each end and at not less than 2 intermediate points.
  - 2. Form ends shall be interlocked and self-aligning.
  - 3. Forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers.
  - 4. Stake pins shall be solid steel rods with chamfered heads and pointed tips, designed for use with steel forms.

- D. Form ties: Form ties shall be snap-off metal of fixed length, leaving no metal within 1-1/2 inch of surface and no fractures or other surface defects larger than 1 inch in diameter. Manufactured by Burke, Dayton, or approved equivalent.
- E. Chamfer strips: Chamfer strips shall be rigid PVC, 3/4 inch x 3/4 inch or 1 inch x 1 inch size, as indicated on the Plans.
- F. Form release agent: Form release agent shall be a colorless, non-staining agent, free from oils, that shall not impair bonding of paint or other coatings.

### 2.3 OTHER MATERIALS

#### A. Concrete Curing Material:

- 1. Burlap: Conforming to AASHTO M182 with a weight of 14 ounces or more per square yard when dry.
- 2. Impervious Sheeting: Comply with ASTM C171.
- 3. Liquid Membrane Curing Compound: Comply with ASTM C309. Provide curing compound free of paraffin or petroleum.

B Expansion Joint Fillers: Comply with ASTM D1751 or provide a resin-impregnated fiberboard conforming to the physical requirements of ASTM D1752.

C Reinforcement: Provide dowels, reinforcement bars and welded wire mesh conforming to the requirements in CSS Section 52, Reinforcement, as required in the Plans.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine the surfaces and areas at the locations for the retaining walls to establish acceptable conditions.
  - 1. Examine areas where formwork will be constructed and verify that:
    - a. The excavations are sufficient to permit placement, inspection, and removal of forms.
    - b. The excavations for earth forms have been neatly and accurately cut.
    - c. Conditions are otherwise proper for formwork construction.
  - 2. Verify that formwork is complete.
  - 3. Verify that the excavation is free of debris and excess water.
- B. Coordinate size and location of openings and penetrations in the concrete.
- C. Coordinate location of items to be embedded into the concrete.
- D. If unsuitable conditions are found, immediately notify the District's Representative in writing, indicating the nature and extent of the unsuitable conditions.

- E. Do not begin installation until defects have been corrected.

### 3.2 SUBGRADE PREPARATION

- A. Remove material deflecting more than 1/2 inch under the roller to a depth of 4 inches below subgrade elevation and replace with an approved granular material.
  - 1. Compact new material as specified in Section 31 23 33 – TRENCHING, BACKFILLING, & COMPACTING, or as shown in the Construction Documents.
  - 2. Test completed subgrade for grade and cross section with a template extending the full width of the footing and supported between side forms.
  - 3. Provide subgrade of materials equal in bearing quality to the subgrade under the adjacent pavement.
  - 4. Place and compact additional subgrade material as needed.
- B. Maintenance of Subgrade:
  - 1. Maintain subgrade in a smooth, compacted condition, in conformity with the required section until the concrete is placed.
  - 2. Prepare and protect subgrade so as to produce a subgrade free from frost and excessive moisture when the concrete is deposited.

### 3.3 FORM SETTING

- A. Construct formwork to produce concrete surfaces to the tolerances of ACI 301.
- B. Provide temporary ports in formwork to facilitate cleaning and inspections. Locate openings at the bottom of forms to allow flushing water to drain. Close ports with tight-fitting panels, flush with the inside face of the forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.
- C. Provide chamfer strips on external corners of walls.
- D. At exposed surfaces, keep the number of panel joints to a practical minimum. Insure vertical joints are plumb and horizontal joints are level.
- E. After forms are set, check grade and alignment with a 10-foot straightedge.
  - 1. Forms shall conform to line and grade with an allowable tolerance of 1/4 inch in any 10-foot long section.
  - 2. Forms shall have a transverse slope with the low side adjacent to the roadway unless otherwise indicated on Drawings.
- F. Form release agent:
  - 1. Apply a coating of form release agent immediately before use, but prior to installation of reinforcing steel and embedded items.
  - 2. Do not apply agent where concrete surfaces are scheduled to receive special

- finishes which may be affected by the agent.
3. Soak contact surfaces of untreated forms with clean water.

G. Embedded parts and openings:

1. Provide formed openings for work passing through concrete where indicated on Electrical drawings.
2. Do not install sleeves or openings, except as indicated on the Plans, without approval of the Engineer.
3. Properly locate and place inserts and embedded items required by work prior to casting concrete.

H. Expansion Joints:

1. Provide expansion joints and isolation joints where shown or noted on the Plans.
2. Provide sealed joints where concrete surface remains exposed to view or at conditions with non-bituminous or liquid waterproofing, unless otherwise shown or noted.
3. Place joint filler in straight line with edge held back to specified dimension from finish surface and secure to formwork or previously placed construction.
4. Use fiber type joints typically and hold edge back 1/4 inch from concrete surface.
5. Use cork type joint fillers at sealed joints and hold edge back 1/2 inch.
6. After curing concrete, carefully clean, prime and fill joints with sealant to 1/4 inch from the finished surface in accordance with manufacturer's recommendations.

- I. Do not remove side forms within 12 hours after finishing has been completed.

### 3.4 EARTH FORMS

- A. Footing forms may be omitted and foundation concrete may be placed directly into neatly and accurately cut excavations, provided that the walls are stable as determined by the Geotechnical Engineer, subject to approval by the Engineer.
- B. Where sides are deemed unstable or excavations are not accurately cut to tolerances of ACI 301, construct forms to the extent required.
- C. Remove loose dirt prior to placing concrete.

### 3.5 FORM REMOVAL

- A. Do not remove forms until concrete has hardened and attained sufficient strength to permit safe removal and adequate support of adjacent loads.
- B. Remove forms carefully to avoid damaging corners and edges of exposed concrete. Prying against the face of concrete is not allowed.
- C. Curing, where forms are removed in less than 14 days, shall be continued as follows:
  1. Wet down concrete immediately after stripping.

2. Apply curing compound as soon as areas are surface dry.
- D. After concrete is placed, forms and shores shall remain in place for not less than 7 days for wall forms and 3 days for side forms of slabs and foundations.

### 3.6 REUSE OF FORMS

- A. The District's Representative will approve reuse of forms. Forms shall be straight, clean, free from nails, hardened concrete, and other deleterious matter. Edges and surfaces should be in good condition.
- B. Clean and repair all damage caused by placing, removal, or storage. Reuse of formwork with patches or repairs that could affect the exposed concrete finish will not be permitted.
- C. Forms shall not be reused for Architectural Concrete if there is any evidence of surface damage or defect which could affect the quality of the surface.
- D. Reseal form faces as required to achieve concrete of specified quality.

### 3.7 REINFORCEMENT PLACEMENT

- A. Place bars at locations shown on the Plans, maintaining minimum cover, to the following tolerances:
1. Clear distance to formed surfaces: Plus or minus 1/4 inch.
  2. Top bars in slabs 8 inches deep or less: Plus or minus 1/4 inch.
  3. Tops bars in beams and slabs over 8 inches deep: Plus 1/4 inch and minus 1/2 inch.
  4. Bar Spacing: Plus or minus one inch, but not less than minimum spacing.
  5. Ends of Bars: Plus or minus 2 inches, except plus or minus 1/2 inch at discontinuous ends.
- B. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as herein specified.
- C. Clean reinforcement of loose rust and mill scale, earth, ice, and other bond-reducing materials.
- D. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers.
- E. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations.
- F. Place reinforcement to obtain at least minimum coverage for concrete protection.
1. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations.



2. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- G. Reinforcement to be welded shall conform to requirement of American Welding Society Specifications, AWS D12.1.
1. If mill test reports are not available, chemical analysis shall be made of bars representative of the bars to be welded.
  2. ASTM A706 bars may be assumed to have a carbon equivalent (C.E.) not exceeding 0.55. Bars with a C.E. above 0.75 shall not be welded.
  3. Welding shall not be done on or within two bar diameters of any bent portion of a bar which has been bent cold.
  4. Welding of crossing bars shall not be permitted for assembly of reinforcement unless authorized by the Structural Engineer of Record and approved by the Inspector of Record.
  5. Welding is not permitted unless specifically detailed on plans or approved by Architect.
- H. Splicing: Make splices only at those locations shown on the Plans or as accepted by the Owner's Representative. Stagger splices in adjacent bars wherever possible.
- I. Dowels: Dowels shall be tied securely in place before concrete is deposited. In the event there are no bars in position to which dowel may be tied, No. 3 bars (minimum) shall be added to provide proper support and anchorage.
- J. Install deformed bar anchors in accordance with the manufacturer's recommendations.
- K. Install mechanical splices and reinforcing couplers in accordance with manufacturer's recommendations.
- L. Reinforcement shall not be bent after being embedded in hardened concrete.
- M. Protection Against Rust
1. Where there is danger of rust staining adjacent surfaces, wrap reinforcement with impervious tape or otherwise prevent rust staining.
  2. Remove protective materials and clean reinforcement as required before proceeding with concrete placement.

### 3.8 CONCRETE PLACEMENT

- A. Placing Record: Record time, date and location of concrete placement; maintain record open to inspection by the Inspector-of-Record.
- B. Place concrete in accordance with ACI 301, or CSS Section 51-1.09 Placing Concrete.
- C. Convey concrete as rapidly and directly as practicable to preserve quality and to prevent separation.

1. Do not deposit concrete which has initially set.
  2. Retempering of concrete which has partially set will not be permitted.
- D. The free vertical drop of the concrete deposited at any point in forms during conveying shall not exceed 3 feet. Chutes may be issued only where they discharge into a hopper before distribution.
- E. Deposit concrete in a continuous operation to permit proper and thorough integration.
1. Carry work started in a section continuously to construction joint.
  2. Place concrete at rate and in such manner that concrete surfaces not carried to joint levels will not attain initial set before additional concrete is placed.
  3. Use equipment that will permit the concrete to be placed in a manner that will prevent segregation and accumulations or hardened concrete above the level of the concrete.
- F. Keep forms and reinforcement clean above pour line by removing clinging concrete.
- G. Cold Weather Placement: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing, or low temperatures, in compliance with ACI 306 and as herein specified.
1. When air temperature has fallen to or is expected to generally fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C), and not more than 80 degrees F (27 degrees C) at point of placement.
  2. Thin upper level slabs should obtain a concrete mixture temperature of not less than 55 degrees F (13 degrees C).
  3. Do not use frozen materials or materials containing ice or snow.
  4. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  5. Do not use calcium chloride, salt and other mineral containing anti-freeze agents or chemical accelerators, unless otherwise accepted by Architect.
- H. Hot Weather Placement: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F (32 degrees C). Mixing water may be chilled, or chopped ice may be used to control concrete temperature provided water equivalent of ice is calculated to total amount of mixing water.
  2. Place concrete immediately upon delivery. Keep exposed concrete surfaces, and formed shaft extensions, moist by fog sprays, wet burlap or other effective means.
  3. Do not use retarding admixtures without acceptance of Architect.
- I. Consolidation:

1. Use internal vibrators for thorough consolidation of all concrete, in compliance with ACI 309 and as herein specified. Use largest size and most powerful vibrators that can be accommodated in the work.
2. Do not place vibrators against reinforcement, attach to forms, or use to spread concrete.
3. Exposed Concrete: Vibrate with rubber type heads and spade along forms with flat strap or plate.
4. Architectural Concrete:
  - a. Proper placement and thorough compaction of architectural concrete are critical.
  - b. Place vibrators in the concrete rapidly to minimize entrapped air between the concrete and the form and to blend the two layers.
  - c. Insert vibrators in accordance with manufacturer's recommended radius of influence.
  - d. Use a minimum of three 180-cycle motor-in-head vibrators for concrete placing. Minimum frequency 9,000 impulses per minute, minimum head diameter 1-1/2 inches.
5. Keep vibrator heads a minimum of 2-1/2 inches from the architectural concrete face.
6. If, during the placing operation, there is any delay of more than 15 minutes, the previous lift will be manipulated with the vibrators just prior to the placement of fresh concrete.

### 3.9 FINISHING

- A. Finish of formed surfaces to be smooth and free of fins, honeycomb, or segregation. When defects occur, they are to be remedied by chipping cavities and patching, or by other methods approved by Owner.
- B. Exposed surfaces to be "sacked" by rubbing cement mortar into voids with burlap or canvas. Fins to be ground smooth and loose mortar to be removed.
- C. Vertical edges of the walls to have 3/4-inch chamfer.
- D. Horizontal edges of the walls to have 1/2-inch chamfer.
- E. Unformed surfaces to be steel troweled to a smooth dense finish. After the trowel finish has sufficiently hardened, walking surfaces of the entire surface to be given a medium broom finish perpendicular to the direction of travel. The broom finish to be applied just prior to the application of the curing compound/sealer.

### 3.10 CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperature in accordance with ACI 308 and as specified herein.
  1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing concrete. Weather permitting, keep continuously moist for not less than 7 days.

2. Begin final curing procedures immediately following initial curing and before concrete has dried.
  3. Continue final curing for at least 7 days in accordance with ACI 301 procedures.
  4. Avoid rapid drying at end of final curing period.
- B. Curing Methods: Perform curing of concrete by moist curing (Mat Method), by moisture-retaining cover curing (Impervious Sheeting Method), by curing compound (Membrane Curing Method), or by combinations thereof.
1. Mat Method: Provide moist curing by any of the following methods to keep concrete surface continuously wet:
- C. Cover concrete continuously with water.
- D. Provide a continuous water fog spray.
- E. Cover concrete with a saturated absorptive mat. Prior to placing mats on concrete surface, thoroughly wet the exposed surface with water. Cover the entire exposed surface with 2 or more layers of burlap. Mats shall overlap each other at least 6 inches. Continuously keep mats in a saturated condition and in intimate contact with concrete for not less than 7 days.
- F. Impervious Sheeting Method: Provide moisture-cover curing as follows:
1. Wet the entire exposed surface with a fine spray of water and then cover with impervious sheeting material.
  2. Lay sheets directly on the concrete surface, placed in widest practicable width with sides and ends lapped at least 12 inches when a continuous sheet is not used.
  3. Provide impervious sheeting at least 18 inches wider than the concrete surface to be cured.
  4. Securely weigh sheeting down with heavy wood planks, or by placing a bank of moist earth along edges and laps in the sheets, or by sealing with waterproof tape or adhesive.
  5. Immediately repair any holes or tears in cover during curing period using cover material and waterproof tape.
  6. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing.
    - a. The curing sheet shall remain on the concrete surface to be cured for not less than 7 days.
- G. Membrane Curing Method: Provide curing compound to slabs as follows:
1. Cover the entire exposed surface with a membrane-forming curing compound.
  2. Apply specified curing and sealing compound as soon as final finishing operations are complete (within 2 hours).
  3. Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions, or apply in 2 coats by hand-operated pressure sprayers as recommended by the manufacturer.
  4. Apply an additional coat to all surfaces showing discontinuity, pinholes or other defects.

5. Recoat areas subjected to heavy rainfall within 3 hours after initial application.
6. Maintain continuity of coating and repair damage during curing period.
7. Protect concrete surfaces to which membrane-curing compounds have been applied.
8. Any area covered with curing compound and damaged by subsequent construction operations within the 7-day curing period shall be resprayed.

H. Do not use membrane curing compounds on concrete surfaces which are to be covered with material applied directly to concrete, such as liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Engineer.

### 3.11 CONSTRUCTION JOINTS

- A. General: Construction joints shall conform to typical details and be located where shown on the Plans or where approved by the Engineer. Locate joints to minimize impairment to the strength of the structure.
- B. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.
- C. Walls: To assure a level and straight joint in exposed vertical surfaces, tack a 3/4 inch x 1-1/4 inch strip of dressed lumber to exposed face form at construction joint.
1. Place concrete 1 inch above underside of strip.
  2. During stripping, carefully remove tack strip to prevent chipping or spalling.
  3. Maximum spacing between vertical construction joints shall be 60 feet.
- D. Provide keyways at least 1½-inches deep in construction joints in walls and slabs, unless shown otherwise. Bulkheads designed for this purpose may be used for slabs if approved by Architect.

### 3.12 CONTRACTION (CONTROL) JOINTS

- A. Provide joints of size and at locations specified below:
1. Provide 3/4" Chamfer joints at 20 feet maximum spacing in each direction, unless otherwise shown or noted.
- B. Sawcut as soon as concrete has hardened sufficiently to prevent aggregates being dislodged by saw. Complete sawcutting operations within 24 hours of the introduction of water to the mix.

### 3.14 REPAIR OF 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, or is otherwise defective, and in the Engineers's judgment, these defects impair the proper strength or appearance of the work, the Engineer 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 with patches that match finish of adjacent surface.
  - 1. Tie holes shall be filled solid with patching mortar.
  - 2. Cut out honeycombed or otherwise defective areas to solid concrete to a depth of not less than 1 inch.
  - 3. The edges of the cut shall be perpendicular to the surface of the concrete.
  - 4. Saturate the area to be patched and at least 6 inches adjacent thereto with water before placing the mortar.
  - 5. Mix the mortar approximately 1 hour before placing and remix occasionally during this period with a trowel without the addition of water.
  - 6. A grout of cement and water mixed to the consistency of paint shall then be brushed on to the surfaces to which the mortar is to be bonded.
  - 7. Compact the mortar into place and screed slightly higher than the surrounding surface.
  - 8. Finish patches on exposed surfaces to match the adjoining surfaces, after they have set for an hour or more.
  - 9. Cure patches as specified for the concrete.
- C. The specified patching mortar may be used in lieu of the above method when color match of the adjacent concrete is not required. Prior approval by the Engineer is required.
- D. All structural repairs shall be made with prior approval of the Engineer of Record, as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar. Where epoxy injection procedures must be used, an approved low viscosity epoxy made by the manufacturers previously specified shall be used.

### 3.15 FIELD QUALITY CONTROL

- A. Comply with requirements of Section 01 45 23 - TESTING AND INSPECTION SERVICES.
- B. The Owner's Testing Agency will:
  - 1. Provide full time special inspection for concrete placement.
  - 2. Inspect concrete placement for conformance with the Contract Documents in accordance with the California Building Code.
- C. Sampling Fresh Concrete: Samples for strength tests shall be taken in accordance with ASTM C172. Cylinders and cores for acceptance shall be made, cured and tested in accordance with ASTM C31 and ASTM C39.

1. Slump: ASTM C 143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.
  2. Air Content: Air content tests shall be made each time compressive strength cylinders are taken of concrete required to be air entrained.
  3. Compression Test Specimen: One set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
  4. Compressive Strength Tests: One set for each 10 cubic yards or fraction thereof, of each concrete type and strength placed in any one day, 1 specimen tested at 7 days, 2 specimens tested at 28 days, and 1 specimen retained in reserve for later testing if required. Compressive strength tests are not required for exterior concrete paving.
  5. When frequency of testing will provide less than 5 tests for a given type and strength of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
  6. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
  7. Strength level of concrete will be considered satisfactory if averages of sets of two consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified 28 day compressive strength by more than 500 psi.
- D. Structural Grout for Horizontal Joints: Verify that required mixing procedures are taken. One set of four samples will be taken for compression tests for each day grouting takes place. Observe initial grout placement and conduct periodic visual inspections of in-place work.
- E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer.
1. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
  2. Owner shall back charge the Contractor for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

### 3.16 BACKFILL

- A. After curing, remove debris; backfill, grade and compact the area adjoining the concrete to conform to the surrounding area in accordance with lines and grades indicated.

### 3.17 CLEANING

- A. Comply with requirements of Section 01 71 00 - CLEANING.
- B. Protect completed concrete from damage until accepted.

- C. Repair damaged concrete and clean concrete discolored during construction.
  - 1. Concrete that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints.
  - 2. Refinishing the damaged portion will not be acceptable.
  - 3. Remove damaged portions and dispose of as directed.
  
- D. Ensure removal of bituminous materials, form release agents, bond breakers, curing compounds or other materials employed in work of concreting which would otherwise prevent proper application of sealants, liquid waterproofing, or other delayed finishes or treatments.
  
- E. Where cleaning is required, take care not to damage surrounding surfaces or leave residue from cleaning agents.

END OF SECTION



## **Section 32 50 00**

# **RESTORATION OF SURFACES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes but is not limited to:
1. General surface restoration.
  2. Asphalt concrete surface restoration.
  3. Concrete surface restoration.
  4. Pavement Marking
  5. Landscape/Planting restoration.
- B. Related Sections:
1. Section 02315 - TRENCHING, BACKFILLING & COMPACTING.
  2. Section 02750 - PAVING AND SURFACING.
  3. Section 02780 – PAVEMENT MARKING.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS**

- A. Refer to Section 31 23 33 - TRENCHING, BACKFILLING & COMPACTING.  
Refer to Section 31 12 23 - PAVING AND SURFACING.  
Refer to Section 32 17 23 – PAVEMENT MARKING.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. Surface restoration shall be in kind or better.

#### **3.2 ASPHALT CONCRETE SURFACE RESTORATION**

- A. The base course for permanent asphalt concrete surface restoration shall be Class II Aggregate Base, equal in depth to the existing pavement structural section, but not less than 8 inches in depth.
- B. The wearing surface for permanent surface restoration on improved streets shall be asphalt concrete equal in thickness to the existing pavement, but not less than 3 inches in depth. The asphalt concrete shall be Type B Asphalt Concrete, in accordance with Section 32 12 23 - PAVING AND SURFACING.

#### **3.3 CONCRETE SURFACE RESTORATION**

- A. The base for permanent concrete surface restoration shall be Class II Aggregate base, equal in depth to the existing section, but not less than 6 inches in depth.
- B. The weaving surface for permanent concrete surface restoration shall be concrete equal in thickness to the existing concrete section, but not less than 4 inches in depth for Pedestrian Areas and not less than 6 inches in depth for Vehicular areas. The concrete shall be 6-sack concrete, in accordance with Section 32 12 33 – PAVING AND SURFACING.

**3.4 PAVEMENT MARKING RESTORATION**

- A. Replace pavement marking disturbed by construction operations/activity to the satisfaction of the Project Manager in kind in accordance with Section 31 17 23 – PAVEMENT MARKING.

**3.5 LANDSCAPE RESTORATION**

- A. Replace landscaping, planting, trees, shrubs, ground cover, irrigations systems disturbed by construction operations/activity to the satisfaction of the Project Manager in kind or better.
- B. Disturbed lawn areas shall be replace with Sod in kind or better to the satisfaction of the Project Manager.

END OF SECTION

**Section 33 10 00**  
**WATER SYSTEMS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This section describes general requirements, products, and methods of execution relating to on-site domestic water and fire water systems serving all buildings and appurtenances. Unless otherwise noted, this section does not apply to irrigation water systems and water systems inside and within 5 feet of buildings. This section applies to:
1. Domestic water distribution and services.
  2. Fire water distribution and services.
  3. Water storage tanks.
  4. Booster pumps.
- B. Contractor shall provide all labor, equipment, materials, and testing services unless otherwise noted.
- C. Related Sections:
1. Section 31 23 33 – TRENCHING, BACKFILLING AND COMPACTING.

**1.2 SUBMITTALS**

- A. Comply with requirements of Section 01330 – SUBMITTAL PROCEDURES.
- B. Product Data: Manufacturer's literature and data, including, where applicable, sizes, pressure rating, rated capacity, listing/approval stamps, labels, or other marking on equipment made to the specified standards for materials, and settings of selected models, for the following:
1. Piping and fittings.
  2. Gaskets, couplings, sleeves, and assembly bolts and nuts.
  3. Gate valves and ball valves.
  4. Blow-off valves, air release and vacuum valves, and combination air valves.
  5. Check valves.
  6. Pressure reducing valves.
  7. Backflow preventers.
  8. Post indicators.
  9. Fire department connections and wet stand pipes.
  10. Fire hydrants.
  11. Thrust block concrete mix and/or restrained joints and fittings.

12. Tapping sleeves and tapping valves.
  13. Service saddles and corporation stops.
  14. Identification materials and devices.
- C. Shop Plans and Calculations: Where an on-site fire water system is required, Contractor shall provide shop plans for Program Manager and agency approval prior to construction. Coordinate with the Construction Documents and identify any proposed modifications or deviations. Shop Plans and Calculations shall be stamped and signed by a registered Fire Protection Engineer licensed by the State of California as required.
1. Include the following information:
    - a. Design assumptions.
    - b. Thrust block sizing and calculations.
    - c. Materials to be used.
    - d. Available water pressure.
    - e. Required water pressure.
  2. The review of fire system components constitutes only a portion of the review and approval required. A copy of the fire system component submittal package shall be forwarded to the local fire marshal for further review and approval.
- D. Test Reports:
1. Water Pressure Report: At the conclusion of work, the Contractor shall engage a qualified testing service to conduct a flow test of the existing campus main(providing flow test data for all mains and at least six (6) hydrants). Provide date and location of test, type and method of test performed, static pressure and residual pressure in psig, observed flow in gpm, and orifice size.
- E. Samples: None specified. Provide as necessary.

### 1.3 QUALITY ASSURANCE

- A. Comply with the latest edition of the following Standards and Regulations:
1. American Water Works Association (AWWA) and American National Standards Institute (ANSI):
    - a. C104/A21.4 ANSI Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
    - b. C105/A21.5 ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
    - c. C110/A21.10 ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 inch - 48 inch for Water.
    - d. C111/A21.11 ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
    - e. C115/A21.15 ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.

- f. C116/A21.16 ANSI Standard for Protective Fusion-Bonded Epoxy Coatings Interior & Exterior Surfaces for Ductile-Iron and Gray-Iron Fittings.
- g. C150/A21.50 ANSI Standard for Thickness Design of Ductile-Iron Pipe.
- h. C151/A21.51 ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
- i. C153/A21.53 ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
- j. C500 Metal-Seated Gate Valves for Water Supply Service.
- k. C502 Dry-Barrel Fire Hydrants.
- l. C503 Wet-Barrel Fire Hydrants.
- m. C504 Rubber-Seated Butterfly Valves.
- n. C507 Ball Valves, 6 inches - 48 inches.
- o. C508 Swing-Check Valves for Waterworks Service, 2 inches - 24 inches NPS.
- p. C509 Resilient-Seated Gate Valves for Water Supply Service.
- q. C510 Double Check Valve Backflow Prevention Assembly.
- r. C511 Reduced-Pressure Principle Backflow Prevention Assembly.
- s. C512 Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
- t. C550 Protective Epoxy Interior Coating for valves and Hydrants.
- u. C600 Installation of Ductile-Iron Water Mains and their Appurtenances.
- v. C602 Cement- Mortar Lining of water Piplines in place- 4 inches and larger.
- w. C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
- x. C651 Disinfecting Water Mains
- y. C652 Disinfection of Water-Storage Facilities
- z. C800 Underground Service Line Valves and Fittings for 1/2 inches - 2 inches.
- aa. C900 Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 inches - 12 inches, for Water Distribution.
- bb. C901 Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inches through 3 inches, for Water Service.
- cc. C905 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inches - 48 inches.
- dd. C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 inches - 63 inches, for Water Distribution and Transmission.
- ee. C907 Polyvinyl Chloride (PVC) Pressure Fittings for Water, 4 inches - 8 inches.
- ff. C908 PVC Self-Tapping Saddle Tees for Use on PVC

- Pipe.
- gg. D103 Factory-Coated Bolted steel Tanks for water Storage.
2. National Fire Protection Association (NFPA):
- a. NFPA 13 Standard for the Installation of Sprinkler Systems.
  - b. NFPA 14 Standard for the Installation of Standpipe, Private Hydrants, and Hose Systems.
  - c. NFPA 20 Standard for the Installation of Stationary Pumps for Fire Protection.
  - d. NFPA 22 Standard for Water Tanks for Private Fire Protection.
  - e. NFPA 24 Private Service Mains and their Appurtenances.
  - f. NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
3. Uni-Bell Plastic Pipe Association (UNI).
- a. PUB 3 PVC Pipe – Technology Serving the Water Industry.
  - b. PUB 7 External Corrosion of Underground Water Distribution Piping Systems.
  - c. PUB 8 Tapping Guide for AWWA C900 Pressure Pipe.
  - d. PUB 9 Installation Guide for PVC Pressure Pipe.
  - e. B-8 Recommended Practice for the Direct Tapping of Polyvinyl Chloride (PVC) Pressure Water Pipe (Nominal Diameters 6-12 inch).
4. American Society of Testing and Materials (ASTM).
- a. ASTM A536 Standard Specification for Ductile Iron Castings.
  - b. ASTM A674 Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
  - c. ASTM D1785 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  - d. ASTM D2241 Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe.
  - e. ASTM D2466 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
  - f. ASTM D2564 Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
  - g. ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
  - h. ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

- i. ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
  - j. ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
  - k. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  - l. ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.
  - m. ASTM F1056 Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings.
  - n. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - o. ASTM A795 Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
  - p. ASTM A865 Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints.
  - q. ASTM B88 Standard Specification for Seamless Copper Water Tube.
5. American Society of Mechanical Engineers (ASME).
    - a. ASME B16 series for valves, fittings, flanges, and gaskets applicable for use in water systems.
    - b. ASME B1.20.1 American Standard Tapered Pipe Threads for factory-threaded pipe and pipe fittings.
  6. National Sanitation Foundation (NSF).
    - a. NSF/ANSI 14 Plastics Piping System Components and Related Materials.
    - b. NSF/ANSI 61 Standard for Drinking Water Systems Components – Health Effects.
  7. Underwriters Laboratories, Inc. (UL).
    - a. UL 157 Standard for Safety for Gaskets and Seals.
    - b. UL 194 Standard for Safety for Gasketed Joints for Ductile-Iron Pipe and Fittings for Fire Protection Service.
    - c. UL 213 Rubber Gasketed Fittings for Fire-Protection Service.
    - d. UL 246 Standard for Safety for Hydrants for Fire-Protection Service.
    - e. UL 262 Standard for Safety for Gate Valves for Fire-Protection Service.
    - f. UL 312 Standard for Safety for Check Valves for Fire-Protection Service.

- g. UL 405 Standard for Safety for Fire Department Connections.
  - h. UL 448 Standard for Safety for Pumps for Fire-Protection Service.
  - i. UL 789 Standard for Safety for Indicator Posts for Fire-Protection Service.
  - j. UL 860 Pipe Unions for Flammable and Combustible Fluids and Fire-Protection Service.
  - k. UL 1091 Standard for Safety for Butterfly Valves for Fire-Protection Service.
  - l. UL 1285 Pipe and Couplings, Polyvinyl Chloride (PVC), for Underground Fire Service.
  - m. UL 1468 Direct Acting Pressure Reducing and Pressure Restricting Valves.
  - n. UL 1478 Standard for Safety for Fire Pump Relief Valves.
8. FM Global (FM).
- a. FM 1020 Automatic Water Control Valves.
  - b. FM 1045 Waterflow Detector Check Valves.
  - c. FM 1110 Indicator Posts.
  - d. FM 1111 Post-Indicator-Valve-Assembly.
  - e. FM 1112 Indicating Butterfly Valves.
  - f. FM 1120 and FM 1130 Fire Service Water Control Valves (OS&Y and NRS Type Gate Valves).
  - g. FM 1210 Swing Check Valves.
  - h. FM 1221 Backflow Preventers (Reduced Pressure Principle and Double Check Valve Types).
  - i. FM 1311 Centrifugal Fire Pumps (Horizontal, Split-Case Type).
  - j. FM 1312 Centrifugal Fire Pumps (Vertical-Shaft, Turbine Type).
  - k. FM 1319 Centrifugal Fire Pumps (Horizontal, End Suction Type).
  - l. FM 1361 Water Pressure Relief Valve.
  - m. FM 1362 Pressure Reducing Valves.
  - n. FM 1371 Centrifugal Fire Pumps (In-Line Type).
  - o. FM 1510 Fire Hydrants (Dry Barrel Type) for Private Fire Service.
  - p. FM 1511 Fire Hydrants (Wet Barrel Type) for Private Fire Service.
  - q. FM 1530 Fire Department Connections.
  - r. FM 1610 Plastic Pipe & Fittings for Underground Fire Protection Service.
  - s. FM 1620 Pipe Joints & Anchor Fittings for Underground Fire Service Mains.
9. Plastics Pipe Institute (PPI).
- a. Underground Installation of Polyethylene Pipe.
  - b. Polyethylene Joining Procedures.



- c. Inspections, Test and Safety Considerations.
  - 10. American Association of State Highway and Transportation Officials (AASHTO) for H2O Loading.
  - 11. American Concrete Institute (ACI).
    - a. ACI 348 - Meter Pit Construction.
  - 12. Local Water District Standard Specifications and Details.
  - 13. Local Office of the Fire Marshal Regulations.
  - 14. Other authorities having jurisdiction.
- B. System Description: Grades and elevations are to be established with benchmarks referenced on Plans.
- C. Comply with authorities having jurisdiction for the installation and testing of potable water piping and fire protection systems.
- D. All testing of systems specified in this section shall be witnessed by representatives of the local water department or local authority. Provide at least 7 days notice.
- E. The Contractor shall prepare shop plans and calculations, and obtain all required approvals for the fire water system of the proposed project. Contractor shall have shop plans and calculations stamped and signed by a Fire Protection Engineer, licensed by the State of California, as required by the local jurisdiction.

## **PART 2 - PRODUCTS**

### **2.1 PIPING**

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- A. Water Distribution Main (pipe size 4 inches and larger).
  - 1. Ductile Iron Pipe (DIP): Pressure Class 350 pipe conforming to AWWA/ANSI C151/A21.5, cement-mortar lining conforming to AWWA/ANSI C104/A21.4, with standard thickness per AWWA/ANSI C150/A21.50. U.S. Pipe, American Cast Iron Pipe Company (ACIPCO), or approved equivalent.
    - a. Flanged ends shall conform to AWWA/ANSI C115/A21.15.
    - b. Rubber-gasket joints shall conform to AWWA/ANSI C111/A21.11.
  - 2. Polyvinyl Chloride Pipe (PVC): Pressure Class 200, DR 14, spigot and gasket bell end, conforming to AWWA C900 or AWWA C905, with equivalent cast-iron pipe outer diameter (O.D.). J-M Manufacturing, PW Pipe, North American Pipe Company, or approved equivalent.

- B. Water Service Line (pipe size 3 inches and smaller)
1. Copper (Cu): Provide Type K soft or hard copper pipe conforming to ASTM B88.
  2. For pipe size 1 inches and smaller High Density Polyethylene Pipe (HDPE): PE3408, Pressure Class 200, DR 9 conforming to AWWA C901. PWPIPE or approved equivalent.

## 2.2 FITTINGS, GASKETS, COUPLINGS, SLEEVES, AND ASSEMBLY BOLTS AND NUTS

- A. For DIP: Provide fittings with pressure rating greater than or equal to that of the pipe. Provide flanged joints, mechanical joints, push-on joints, and insulating joints where indicated. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends. Provide mechanically coupled type joints using a sleeve-type mechanical coupling where indicated. Provide ends of pipe and fittings suitable for the specified joints. Fittings shall have cement-mortar lining conforming to AWWA/ANSI C104/A21.4.
1. Flanged Joints: Provide bolts, nuts, and gaskets in conformance with AWWA/ANSI C115/A21.15. Flanged fittings shall conform to AWWA/ANSI C110/A21.10 or C153/A21.53.
    - a. Provide flange for setscrewed flanges of ductile iron, ASTM A536, Grade 65-45-12, and conform to the applicable requirements of ASME B16.1, Class 250.
    - b. Provide setscrews for setscrewed flanges of 190,000 psi tensile strength, heat treated and zinc-coated steel.
    - c. Gaskets for setscrewed flanges shall conform to the applicable requirements for mechanical-joint gaskets specified in AWWA/ANSI C111/A21.11.
    - d. Design of setscrewed gaskets shall provide for confinement and compression of gasket when joint to adjoining flange is made.
    - e. Unless otherwise required, above ground flange assembly bolts shall be standard hex-head, cadmium plated machine bolts with American Standard Heavy, hot-pressed, cadmium plated hexagonal nuts. Buried flange nuts and bolts shall be as above except they shall be of Type 304 stainless steel.
  2. Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets shall conform to AWWA/ANSI C111/A21.11.
  3. Push-on Joints: Provide shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly conforming to AWWA/ANSI C111/A21.11. Modify bell design fittings, as approved.

4. Insulating Joints: Provide a rubber-gasketed or other suitable approved type of insulating joint or dielectric coupling which will effectively prevent metal-to-metal contact at the joint between adjacent sections of dissimilar metals.
    - a. Provide joint of the flanged type with insulating gasket, insulating bolt sleeves, and insulating washers.
    - b. Provide gasket of the dielectric type, full face, as recommended in AWWA/ANSI C115/A21.15.
    - c. Provide bolts and nuts as recommended in AWWA/ANSI C115/A21.15.
- B. For PVC: Fittings shall be DIP.
1. DIP fittings: Provide gray-iron or ductile-iron conforming to AWWA/ANSI C110/A21.10, with cement-mortar lining conforming to AWWA/ANSI C104/A21.4, and standard thickness, with equivalent cast-iron pipe O.D.
    - a. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except the bell design shall be modified, as approved, for push-on joint suitable for use with PVC plastic pipe.
    - b. Provide push-on joints, compression joints and mechanical joints where indicated between pipe and fittings, valves, and other accessories.
    - c. Mechanical joints, glands, bolts and nuts, and gaskets shall conform to AWWA/ANSI C111/A21.11.
    - d. All fittings shall be epoxy-coated, 10-mil thickness conforming to AWWA C550.
- C. For Cu:
1. Cast copper alloy solder-joint pressure fittings shall conform to ASME B16.18.
  2. Wrought copper solder-joint pressure fittings or wrought copper alloy unions shall conform to ASME B16.22
  3. Cast copper alloy flare fittings shall conform to ASME B16.26.
  4. Wrought copper alloy body, hexagonal stock, metal-to-metal seating surfaces, and solder-joint threaded ends shall conform to ASME B1.20.1.
  5. Compression connections shall be Mueller 110, Ford or approved equivalent.
- D. For PE:
1. Cast Copper Fittings shall conform to ASME B16.18.
  2. Cast Copper Compression Fittings and connections shall be Mueller 110 Ford or approved equivalent.

### **2.3 GATE VALVES AND BALL VALVES**

- A. Gate Valves: Valves shall open by counterclockwise rotation of the valve stem. Provide valves with ends as appropriate for the adjoining pipe.
1. Stuffing boxes shall have O-ring stem seals. Provide stuffing boxes bolted and constructed so as to permit easy removal of parts for repair.
  2. Valves (2-1/2 inches and larger):
    - a. Provide valves conforming to AWWA C500 or AWWA C509 and of one manufacturer. Valves shall have a non-rising stem, a 2-inch square nut, and double-disc gates. Valves shall be rated for 250 psi maximum working pressure. Mueller 2360 series, ACIPCO, or approved equivalent.
    - b. For the domestic water system, valves shall also conform to ANSI/NSF 61.
    - c. For the fire water system, valves 2 inches through 16 inches in size shall also conform to UL 262 and FM 1120 or FM 1130 to a working pressure of 200 psi.
  3. Where a post indicator is shown, provide valve with an indicator post flange.
- B. Ball Valves: Valves shall open by counterclockwise rotation of the valve stem. Provide valves with ends as appropriate for the adjoining pipe.
1. Valves (2-inches and smaller):
    - a. Provide valves conforming to AWWA C800 and of one manufacturer. Mueller 300 Series, Ford, or approved equivalent.
  2. Provide valve with lockable operating nut or handle as shown on the Construction Documents.

#### **2.4 BLOW-OFF VALVES, AIR RELEASE AND VACUUM VALVES, AND COMBINATION AIR VALVES**

- A. Blow-off valves: Provide valve and service size as shown in the Construction Documents. Provide 2-inch valves at low points of the piping system, and 4-inch valves at dead-ends of the piping system, unless otherwise directed by the Program Manager.
1. 2-inch blow-off shall have a 2-inch vertical female iron pipe (FIP) inlet and a 2-inch normal pressure and temperature (NPT) nozzle outlet with cap. Valve shall open by counterclockwise rotation of a top-mounted 9/16-inch square operating nut. All working parts shall be serviceable without excavation. Kupferle/Truflo Model TF550, or approved equivalent.
  2. 4-inch blow-off shall have a 4-inch vertical FIP inlet and a 4-inch male iron pipe (MIP) outlet with cap. Valve shall open by counterclockwise rotation of a top-mounted 9/16-inch square operating nut. All working

parts shall be serviceable without excavation. Kupferle/Truflo Model TF800, or approved equivalent.

- B. Air release and vacuum valves: Provide valve and service size as shown on the Construction Documents, and where there is an increase in the downward slope or a decrease in the upward slope of the piping system. Valve shall have cast-iron single valve body, and shall conform to AWWA C512. A compound lever system shall have a maximum operating pressure of 300psi. Provide a protective cap for the outlet of the valve. Provide universal air-vacuum type valves, Crispin Model UL, Apco, or approved equivalent.
- C. Combination air valves: Provide valve and service size as shown on the Construction Documents, and at high points and sharp changes in gradient of the pipe system. Valve shall have cast-iron single valve or double valve body, and shall conform to AWWA C512. A simple or compound lever system shall have a maximum operating pressure of 300psi. Provide a protective cap for the outlet of the valve. Crispin Model C, Apco, or approved equivalent.

## **2.5 CHECK VALVES**

- A. Check Valves: Valves shall have clear port opening and a cast-iron body. Provide spring-loaded or weight-loaded valves where indicated on the Construction Documents.
  - 1. For the domestic water system, provide swing-check type valves conforming to AWWA C508. Provide valves of one manufacturer. Mueller, Apco, or approved equivalent.
  - 2. For the fire water system, provide swing-check type valves conforming to FM 1210 and UL 312. Mueller, Watts, or approved equivalent.

## **2.6 PRESSURE REDUCING VALVES**

- A. Pressure Reducing Valves: Valves shall have a cast-iron body, conforming to ASTM A536, with epoxy interior coating conforming to AWWA, and rated to pressure class 300. Cla-Val Model 90-01, Singer, or approved equivalent.
  - 1. Valves shall have flanged ends.
  - 2. Valves sized 3-inches or smaller may have screwed ends.

## **2.7 POST INDICATORS**

- A. Posts Indicators shall withstand up to 900 ft-lbs of operating torque, be free-standing, and tamper-proof.
- B. Post Indicators shall conform to UL 789 and FM 1110. Mueller, ACIPCO, or approved equivalent.

## **2.8 VALVE BOXES, METER BOXES, FRAMES AND COVERS**

- A. Water Valve Box: Provide pre-cast concrete valve box for each buried valve. Provide box with steel or cast iron traffic cover marked "WATER". Christy Model G5 with G5C cover or approved equivalent.
- B. Valve or Meter Boxes: Contractor shall verify box size required for water system appurtenances as shown in the Construction Documents. Provide a precast concrete utility box for each buried appurtenance. Provide a traffic-rated lid for H20 loading. A non-traffic rated lid may be used for boxes located in landscape areas. Christy, or approved equivalent.

## **2.9 BACKFLOW PREVENTERS**

- A. Provide backflow preventers as shown on the Construction Documents. Subject to District's approval. Backflow preventers on the fire water system shall be subject to approval by the local office of the fire marshal.
- B. Reduced Pressure Principle Assemblies (RPPA): Provide a cast-iron body RPPA consisting of two independently operating check valves with a pressure differential relief valve located between the two check valves, two shut-off valves and four test cocks. RPPA shall be tamper-proof and conform to AWWA C511. Febco 860, Watts, or approved equivalent.
- C. Double Check Detector Assemblies (DCDA): Provide a cast-iron body DCDA consisting of mainline double check assemblies in parallel with a bypass double check and meter assembly, two shut-off valves and four test cocks. DCDA shall be tamper-proof and conform to AWWA C510. Febco 806, Watts, or approved equivalent.

## **2.10 FIRE DEPARTMENT CONNECTIONS AND WET STAND PIPES**

- A. Fire Department Connections (FDC): Provide FDC's with 2-1/2 inch female hose connections, sidewalk or free-standing type. Number of inlets shall be as shown on the Construction Documents. Clapper and spring check inlets shall each have a minimum capacity of 250 gpm, and be furnished with a cap and chain. Outlet shall be sized for simultaneous use of all inlets. Connection shall be branded "Building XX".
  - 1. 2-Way FDC: Connection shall conform to UL 405 or FM 1530. Elkhart, Croker, or approved equivalent.
  - 2. 3-Way FDC: Connection shall be subject to approval by the local water department or fire marshal. Elkhart, Croker, Potter-Roemer or approved equivalent.
  - 3. 4-Way FDC: Connection shall conform to UL 405. Potter-Roemer, Croker, or approved equivalent.

4. 6-Way FDC: Connection shall be subject to approval by the local water department or fire marshal. Croker, Potter-Roemer or approved equivalent.

## **2.11 FIRE HYDRANTS**

- A. Provide two 2-1/2 inch and one 4-1/2 inch outlets, with a 6-inch nominal inside diameter inlet and break-away type bolts. Hydrant shall have a working pressure of 250 psi and shall conform to AWWA C502 or C503, and be UL listed and FM approved. Provide hydrants of one manufacturer. Clow model 960 series or approved equivalent, subject to approval of the District and fire marshal.

## **2.12 THRUST BLOCKS AND PIPE RESTRAINTS**

- A. Thrust Blocks: Provide thrust blocks in accordance with NFPA 24 Standards. Use concrete conforming to ASTM C94 having a minimum compressive strength of 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.
- B. Pipe Restraints: Provide thrust restraint systems for fittings and joints as indicated on the Plans. Restrained lengths for onsite fire system will be as indicated on the Plans.
  1. For mechanical joint fittings and joints: Pipe restraints shall be "Mega-Lug" pipe restraint system by EBBA Iron, Inc., or approved equivalent.
  2. For push-on joint fittings and joints: Pipe restraints shall be "Field-Lok" gaskets by U.S. Pipe, or approved equivalent.
- C. Thrust blocks or mechanical pipe restraints may be used at Contractor's option, unless otherwise indicated on the Plans.
- D. Provide thrust blocks or mechanical pipe restraints at all fittings and changes in angle, alignment or elevation.
- E. Where depth or location of existing structures prohibit the use of standard thrust blocks, gravity blocks may be used. Conform to NFPA 24 Standards.

## **2.13 TAPPING SLEEVES AND TAPPING VALVES**

- A. Tapping sleeves shall be epoxy coated and furnished with stainless steel washers, nuts and bolts. Mueller H-615 and H-619, Ford, or approved equivalent.

- B. Tapping valves shall have flanged inlet, Class 125, conforming to ASME B16.1 and furnished with stainless steel washers, nuts and bolts. Tapping valves shall be constructed with a mechanical joint outlet. Mueller T-687, T-642, T-681, or approved equivalent.

## **2.14 SERVICE SADDLES AND CORPORATION STOPS**

- A. Service Saddles: Saddles shall conform to AWWA C800 and NSF 61.
  - 1. For DIP: Provide bronze or stainless steel body, double strap type with a 200 psi maximum working pressure. Mueller BR2 Series, Ford, or approved equivalent.
  - 2. For PVC: Provide bronze body, wide strap type. Mueller H-13000 Series, Ford, or approved equivalent.
  - 3. For PE: Per manufacturer's recommendations.
- B. Corporation Stops: Provide ground key type; bronze conforming to ASTM B61 or ASTM B62, for a working pressure of 100 psi. and suitable for the working pressure of the system.
  - 1. Ends shall be suitable for adjoining pipe and connections, solder-joint, or flared tube compression type joint.
  - 2. Threaded ends shall conform to AWWA C800.
  - 3. Coupling nut for connection to flared copper tubing shall conform to ASME B16.26.
  - 4. Mueller H-15000 Series with "CC" threads and a copper flare straight connection outlet, Ford, or approved equivalent.

## **2.15 IDENTIFICATION MATERIALS AND DEVICES**

- A. Marker Tape: Provide marker tape consisting of metallic foil bonded to plastic film not less than 2-inches wide. Film shall be inert polyethylene plastic. Film and foil shall each not be less than 1-mil. thick. The tape shall be identified with lettering, not less than 3/4-inch high, "CAUTION: WATER MAIN BELOW", repeated at approximately 24-inch intervals.
- B. Tracer Wire for Nonmetallic Piping: Provide 12 gage, coated copper or aluminum wire not less than 0.10 inch in diameter in sufficient length to be continuous over each separate run of nonmetallic pipe. Wire shall be tied in at all valves.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine surfaces and areas for suitable conditions where water service is being installed.



- B. Do not begin installation until unsatisfactory conditions have been corrected.

### 3.2 LOCATION OF WATER LINES

- A. Where the location of the water line is not clearly defined by dimensions on the Plans, do not lay water line closer than 10 feet horizontally from any sewer line.
- B. Where water lines cross under gravity sewer lines, encase sewer line in concrete for a distance of at least 10 feet on each side of the crossing, unless sewer line is made of pressure pipe with rubber-gasketed joints and no joint is located within 3 feet horizontally of the crossing.
- C. Where water lines cross sewer force mains and inverted siphons, install water line at least 2 feet above these sewer lines.
- D. When joints in the sewer line are closer than 3 feet horizontally from the water line, encase sewer line joints in concrete.
- E. Do not lay water lines in the same trench with other utilities.
- F. Install water lines at 3'-0" minimum depth or as detailed on Plans.

### 3.3 INSTALLATION OF PIPING

- A. Inspection:
  - 1. Before placing in position, inspect pipe for noticeable defects. Clean the inside and outside of the pipe, fittings, valves, and accessories, and maintain in a clean condition.
  - 2. Remove fins and burrs from pipe and fittings.
- B. Pipe laying and jointing:
  - 1. Provide proper facilities for lowering sections of pipe into trenches.
  - 2. Do not drop or dump pipe, fittings, valves, or any other water line material into trenches.
  - 3. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
  - 4. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying.
  - 5. Grade the pipeline in straight lines; avoid the formation of dips and low points.
  - 6. Support pipe at proper elevation and grade.

7. Provide secure firm, uniform support. Wood support blocking will not be permitted.
8. Lay pipe so that the full length of each section of pipe and each fitting rests solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
9. Provide anchors and supports where indicated and where necessary for fastening work into place.
10. Make proper provision for expansion and contraction of pipelines.
11. Keep trenches free of water until joints have been properly made.
12. Do not lay pipe when conditions of trench or weather prevent proper installation.
13. All fittings shall be blocked with appropriately sized thrust blocks as shown in the Construction Documents.

C. Installation of Tracer Wire:

1. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe.
2. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

D. Connections to Existing Lines:

1. Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line.
2. Make connections to existing lines under pressure in accordance with the recommended procedures of a manufacturer of pipe of which the line being tapped is made.

- E. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads to keep out debris and contamination.

### **3.4. INSTALLATION OF DUCTILE-IRON PIPING**

- A. Install pipe and fittings in accordance with requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

B. Jointing:

1. Provide push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly.
2. Provide mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and with the recommendations of AWWA C111.
3. Provide flanged joints with the gaskets, bolts, and nuts specified for this type joint.

- a. Install flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories.
  - b. Align bolt holes for each flanged joint.
  - c. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted.
  - d. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without over straining the flange.
  - e. Where flanged pipe and fitting have dimensions that do not allow the installation of a proper flanged joint as specified, replace it by one of proper dimensions.
  - f. Use setscrewed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe. Assemble in accordance with the recommendations of the setscrewed flange manufacturer.
3. Provide insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint. Assemble insulating joints as specified for flanged joints. Bolts for insulating sleeves shall be full size for the bolt holes.
  4. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.
- C. Exterior Protection: Completely encase buried ductile iron pipelines and underground appurtenances with polyethylene wrap. Install 8-mil linear low-density polyethylene (LLD) film or 4-mil high-density cross-laminated (HDCL) film per manufacturer's recommendations and in accordance with AWWA/ANSI C105/A21.5 and ASTM A674.
- D. Pipe Anchorage:
1. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Construction Documents.
  2. Pipe anchorage shall be in accordance with NFPA 24 Standards.

### **3.5 INSTALLATION OF POLYVINYL CHLORIDE PIPING**

- A. Install pipe and fittings in accordance with the requirements of UNI B-3 for the following:
1. The laying of pipe, joining PVC pipe to fittings and accessories.
  2. The setting of hydrants, valves, and fittings.
- B. Comply with the recommendations for pipe joint assembly and appurtenance installation in AWWA Manual M23, Chapter 7, "Installation".

- C. Comply with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111.
- D. Jointing:
1. Provide push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings.
  2. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel.
  3. For push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint.
  4. Use an approved lubricant recommended by the pipe manufacturer for push-on joints.
  5. Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the requirements of UNI B-3 for joining PVC pipe to fittings and accessories and with the applicable requirements of AWWA C600 for joint assembly.
  6. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint. Cut off spigot end of pipe for compression-type joint or mechanical-joint connections and do not re-bevel.
  7. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.
- E. Pipe Anchorage:
1. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Construction Documents.

2. Anchorage shall be in accordance with the requirements of UNI B-3 and in accordance with NFPA 24 Standards for reaction or thrust blocking and plugging of dead ends, except that size and positioning of thrust blocks shall be as indicated on the Construction Documents.

### **3.6 INSTALLATION OF POLYETHYLENE PIPING**

- A. Install pipe, fittings, and appurtenances in accordance with PPI and Manufacturer's Recommendations.
- B. Jointing:
  1. Provide mechanical joints, compression fittings, or flanges as recommended by the manufacturer.
  2. Jointing shall be performed using proper equipment and machinery by trained and certified personnel.
  3. Joints, fittings and tools shall be clean and free of burrs, oil, and dirt.
  4. Butt fusion:
    - a. Pipe ends shall be faced to establish clean, parallel mating surfaces.
    - b. Align and securely fasten the components to be joined squarely between the jaws of the joining machine.
    - c. Heat the ends of the pipe to the pipe manufacturer's recommended temperature interface pressure and time duration. A pyrometer or other surface temperature measuring device should be used to insure proper temperature of the heating tool. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
    - d. Prevent molten plastic from sticking to the heater faces. Molten plastic on the heater faces shall be removed immediately according to the tool manufacturer's instructions.
    - e. Bring the molten ends together with sufficient pressure to properly mix the pipe materials and form a homogeneous joint. Hold the molten joint under pressure until cooled adequately to develop strength. Refer to the Manufacturer's recommendations for temperature, pressure, holding, and cooling times.
    - f. Remove the inside bead from the fusion process using Manufacturer's recommended procedure.
  5. Socket fusion:
    - a. Mixing manufacturers' heating tools and depth gages will not be allowed unless the tools conform to ASTM F1056.
    - b. Pipe ends shall be faced square to establish clean, parallel mating surfaces.

- c. Clamp the cold ring on the pipe at the proper position using a depth gauge.
  - d. Heat the tool to the pipe manufacturer's recommended temperature. A pyrometer or other surface temperature measuring device should be used to insure proper temperature. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
  - e. Follow manufacturer's recommendations for bringing the hot tool faces into contact with the outside surface of the end of the pipe and the inside surface of the socket fitting.
  - f. Simultaneously remove the pipe and fitting from the tool.
  - g. Inspect the melt pattern for uniformity and immediately insert the pipe squarely and fully into the socket of the fitting until the fitting contacts the cold ring. Do not twist the pipe or fitting during or after the insertion.
  - h. Hold or block the pipe in place during cooling.
6. Electrofusion:
- a. Unless the operation is for a saddle-type electrofusion joint, pipe ends shall be faced square to establish clean, parallel mating surfaces.
  - b. Clamp the pipe and fitting at the proper position in the fixture.
  - c. Connect the electrofusion control box to the fitting and to the power source. Apply the electric current using manufacturer's instructions.
  - d. Allow the joint to cool before removing the clamping fixtures.

### 3.7 INSTALLATION OF VALVES

- A. Install gate valves conforming to AWWA C500 and UL 262 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, operation, and Maintenance of Gate Valves) to AWWA C509.
- B. Install gate valves conforming to AWWA C509 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, Operation, and Maintenance of Gate Valves) to AWWA C509.
- C. Install gate valves on PVC water mains in addition in accordance with the recommendations for appurtenance installation in AWWA Manual M23, Chapter 7, "Installation."
- D. Install check valves in accordance with the applicable requirements of AWWA C600 for valve-and-fitting installation, except as otherwise indicated.

- E. Provide and assemble joints to gate valves and check valves as specified for making and assembling the same type joints between pipe and fittings.

### **3.8 INSTALLATION OF VALVE AND METER BOXES**

- A. Boxes shall be centered over the appurtenance so as not to transmit shock or stress. Covers shall be set flush with the surface of the finished pavement, or as shown in the Construction Documents. Backfill shall be placed around the boxes and compacted to the specified level in a manner that will not damage or displace the box from proper alignment or grade. Misaligned boxes shall be excavated, plumbed, and backfilled at no additional cost to the District.

### **3.9 INSTALLATION OF HYDRANTS**

- A. Install hydrants, except for metal harness, plumbed vertical, in accordance with AWWA C600 for hydrant installation and as indicated.
- B. Provide and assemble joints as specified for making and assembling the same type joints between pipe and fittings. Hydrants shall be set so that mounting bolts clear the top of finished grade by three inches so bolts may be easily replaced if needed.
- C. Provide metal harness as specified under pipe anchorage requirements for the respective pipeline material to which hydrant is attached.

### **3.10 SERVICE LINE CONNECTIONS TO WATER MAINS**

- A. Connect service lines of size shown on plans to the main with a rigid connection or a corporation stop and gooseneck. Install a gate valve on the service line.
- B. Connect service lines to ductile-iron water mains in accordance with AWWA C600 for service taps.
- C. Connect service lines to PVC plastic water mains in accordance with UNI-B-8 and the recommendations of AWWA Manual M231, Chapter 9, "Service Connections."

**3.11 INSTALLATION OF BACKFLOW PREVENTERS**

- A. Backflow devices shall be installed horizontal and level, with three feet minimum clearances from obstructions.

**3.12 HYDROSTATIC PIPELINE TESTING**

A. Requirements:

1. After the pipe has been laid and backfilled, perform hydrostatic pressure tests.
2. Do not conduct tests until at least 12 hours have elapsed since pipe laying and at least 5 days have elapsed since placing of concrete thrust blocks.
3. Fill the pipe with water which shall remain without external application of pressure for 24 hours before tests are conducted.
4. Prior to hydrostatic testing, flush pipe system with fresh water until piping is free of dirt and foreign matter.
5. Apply pressure by a pump and measured by a test gage. All necessary apparatus and labor for conducting the pressure and leakage tests shall be furnished by the Contractor.
6. Ensure the release of air from the line during filling, and prevent collapse due to vacuum when dewatering the line.
7. For pressure test, use a hydrostatic pressure not less than 200 psi. The duration of the test shall not be less than 4 hours with the variation in pressure of not more than 5 psi for the duration of the test.

B. Leakage Tests:

1. Perform tests at the same time as pressure tests.
2. Leakage rate shall be measured for at least 4 hours with a certified water meter, or other approved method. If requested, meter certification shall be submitted to the District for approval prior to testing.
3. Leakage shall not be measured by a drop in pressure in a test section over a period of time.
4. Leakage at mechanical couplings and joints, tapping sleeves, saddles, flanged joints, and copper piping will not be accepted. Correct any visible leaks.
5. Push-on joints: Test ductile iron pipe for leakage in accordance with AWWA C600 as shown in the following table:

**TABLE 1**

Allowable Leakage per 1000 feet of DIP Pipeline (Gal/Hr)

Average Test Pressure	Nominal Pipe Diameter - Inches
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Average Test Pressure (psi)	Nominal Pipe Diameter - Inches									
	3	4	6	8	10	12	14	16	18	20
300	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60
275	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12

6. When the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
7. Test polyvinyl chloride pipe for leakage in accordance with the recommendations of the Uni-Bell Plastic Pipe Association (UNI) as shown in the following table:

**TABLE 2**

Allowable Leakage per 1000 feet or 50 joints of PVC Pipeline (Gal/Hr)

Nominal Pipe Size (inches)	Average Test Pressure in Line (psi.)	
	200	250
4	0.38	0.43
6	0.57	0.64
8	0.76	0.85
10	0.96	1.07
12	1.15	1.28
14	1.34	1.50
16	1.53	1.71
18	1.72	1.92
20	1.91	2.14

8. Should any section of new pipe fail to pass either test, locate and repair the defective pipe and repeat the test.

**3.13 STERILIZATION AND FLUSHING**

**A. General:**

1. Disinfect domestic water lines, mains, and branches by chlorination in accordance with AWWA C601 and as herein specified.

**B. Sterilization Methods:**

1. Liquid Chlorine Solution Method:
  - a. Flush all foreign matter from mains, branch runs, hydrant runs, and installed services.
  - b. Introduce liquid chlorine solution at appropriate locations to assure uniform distribution through the facilities at the proper concentration.
  - c. Do not use installed copper service lines to convey the concentrated chlorine solution to the mains.
  - d. The sanitizing solution shall be retained in the facilities for a period of 24 hours after which each service, hydrant run, branch run and dead end shall be flushed until:
    - i. Residual chlorine is less than 1 part per million.
    - ii. Residual chlorine is no greater than the concentration of chlorine in the water supplied for flushing.
  - e. Chlorine shall be a 1 percent solution (containing 10,000 parts per million available chlorine) or shall be obtained by use of dry chlorine in tablet form firmly attached to inside tope of the pipe.
  - f. The required concentration of chlorine in the pipe is 50 parts per million. This concentration may be attained by adding 5 gallons of the chlorine solution to 1,000 gallons of water.
  - g. The weight of chlorine or chlorine compound required to make a 1 percent chlorine solution is as follows:

**TABLE 3**

One-Percent Chlorine Solution Mix

AMOUNT OF PRODUCT COMPOUND		QUANTITY OF WATER (in gallons)
High-Test Calcium Hypochlorite (65-70% Cl)	1 pound	7.50
Chlorinated Lime (32-35% Cl)	2 pounds	7.50
Liquid Laundry Bleach (5.25% Cl)	1 gallon	4.25
Liquid Chlorine (100% available chlorine)	0.62 pounds	7.50

2. HTH Tablet Method:
  - a. The required concentration of chlorine in the mains may be obtained by the use of HTH tablets as produced by Olin Mathieson in the following quantities or approved equivalent:

**TABLE 4**

HTH Tablet (70%) Dosage  
Number of Tablets Per Length of Pipe

Length of Section	DIAMETER OF PIPE				
	4 inches	6 inches	8 inches	10 inches	12 inches
13 feet or less	1	2	3	4	6
18 feet	1	2	3	5	6
20 feet	1	2	3	5	7
30 feet	2	3	5	7	10
36 feet	2	3	5	8	12
40 feet	2	4	6	9	14
100 feet	4	9	15	23	30

- b. Tablets are to be fastened to the inside top surface of each length of pipe using “Permatex No. 1” no earlier than the day pipe is laid.
- c. Tablets shall not be installed in the pipe and left overnight before laying and shall not be accessible at any time for casual pilferage by the general public or by children. Tablets shall be stored in a hermetically sealed container.
- d. The new water lines are to be slowly filled with water. Air is to be exhausted from each dead end, branch run, hydrant run, and installed service.
- e. Water shall be retained for a period of 24 hours, after which each service, hydrant run, branch run and dead end shall be thoroughly flushed to clear foreign matter and until:
  - i. Residual chlorine concentration is less than 1 part per million
  - ii. Residual chlorine is no greater than the concentration of chlorine in the water supplied for flushing.

**B. Bacteriological Testing:**

- 1. Samples shall be gathered and tests conducted at the expense of the Contractor by a laboratory approved by the District.
- 2. Samples are to be taken at representative points not less than one test per every 500 feet of pipe, plus one test at each end of the pipe; or as required by the District and inspector having jurisdiction.
- 3. The new water lines shall remain isolated and out of service until satisfactory test results have been obtained that:
  - a. All samples shall be tested and show the absence of Coliform Organisms, the presence of free chlorine residual (and shall equal to that of source water). Turbidity, PH and

Heterotrophic Plate Count shall also match that of the source water.

- b. District has accepted the results as indicative of the bacteriological condition of the facilities.
- c. If unsatisfactory or doubtful results are obtained from the initial sampling, repeat the chlorination process until acceptable test results are reported.
- d. Source water shall be that of the campus.

END OF SECTION

## **Section 33 30 00**

# **SANITARY SEWER**

### **PART 1 – GENERAL**

#### **1.1 SUMMARY**

- A. This section describes general requirements, products, and methods of execution relating to on-site sanitary sewerage excluding portions within five feet of buildings unless otherwise noted. Any work within the public right-of-way shall be constructed to the standards of the local sanitation district, which would include one of the following: City of Fairfield; City of Vacaville; Vallejo Sanitation and Flood Control Department; and the State of California Department of Transportation.
  - 1. Sanitary Sewer System, including piping and structures.
- B. Contractor shall provide all labor, equipment, and materials, unless otherwise noted.
- C. Related Sections:
  - 1. Section 31 23 33 – TRENCHING, BACKFILLING, AND COMPACTING.

#### **1.2 SUBMITTALS**

- A. Comply with the requirements of Section SUBMITTAL PROCEDURES.
- B. Product Data: Manufacturer's literature and data, including, where applicable, pressure rating, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:
  - 1. Piping and fittings.
  - 2. Jointing material.
  - 3. Gaskets, couplings, and sleeves.
  - 4. Precast concrete structures, including manholes.
  - 5. Concrete mix design for sanitary structures.
  - 6. Manhole lids and frames.
  - 7. Steps.
  - 8. Pipe to Structure Connection Seal
  - 9. Clean-out boxes.
  - 10. Lift Station Vault.
  - 11. Pump Data.

#### **1.3 QUALITY ASSURANCE**

- A. Comply with the latest editions of the following Standards and Regulations:
  - 1. American Concrete Pipe Association (ACPA).
    - a. ACPA 01-102 (1988) Concrete Pipe Handbook.
    - b. ACPA 01-103 (1995) Concrete Pipe Installation Manual.
  - 2. American National Standards Institute (ANSI).
    - a. ANSI B18.5.2.1M (1981; R 1995) Metric Round Head Short Square Neck Bolts.
  - 3. American Railway Engineering & Maintenance-of-Way Association (AREMA).
    - a. AREMA 1-5 (2001) Pipelines.
  - 4. American Society for Testing and Materials (ASTM).
    - a. A 123/A 123M (2001a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

- b. A 307 (2000) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- c. A 47 (1999) Ferritic Malleable Iron Castings.
- d. A 47M (1990; R 1996) Ferritic Malleable Iron Castings (Metric).
- e. A 48 (1994ae1) Gray Iron Castings.
- f. A 48M (1994e1) Gray Iron Castings (Metric).
- g. A 536 (1984; R 1999e1) Ductile Iron Castings.
- h. A 563 (2000) Carbon and Alloy Steel Nuts.
- i. A 563M (2001) Carbon and Alloy Steel Nuts (Metric).
- j. A 74 (1998) Cast Iron Soil Pipe and Fittings.
- k. A 746 (1999) Ductile Iron Gravity Sewer Pipe.
- l. C 12 (2002) Installing Vitrified Clay Pipe Lines.
- m. C 14 (1999) Concrete Sewer, Storm Drain, and Culvert Pipe.
- n. C 14M (1999) Concrete Sewer, Storm Drain, and Culvert Pipe (Metric).
- o. C 150 (2002) Portland Cement.
- p. C 260 (2001) Air-Entraining Admixtures for Concrete.
- p. C 270 (2001a) Mortar for Unit Masonry.
- q. C 301 (1998) Vitrified Clay Pipe.
- r. C 33 (2001a) Concrete Aggregates.
- s. C 361 (1999) Reinforced Concrete Low-Head Pressure Pipe.
- t. C 361M (1999) Reinforced Concrete Low-Head Pressure (Metric).
- u. C 425 (2002) Compression Joints for Vitrified Clay Pipe and Fittings.
- v. C 443 (2001) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- w. C 443M (2001) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric).
- x. C 478 (1997) Precast Reinforced Concrete Manhole Sections.
- y. C 478M (1997) Precast Reinforced Concrete Manhole Sections (Metric).
- z. C 494 Chemical Admixtures for Concrete.
- aa. C 564 (1997) Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- ab. C 700 (2002) Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
- ac. C 76 (2000) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- ad. C 76M (2000) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric).
- ae. C 828 (2001) Low-Pressure Air Test of Vitrified Clay Pipe Lines.
- af. C 920 (2002) Elastomeric Joint Sealants.
- ag. C 923 (2000) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
- ah. C 923M (1998) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals (Metric).
- ai. C 924 (1989; R 1997) Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
- aj. C 924M (1989; R 1998) Testing Concrete Pipe Sewer Liner by Low-Pressure Air Test Method (Metric).
- ak. C 94 (1994) Ready-Mixed Concrete.
- al. C 94/C 94M (2000e2) Ready-Mixed Concrete.
- am. C 969 (2000) Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
- an. C 969M (2000) Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines (Metric).
- ao. C 972 (2000) Compression-Recovery of Tape Sealant.
- ap. C 990 (2001a) Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealers.

- aq. C 990M (2001a) Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants (Metric).
- ar. D 1784 (1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
- as. D 1785 (1999) Poly(Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120.
- at. D 2235 (2001) Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- au. D 2241 (2000) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- av. D 2321 (2000) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- aw. D 2412 (1996a) Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
- ax. D 2464 (1999) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- ay. D 2466 (2001) Poly(Vinyl Chloride)(PVC) Plastic Pipe Fittings, Schedule 40.
- az. D 2467 (2001) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- ba. D 2680 (2001) Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping.
- bb. D 2751 (1996a) Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- bc. D 2996 (2001) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
- bd. D 2997 (2001) Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
- be. D 3034 (2000) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- bf. D 3139 (1998) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- bg. D 3212 (1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- bh. D 3262 (2002) "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
- bi. D 3350 (2002) Polyethylene Plastics Pipe and Fittings Materials.
- bj. D 3753 (1999) Glass-Fiber-Reinforced Manholes.
- bk. D 3840 (2001) "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Non-pressure Applications.
- bl. D 4101 (2002) Propylene Injection and Extrusion Materials.
- bm. D 412 (1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension.
- bn. D 4161 (2001) "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
- bo. D 624 (2000) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- bp. F 1336 (2002) Poly(Vinyl Chloride) (PVC) Gasketed Sewer Fittings.
- bq. F 402 (1993; R 1999) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.
- br. F 405 (1997) Corrugated Polyethylene (PE) Tubing and Fittings.
- bs. F 477 (1999) Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- bt. F 714 (2001) Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
- bu. F 758 (1995; R 2000) Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage.

- bv. F 794 (1999) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
    - bw. F 894 (1998a) Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.
    - bx. F 949 (2001a) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings.
- 5. ASME International (ASME).
  - a. B1.20.1 (1983; R 2001) Pipe Threads, General Purpose, Inch.
  - b. B16.1 (1998) Cast Iron Pipe Flanges and Flanged Fittings.
  - c. B18.2.2 (1987; R 1999) Square and Hex Nuts.
  - d. B18.5.2.2M (1982; R 2000) Metric Round Head Square Neck Bolts.
- 6. American Water Works Association (AWWA).
  - a. C104 (1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
  - b. C105 (1999) Polyethylene Encasement for Ductile-Iron Pipe Systems.
  - c. C110 (1998) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1219 mm), for Water.
  - d. C111 (2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - e. C115 (1999) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges.
  - f. C151 (1996) Ductile-Iron Pipe, Centrifugally Cast, for Water.
  - g. C153 (2000) Ductile-Iron Compact Fittings for Water Service.
  - h. C302 (1995) Reinforced Concrete Pressure Pipe, Noncylinder Type.
  - i. C600 (1999) Installation of Ductile-Iron Water Mains and Their Appurtenances.
  - j. C606 (1997) Grooved and Shouldered Joints.
  - k. C900 (1997) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution.
  - l. M23 (1980) Manual: PVC Pipe - Design and Installation.
  - m. M9 (1995) Manual: Concrete Pressure Pipe.
- 7. California Department of Transportation (CDT): Standard Specifications:
  - a. Section 55:
  - b. Section 70:
  - c. Section 75:
- 8. Cast Iron Soil Pipe Institute (CISPI).
  - a. 301 (2000) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
  - b. 310 (1997) Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
- 9. Uni-Bell PVC Pipe Association (UBPPA).
  - a. UNI-B-3 (1992) Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nominal Diameters 4-36 Inch).
  - b. UNI-B-6 (1990) Recommended Practice for the Low-Pressure Air Testing of Installed Sewer Pipe.
- 10. City of Fairfield Standard Plans and Specifications.
- 11. City of Vacaville Standard Plans and Specifications.
- 12. Vallejo Sanitation and Flood Control District Standard Plans and Specifications.
- 13. American Association of State Highway and Transportation Officials (AASHTO) for H20 Loading.
- 14. American Concrete Institute (ACI).
- 15. Other authorities having jurisdiction.



- B. System Description: Grades and elevations are to be established with reference to the benchmarks referenced on the Plans.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

##### A. Delivery and Storage

1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

##### B Handling

1. Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. When handling lined pipe, take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench.

### PART 2 – PRODUCTS

#### 2.1 PIPING

- A. Polyvinyl Chloride (PVC) Pipe: PVC pipe conforming to ASTM D3034, SDR 26 with bell-and-spigot type of rubber gasket joints. Bells shall be integral with pipe. Spigot end pipe with separate double hub couplings is not acceptable.
- B. Vitrified Clay Pipe (VCP): VCP and fitting shall conform to ASTM C700, Extra Strength.

#### 2.2 MANHOLES

- A. Manholes shall be pre-cast concrete of the size and shape shown on the Plans and shall conform to Sections 70-1.02H of the CDT Standard Specifications and to ASTM C478. Equivalent poured-in-place structures may be used at the Contractor's option. Concrete shall consist of Caltrans Type I/II cement.
- B. Frames and covers shall be cast iron conforming to Section 55-2.03 and 75-1.02 of the CDT Standard Specifications. Manhole covers shall have the words "SANITARY SEWER" in letters not less than 2 inches cast into the cover. The clear opening for all manhole covers shall be 24 inches.
- C. All interior concrete surfaces shall be coated with "Xypex Crystalline" or approved equivalent. Use of a water-resistant admix is acceptable, at contractor option.
- D. Frames and lids for manholes shall be match-marked in pairs before delivery to the job site. The lids shall fit into their frames without rocking.
- E. Reinforcing Bars: Reinforcing bars shall be of intermediate grade billet steel conforming to ASTM A615 and shall be of the size shown on the Standard Details or in the Plans. Bars shall be of the round deformed type, free from injurious seams, flaws, or cracks, and shall be cleaned of all rust, dirt, grease and loose scales.

- F. Portland Cement Concrete: Concrete for manhole bases, inlets, and other concrete structures shall conform to the requirements of CDT Section 90 and as herein specified. The concrete shall be Class "A" containing six (6) sacks of Portland Cement per cubic yard of concrete. The grading of the combined aggregate shall conform with the CDT requirements of the three-quarter inch maximum. The consistency of the fresh aggregate shall be such that the slump does not exceed four inches, as determined by Test Method No. Calif. 520. The concrete shall have a minimum design compressive strength of 3,000 psi after 28 days.

### 2.3 CLEAN-OUTS

- A. Where cleanouts are located in landscaping, a box shall be provided for each clean-out. Boxes shall be pre-cast concrete with cast iron frame and cover marked "SAN SEWER"; Christy G5 with G5C lid or approved equivalent. Where cleanouts are in hardscape, minimize the aesthetic impact of the cleanout by eliminating the concrete box (cleanout cover flush with hardscape).

### 2.4 PIPE TO STRUCTURE CONNECTOR/SEAL

- A. A flexible pipe to manhole connector shall be used for all pipe penetrations to pre-cast and/or cast-in-place concrete structures.
1. The seal shall provide a flexible, positive, watertight connection between pipe and concrete wastewater structures. The connector shall assure that a seal is made between (1) the connector and the structure wall, and (2) between the connector and the pipe. The seal between the connector and the manhole wall shall be made by casting the connector integrally with the structure wall during the manufacturing process in such a manner that it will not pull out during coupling. The seal between connector and pipe will be made by way of a stainless steel take down band compressing the gasket against the outside diameter of the pipe.
 

The connector shall be molded from materials whose physical/chemical properties meet or exceed the physical/chemical resistant properties outlined in ASTM C-923. The connector and stainless steel hardware shall meet or exceed the performance requirements proscribed in ASTM C-923.

The connector shall be of size specifically designed for the pipe material being used and shall be installed in accordance with recommendations of the manufacturer.
  2. Connectors shall be Z-LOK or G3 connectors manufactured by A-LOK Products Inc. or approved equivalent.

## PART 3 – EXECUTION

### 3.1 PIPE INSTALLATION

- A. Pipe shall be installed in conformance with Section 31 23 33 – TRENCHING, BACKFILLING AND COMPACTING, and manufacturer's recommendations.
- B. Pipe laying:
1. No pipe shall be laid until the Geotechnical Project Manager inspects and approves the conditions of the bottom of the trench.
  2. Pipe laying shall proceed "up grade" with the spigot section of the bell-and-spigot pipe pointing in the direction of the flow.

3. Each section of pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line.
4. Pipe shall not be laid when the condition of the trench or the weather is unsuitable.

C. Debris Control:

1. The interior of the sewer pipe shall be kept clean of dirt and debris at all times. When work is not in progress, open ends of pipe and fittings shall be plugged.
2. Where clearing after laying is difficult because of small pipe size, a suitable swab or squeegee shall be kept in the pipe and bulled forward past every joint immediately after joining has been completed.

### 3.2 POURED-IN-PLACE CONCRETE

- A. Concrete shall be mixed in accordance with applicable provisions of Section 90 of the CDT Standard Specifications.
- B. Construction of concrete structures shall conform to applicable provisions of Section 51 of the CDT Standards Specifications. Unless otherwise noted herein or in the Plans, exposed surfaces of structures shall be Class 1 surface finish.
- C. Curing shall conform to applicable portions in Section 90 of CDT Standard Specifications. No pigment shall be used in curing compounds. All work shall be subject to inspection. No concrete shall be placed until the Project Manager has approved the forms and reinforcement.
- D. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

### 3.3 PIPELINE AIR TESTING AND FLUSHING

- A. All new sections of sanitary sewer shall be tested using the following procedures:
  1. Test is conducted between two consecutive manholes, or as directed by the Project Manager.
  2. The test section of the sewer shall be plugged at each end. One of the plugs used at the manhole shall be tapped and equipped for the air inlet connection for filling the line from an air compressor.
  3. All service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged and carefully braced against the internal pressure to prevent air leakage by slippage and blowout.
  4. Connect air hose to tapped plug selected for the air inlet. Connect the other end of the air hose to the portable air control equipment, which consists of valves and pressure gauges used to control the air entry rate into the sewer test section, and to monitor the air pressure in the pipeline. More specifically, the air control equipment includes a shut-off valve, pressure regulating valve, pressure reduction valve, and a monitoring pressure gauge having a pressure range from 0-5 psi. The gauge shall have minimum divisions of 0.10 psi and an accuracy of 0.40 psi.
  5. Connect another air hose between the air compressor (or other source of compressed air) and the air control equipment. This completes the test equipment set-up. Test operations may commence.
  6. Supply air to the test section slowly, filling the pipeline until a constant pressure of 3.5 psig is maintained. The air pressure must be regulated to prevent the pressure inside the pipe from exceeding 5.0 psig.
  7. When constant pressure of 3.5 psig is reached, throttle the air supply to maintain the internal pressure above 3.0 psig for at least 5 minutes. This time permits the

temperature of the entering air to equalize with the temperature of the pipe wall. During this stabilization period, it is advisable to check all capped and plugged fittings with a soap solution to detect any leakage at these connections. If leakage is detected at any cap plug, release the pressure in the line and tighten all leaky caps and plugs. Start the test operation again by supplying air. When it is necessary to bleed off the air to tighten or repair a faulty plug, a new 5-minute interval must be allowed after the pipeline has been refilled.

8. After the stabilization period, adjust the air pressure to 3.5 psig and shut-off or disconnect the air supply. Observe the gauge until the air pressure reached 3.0 psig. At 3.0 psig, commence timing with a stopwatch until the pressure drops to 2.5 psig, at which time the stop watch is stopped. The time required, as shown on the stopwatch, for a pressure loss of 0.5 psig is used to compute the air loss.
9. If the time, in minutes and seconds, for the air pressure drop from 3.0 to 2.5 psi is greater than that shown in the following table for the designated pipe size, the section undergoing test shall have passed and shall be presumed to be free of defects. The test may be discontinued at any time.
10. If the time, in minutes and seconds, for the 0.5 psig drop is less than that shown in the following table for the designated pipe size, the section of the pipe shall not have passed the test; therefore, adequate repairs must be made and the line retested.

Requirements for Air Testing

Pipe Size (in inches)	Time	
	Minutes	Seconds
4	2	32
6	3	50
8	5	6
10	6	22
12	7	39
14	8	56
15	9	35
16	10	12
18	11	34
20	12	30

(For larger diameter pipe use the following: Minimum time in seconds = 462 X pipe diameter in feet).

11. For 8 inch and smaller pipe, only: if, during the 5 minute saturation period, pressure drops less than 0.5 psig after the initial pressurization and air is not added, the pipe section undergoing test shall have passed.
12. Multi-pipe sizes: when the sewer line undergoing test is 8 inch or larger diameter pipe and includes 4 inch or 6 inch laterals, the figures in the table for uniform sewer main sizes will not give reliable or accurate criteria for the test. Where multi-pipe sizes are to undergo the air test, the Project Manager can compute the “average” size in inches which is then multiplied by 38.2 seconds. The results will give the minimum time in seconds acceptable for a pressure drop of 0.5 psig for the “averaged” diameter pipe.
13. Adjustment Required for Groundwater:
  - a. An air pressure correction is required when the ground water table is above the sewer line being tested. Under this condition, the air test pressure must be increased .433 psi for each foot the ground water level is above the invert of the pipe.
  - b. Where ground water is encountered or is anticipated to be above the sewer pipe before the air testing will be conducted, the following procedure shall be implemented at the time the sewer main and manholes are constructed.
    - i. Install a ½ inch diameter pipe nipple (threaded one or both ends, approximately 10 inch long) through the manhole wall directly on top of one of the sewer pipes entering the manhole with threaded end of nipple extending inside the manhole.

- ii. Seal pipe nipple with a threaded ½ inch cap.
- iii. Immediately before air testing, determine the ground water level by removing the threaded cap from the nipple, blowing air through the pipe nipple to remove any obstruction, and then connecting a clear plastic tube to the pipe nipple.
- iv. Hold plastic tube vertically permitting water to rise in it to the groundwater level.
- v. After water level has stabilized in plastic tube, measure vertical height of water, in feet, above invert of sewer pipe.
- vi. Determine air pressure correction, which must be added to the 3.0 psig normal starting pressure of test, by dividing the vertical height in feet by 2.31. The result gives the air pressure correction in pounds per square inch to be added.

Example: if the vertical height of water from the sewer invert to the top of the water column measures 11.55 feet, the additional air pressure required would be:

$$\frac{(11.55)}{(2.31)} = 5.0 \text{ psig}$$

Therefore, the starting pressure of the test would be 3.0 plus 5 or 8.0 psig, and the ½ pound drop becomes 7.5 psig. There is no change in the allowable drop (0.5 psig) or in the time requirements established for the basic air test.

- B. After the line has passed the air test, it shall be balled and flushed with water to clean. A metal screen shall be used downstream at the point of connection to the existing system to collect and remove any rock or other debris that is flushed out during cleaning.

### 3.4 DEFLECTION TESTING

- A. Upon completion of work, perform a deflection test on entire length of installed plastic pipeline. Completed work includes superimposed loads adjacent to and over the pipeline, such as compacted backfill and earthwork, and does not include paving, concrete curbs and gutters, sidewalks, walkways, and landscaping.
- B. Under external loads, deflection of pipe in the installed pipeline shall not exceed 4.5 percent of the average inside diameter of pipe.
- C. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.
- D. Pull-Through Device:
  - 1. Provide a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft.
    - a. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section.
    - b. Pull-through device may also be of a design approved by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device.
  - 2. Ball, cylinder, or circular sections shall conform to the following:
    - a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
    - b. A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.

- c. Center bored and through bolted with a ¼ inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
  - d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
3. Pull-Through Device:
- a. Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water.
  - b. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions as specified.
- E. Deflection measuring Device:
- 1. Sensitive to 1.0 percent of the diameter of the pipe being tested and accurate to 1.0 percent of the indicated dimension.
  - 2. Obtain approval of deflection measuring device prior to use.
- F. Deflection Measuring Device Procedure:
- 1. Measure deflections through each run of installed pipe.
  - 2. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction.
  - 3. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, remove pipe which has excessive deflections, replace with new pipe, and completely retest in same manner and under same conditions.
- G. Warranty Period Test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of 1 year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection.

### 3.5 CLEANING

- A. Thoroughly clean storm drain lines, manholes, catch basins, field inlets, culverts, and similar structures, of dirt, debris, and obstructions of any kind.

### 3.6 TELEVISION INSPECTION

- A. After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the sewer line shall be televised with a color closed-circuit television with tilt-head camera recorded in VHS format. The original videotape and log sheets shall be provided to the Project Manager for review.
  - 1. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to placement of pavement:
    - a. Low spot (1 inch or greater - mainlines only).
    - b. Joint separations (¾ inch or greater opening between pipe sections).
    - c. Cocked joints present in straight runs or on the wrong side of pipe curves.
    - d. Chips in pipe ends.
    - e. Cracked or damaged pipe.
    - f. Dropped joints.
    - g. Infiltration.
    - h. Debris or other foreign objects.
    - i. Other obvious deficiencies.

- j. Irregular condition without logical explanation

End of Document

## Section 33 40 00 STORM DRAINAGE

### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to on-site storm drainage excluding portions within five feet of buildings unless otherwise noted. Any work within the public right-of-way shall be constructed to the standards of the local Jurisdiction, which would include one of the following: City of Fairfield; City of Vacaville; City of Vallejo; and the State of California Department of Transportation.
- B. State of California Department of Transportation.
  - 1. Storm drain piping.
  - 2. Storm drain structures including curb inlets, catch basins, area drains, and manholes.
  - 3. Storm drain outfalls.
  - 4. Culverts and headwalls.
  - 5. Storm drain pump station.
- C. Contractor shall provide all labor, equipment, and materials, unless otherwise noted.
- D. Related Sections:
  - 1. Section 02315 – TRENCHING, BACKFILLING, AND COMPACTING.

#### 1.2 SUBMITTALS

- A. Comply with the requirements of Section 01330 – SUBMITTAL PROCEDURES.
- B. Product Data: Manufacturer's literature and data, including, where applicable, pressure rating, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:
  - 1. Piping and fittings.
  - 2. Jointing material.
  - 3. Gaskets, couplings, and sleeves.
  - 4. Precast concrete structures, including manholes and drainage inlets.
  - 5. Concrete mix design for precast and cast-in-place structures.
  - 6. Manhole lids and frames.
  - 7. Manhole steps.
  - 8. Pipe to Structure Connection Seal
  - 9. Drainage inlet and area drain grates and frames.
  - 10. Pump station vaults.
  - 11. Pump data.

#### 1.3 QUALITY ASSURANCE

- A. Comply with the latest editions of the following Standards and Regulations:
  - 1. American Society for Testing and Materials (ASTM).
    - a. A74: Cast Iron Soil Pipe and Fittings.
    - b. A615: Deformed and Plain Billet-Steel Bars for Reinforcement.
    - c. B32: Solder Metal.
    - d. C76: Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.



- e. C150: Portland Cement.
  - f. C478: Precast Reinforced Concrete Manhole Sections.
  - g. C494: Chemical Admixtures for Concrete.
  - h. C920-02: Elastomeric Joint Sealants.
  - i. D2241-00: Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
  - j. D2680-01 Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
  - k. D2729: Perforated PVC Drain Pipe.
  - l. D3034-00: Type PSM Polyvinyl Chloride (PVC) Sewer pipe and Fittings.
  - m. F1336-02: Poly(Vinyl Chloride) (PVC) Gasketed Sewer Fittings.
2. California Department of Transportation (CDT): Standard Specifications:
    - a. Section 51: Concrete Structures
    - b. Section 52: Reinforcement
    - c. Section 55: Steel Structures
    - d. Section 66: Corrugated Facilities
    - e. Section 70: Miscellaneous Metal
    - f. Section 72: Slope Protection
    - g. Section 75: Miscellaneous Metal
    - h. Section 90: Portland Cement Concrete
  3. City of Fairfield Standard Plans and Specifications.
  4. City of Vacaville Standard Plans and Specifications.
  5. City of Vallejo Standard Plans and Specifications.
  6. American Association of State Highway and Transportation Officials (AASHTO) for H20 Loading.
  7. American Concrete Institute (ACI).
  8. Other authorities having jurisdiction.

- B. System Description: Grades and elevations are to be established with reference to the benchmarks referenced on the Plans.

## **PART 2 – PRODUCTS**

### **2.1 PIPING**

- A. Polyvinyl Chloride (PVC) Pipe: PVC pipe conforming to ASTM D3034, SDR 35 with bell-and-spigot type of rubber gasket joints. Bells shall be integral with pipe. Spigot end pipe with separate double hub couplings is not acceptable.
- B. Reinforced Concrete Pipe (RCP): RCP shall conform to ASTM C76 with tongue-and-groove or bell-and-spigot joints. Unless indicated otherwise on the plans, all reinforced concrete pipe shall be Class III, 1350-D pipe.
- C. High-Density Polyethylene (HDPE) Pipe: HDPE pipe conforming to ASTM D3212, or ASTM 1417 for pipe sizes four inch - 60 inch (ADS N-12 1B WT pipe or equivalent).

### **2.2 MANHOLES**

- A. Manholes shall be pre-cast concrete of the size and shape shown on the Drawings and shall conform to Sections 70-1.02H of the CDT Standard Specifications and to ASTM C478. Equivalent poured-in-place structures may be used at the Contractor's option. Concrete shall consist of Caltrans Type I/II cement.
- B. Frames and covers shall be cast iron conforming to Section 55-2.03 and 75-1.02 of the CDT Standard Specifications. Manhole covers shall have the words "STORM DRAIN" in letters not less than 2-inches cast into the cover. The clear opening for all manhole covers shall be 24 inches.

- C. All interior concrete surfaces shall be coated with “Xypex Crystalline” or equal. Use of a water-resistant admix is acceptable, at Contractor option.
- D. Frames and grates for manholes and catch basins shall be match-marked in pairs before delivery to the job site. The grates shall fit into their frames without rocking. Grates shall have a maximum opening of one-half inch between bars, unless otherwise noted in the Plans.
- E. Reinforcing Bars: Reinforcing bars shall be of intermediate grade billet steel conforming to ASTM A615 and shall be of the size shown on the Standard Details or in the Drawings. Bars shall be of the round deformed type, free from injurious seams, flaws, or cracks, and shall be cleaned of all rust, dirt, grease and loose scales.
- F. Portland Cement Concrete: Concrete for manhole bases, inlets, and other concrete structures shall conform to the requirements of CDT Section 90 and as herein specified. The concrete shall be Class “2” containing at least six (6) sacks of Portland Cement per cubic yard of concrete. The grading of the combined aggregate shall conform with the CDT requirements of the three-quarter inch maximum. The consistency of the fresh aggregate shall be such that the slump does not exceed four inches, as determined by Test Method No. Calif. 520. The concrete shall have a minimum design compressive strength of 3,000 psi after 28 days.

### 2.3 PIPE TO STRUCTURE CONNECTOR/SEAL

- A. A flexible pipe to manhole connector shall be used for all pipe penetrations and/or cast-in-place concrete structures.
  - 1. The seal shall provide a flexible, positive, watertight connection between pipe and concrete wastewater structures. The connector shall assure that a seal is made between (1) the connector and the structure wall, and (2) between the connector and the pipe. The seal between the connector and the manhole wall shall be made by casting the connector integrally with the structure wall during the manufacturing process in such a manner that it will not pull out during coupling. The seal between connector and pipe will be made by way of a stainless steel take down band compressing the gasket against the outside diameter of the pipe.
    - a. The connector shall be molded from materials whose physical/chemical properties meet or exceed the physical/chemical resistant properties outlined in ASTM C-923. The connector and stainless steel hardware shall meet or exceed the performance requirements proscribed in ASTM C-923.
    - b. The connector shall be of size specifically designed for the pipe material being used and shall be installed in accordance with recommendations of the manufacturer.
  - 2. Connectors shall be Z-LOK or G3 connectors manufactured by A-LOK Products Inc. or approved equivalent.

### 2.4 AREA DRAINS

- A. Grate and Riser: Area drain shall be ADS model 2718 AG or approved equal. Riser shall be constructed of 6-inch PVC SDR 35 piping per paragraph 2.1(A) of this section and connected to area drain by a gasket joint. Riser shall be vertical except as otherwise noted in the plans. Riser may include a reducer if necessary to make connection to the storm drain line.

- B. Elevation and Grading: Area Drain rim elevation shall be set and area around area drain shall be graded to drain away from any adjacent structures, walks, or roadways and towards area drain.

## **2.5 CLEAN-OUTS**

- A. A valve box shall be provided for each clean-out. Boxes shall be pre-cast concrete with cast iron frame and cover marked "STORM DRAIN"; Christy G5 with G5C lid or approved equivalent.

## **2.6 CULVERT AND OUTFALL HEADWALLS**

- A. All headwalls shall be constructed in conformance with CDT Standard Plans as indicated.

## **PART 3 – EXECUTION**

### **3.1 PIPE INSTALLATION**

- A. Pipe shall be installed in conformance with Section 02315, and manufacturer's recommendations.
- B. Pipe laying:
  - 1. No pipe shall be laid until the Geotechnical Engineer inspects and approves the conditions of the bottom of the trench.
  - 2. Pipe laying shall proceed "up grade" with the spigot section of the bell-and-spigot pipe pointing in the direction of the flow.
  - 3. Each section of pipe shall be laid true to line and grade and in such a manner as to form an close concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line.
  - 4. Pipe shall not be laid when the condition of the trench or the weather is unsuitable.
- C. Debris Control:
  - 1. The interior of the storm pipe shall be kept clean of dirt and debris at all times. When work is not in progress, open ends of pipe and fittings shall be plugged.
  - 2. Where clearing after laying is difficult because of small pipe size, a suitable swab or squeegee shall be kept in the pipe and pulled forward past every joint immediately after joining has been completed.

### **3.2 POURED-IN-PLACE CONCRETE**

- A. Concrete shall be mixed in accordance with applicable provisions of Section 90 of the CDT Standard Specifications. Concrete shall consist of Type I/II cement.
- B. Construction of concrete structures shall conform to applicable provisions of Section 51 of the CDT Standards Specifications. Unless otherwise noted herein or in the Drawings, exposed surfaces of structures shall be Class 1 surface finish.
- C. Curing shall conform to applicable portions in Section 90 of CDT Standard Specifications. No pigment shall be used in curing compounds. All work shall be subject to inspection. No concrete shall be placed until the Project Manager has approved the forms and reinforcement.

- D. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

### 3.3 PIPELINE FLUSHING

- A. Newly constructed storm drain pipes shall be flushed with water to clean. A metal screen shall be used to collect and remove any rock, silt and other debris that is flushed out during cleaning.

### 3.4 DEFLECTION TESTING

- A. Upon completion of work, perform a deflection test on entire length of installed plastic pipeline. Completed work includes superimposed loads adjacent to and over the pipeline, such as compacted backfill and earthwork, and does not include paving, concrete curbs and gutters, sidewalks, walkways, and landscaping.
- B. Under external loads, deflection of pipe in the installed pipeline shall not exceed 4.5 percent of the average inside diameter of pipe.
- C. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.
- D. Pull-Through Device:
  - 1. Provide a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft.
    - a. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section.
    - b. Pull-through device may also be of a design approved by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device.
  - 2. Ball, cylinder, or circular sections shall conform to the following:
    - a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
    - b. A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.
    - c. Center bored and through bolted with a ¼ inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
    - d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
  - 3. Pull-Through Device:
    - a. Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water.
    - b. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions as specified.
- E. Deflection measuring Device:
  - 1. Sensitive to 1.0 percent of the diameter of the pipe being tested and accurate to 1.0 percent of the indicated dimension.

2. Obtain approval of deflection measuring device prior to use.

F. Deflection Measuring Device Procedure:

1. Measure deflections through each run of installed pipe.
2. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction.
3. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, remove pipe which has excessive deflections, replace with new pipe, and completely retest in same manner and under same conditions.

- G. Warranty Period Test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of 1 year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection.

### 3.5 CLEANING

- A. Thoroughly clean storm drain lines, manholes, catch basins, field inlets, culverts, and similar structures, of dirt, debris, and obstructions of any kind.

### 3.6 TELEVISION INSPECTION

- A. After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the storm drainage line shall be televised with a color closed-circuit television with tilt-head camera recorded in VHS format. The original videotape and log sheets shall be provided to the District.
1. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to placement of pavement:
    - a. Low spot (1 inch or greater - mainlines only).
    - b. Joint separations (3/4 inch or greater opening between pipe sections).
    - c. Cocked joints present in straight runs or on the wrong side of pipe curves.
    - d. Chips in pipe ends.
    - e. Cracked or damaged pipe.
    - f. Dropped joints.
    - g. Infiltration.
    - h. Debris or other foreign objects.
    - i. Other obvious deficiencies.
    - j. Irregular condition without logical explanation.

End of Document

## **Section 33 50 00**

# **NATURAL GAS DISTRIBUTION PIPING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This section describes general requirements, products, and methods of execution relating to on-site natural gas piping serving all buildings and structures. Unless otherwise noted, this section does not apply to natural gas systems, equipment and appurtenances, inside and within 5 feet of buildings.
- B. Contractor shall provide all labor, equipment, materials, and testing services unless otherwise noted.
- C. Related Sections:
  - 1. Section 31 23 33 – TRENCHING, BACKFILLING AND COMPACTING

#### **1.2 SUBMITTALS**

- A. Comply with requirements of Section SUBMITTAL PROCEDURES.
- B. Product Data: Manufacturer's literature and data, including, where applicable, sizes, pressure rating, rated capacity, listing/approval stamps, labels, or other markings made to the specified standards, for the following:
  - 1. Piping and fittings.
  - 2. Gaskets, couplings, sleeves, and assembly bolts and nuts.
  - 3. Gate valves and ball valves.
  - 4. Valve boxes, frames and covers.
  - 5. Meter boxes, frames and covers.
  - 6. Tapping sleeves and tapping valves.
  - 7. Service saddles and corporation stops.
  - 8. Identification materials and devices.
- C. Shop Plans and Calculations: None required.
- D. Test Reports: Provide as necessary.

#### **1.3 QUALITY ASSURANCE**

- A. Comply with the latest edition of the following Standards and Regulations:
  - 1. Pacific Gas & Electric Company Standard Specifications and Plans.
  - 2. State of California Public Utilities Commission Requirements.
  - 3. American Society of Testing and Materials (ASTM).
    - a. ASTM D2513 Thermoplastic Gas Pressure Pipe, Tubing and Fittings.
    - b. ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
    - c. ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
    - d. ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

- e. ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
  - f. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  - g. ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.
  - h. ASTM F1056 Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings.
  - i. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - j. ASTM A795 Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
  - k. ASTM A865 Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints.
  - l. ASTM B88 Standard Specification for Seamless Copper Water Tube.
  - 4. Plastics Pipe Institute (PPI)
    - a. Underground Installation of Polyethylene Pipe.
    - b. Polyethylene Joining Procedures.
    - c. Inspections, Test and Safety Considerations.
  - 5. American Association of State Highway and Transportation Officials (AASHTO) for H20 Loading
  - 6. American Concrete Institute (ACI)
    - a. ACI 348 - Meter Pit Construction
  - 7. Other authorities having jurisdiction.
- B. System Description: Grades and elevations are to be established with benchmarks referenced on Plans.
- C. All testing of systems specified in this section shall be witnessed by representatives of the inspector or local authority. Provide at least 7 days notice.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Piping:
  - 1. Schedule 40 steel pipes, with malleable iron fittings.
    - a. Maximum service pressure of pipe shall be 125 psi.
    - b. Maximum service temperature of pipe shall be 250 degrees F.
    - c. Provide Teflon® tape pipe joint compound as sealant on all pipe threads.
  - 2. Polyethylene 2406 piping, with PE fittings.
- B. Protective Coating for Underground Steel Pipe: Provide extruded polyethylene sheath, manufactured by Amstead "Plexco."
  - 1. Provide yellow color Federal Specification L-C-530.
  - 2. Provide sealed fittings and couplings sealed using heat-cured sheath shrunk in place, Raychem "Thermofit" sleeves.
- C. Provide shutoff valve at the point of connection where the new gas service connects to the existing underground service stub.
- D. Valve Box: For each valve, provide concrete boxes as specified in Section 02510, WATER SYSTEMS, except that cover shall have cash letters reading "Gas".

- E. Valves: Provide UL approved and listed ball valves with threaded ends and level handle.
  - 1. Acceptable manufacturers: Worcester "Econo-Miser" or Hills-McCanna.
  - 2. Equivalent products will be considered when submitted in accordance with "Substitutions" as specified in Section 01600 - PRODUCT REQUIREMENTS.
- F. Provide 2-inch wide yellow warning tape reading "Caution Medium Pressure Gas Buried Below".

## 2.2 MATERIALS

- A. Polyethylene (PE) Pipe: All plastic pipe installed shall be medium density PE 2406 TR-418 "GAS" pipe manufactured in accordance with the latest listed edition of ASTM D-2513. All pipes will be supplied in straight 40 feet lengths. All PE-to-PE connections shall be Butt Fusion Type made in the presence of a qualified inspector.
- B. Polyethylene (PE) Fittings: All plastic fittings shall be medium density PE 2406, TR-418 "GAS" fittings manufactured in accordance with the latest listed edition of ASTM D-2513 and ASTM D-3261. All fittings shall have Butt End outlets.
- C. Polyethylene (PE) Valves: All plastic valves shall be medium density PE 2406, TR-418 "GAS" valves manufactured in accordance with the latest listed edition of ASTM D-2513 and ASTM D-3261. All valves shall have Butt End outlets.
- D. Pipe Scratches or Cuts: Pipe that has scratches, notches, cuts or any other abrasions that exceed 10% of the pipe wall thickness shall not be used on the project and shall be disposed of. The Contractor shall inspect all pipes and reject any pipe that has scratches exceeding 10% of the pipe wall thickness. The Contractor will be responsible for the cost of all defective or damaged pipe that he accepts, costs will be deducted from payments. The Contractor shall use pipe stands, spooling devices, or other means to avoid damaging the pipe during installation. The Contractor shall observe the pipe during installation for scratches, gouges or other defects. If defects are present, the Contractor shall remove and discard the damaged section of pipe.
- E. Minimum Bending Radius: The minimum bend radius for plastic pipe is twenty times the outer diameter. The Contractor shall not bend plastic pipe to a radius less than twenty times the outside diameter of the pipe. Fittings shall not be installed in pipe that is bent or curved to conform to trench dimensions.
- F. Tracer Wire: Tracer wire shall be attached to the pipe with all non-metallic electric tape at intervals not exceeding 3 feet. All connections between tracer wires shall be made with the split bolt connectors and wrapped with electric tape. See Section 02315 for specifications of tracer wire.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces of site and work area for suitable conditions where gas service is to be installed.
- B. Do not begin installation until unsatisfactory conditions have been corrected.



**3.2 ABANDONMENT OF EXISTING UNDERGROUND PIPE**

- A. Existing gas pipe to be abandoned in place shall be capped at each end, evacuated of all natural gas, pressure tested per section 2.4B, and pressurized with nitrogen gas to a pressure not less than 5 PSIG.

**3.3 INSTALLATION**

- A. Provide protective covers having an extruded polyvinyl chloride outer coating for underground pipe and fittings.
  - 1. Provide "Thermofit" fitting sleeves shrunk in place over joints and fittings after welding and testing of piping.
  - 2. As an option, provide 2-layer wrap of 3M No. 53, 10-mil thickness tape.
- B. Depth of Cover for Underground Piping: 2-foot, 6-inches minimum.
- C. Sand Encasement:
  - 1. For protective-coated pipe, provide 3-inch minimum thickness of clean, washed and graded building sand.
  - 2. Apply after all coatings have been finished.
- D. Installation shall conform to ANSI B31.8.
- E. Location of Service Piping: Service pipe shall enter building wall in areaway or above ground.
- F. Provide backfill and compaction of trenches as specified in Section 02300 - EARTHWORK AND GRADING.

**3.4 FIELD QUALITY CONTROL**

- A. Blowing Out Piping:
  - 1. Blow out piping with air immediately prior to pressure testing.
  - 2. The flow shall be a velocity of at least 100 feet per second.
  - 3. Blow out piping for at least 20 minutes and continue until the effluent is clear and contains no visible particulate matter.
- B. Field Tests:
  - 1. Tests shall conform to requirements in ANSI B31.8; conduct tests prior to backfilling.
  - 2. Air pressure test shall be at a pressure of 100 psig, duration 30 minutes minimum.
  - 3. The Inspector of Record shall witness all field tests.
  - 4. Conduct tests, providing labor, equipment and incidentals required for testing. If any failure occurs during testing, provide replacements as directed by the Project Manager and repeat tests until satisfactory installation and operation are achieved.
- C. May conduct and provide report of 12,000V Tinker Riser Test.

End of Document




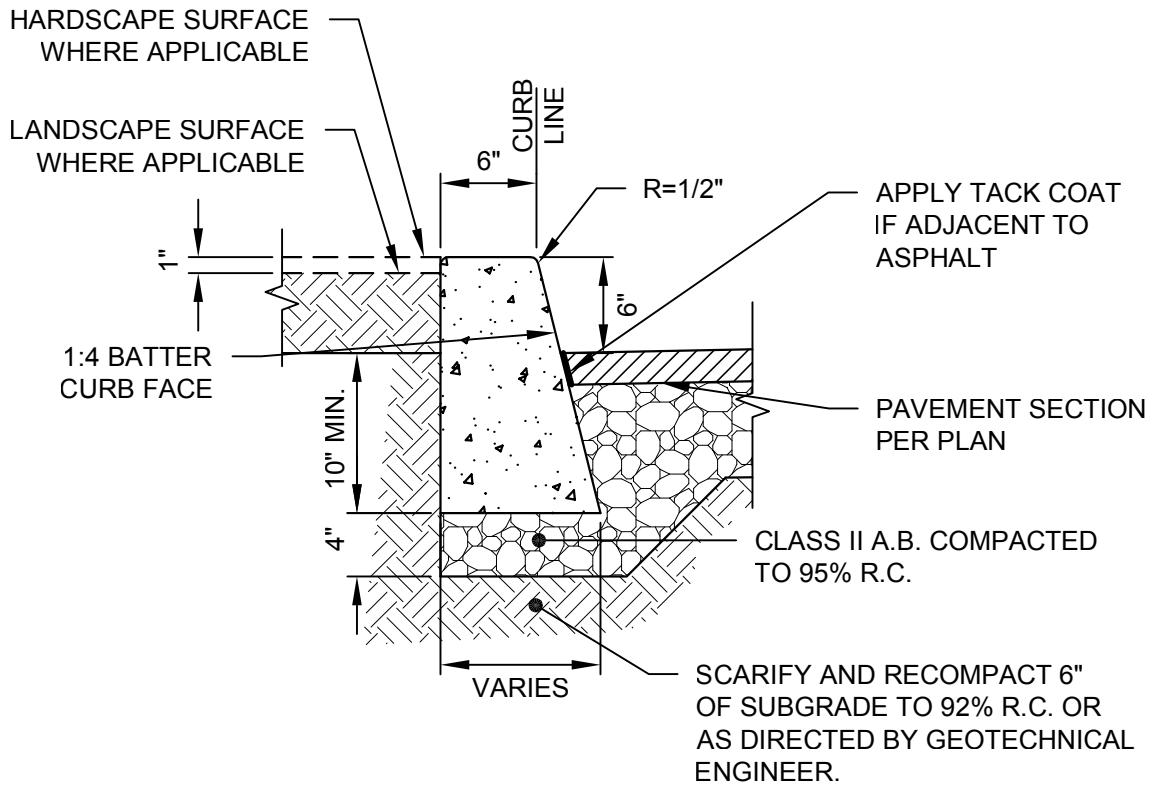
# STANDARD DETAILS FOR SITE CONSTRUCTION



**ADOPTED JANUARY, 2014**


<u>TITLE</u>	<u>DWG. NO.</u>	<u>TITLE</u>	<u>DWG. NO.</u>
<u>STREETS AND HARDSCAPES</u>		<u>ELECTRICAL</u>	
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CURB AND GUTTER	105	CAST IN PLACE LIGHTING FOUNDATION	405
PEDESTRIAN SIDEWALK	110	IDENTIFICATION OF STREET LIGHT LUMINAIRES	410
CONCRETE VEHICULAR PAVEMENT	115	PULL BOXES	415
CONCRETE VALLEY GUTTER	120	SPLICE DETAILS	420
DRIVEWAY APPROACH	125	SPLICE NOTES	425
ASPHALT PAVEMENT CONFORM	130	<u>MISCELLANEOUS</u>	
ASPHALT PAVEMENT EDGE DETAIL	135	CHAIN LINK FENCE	500
ASPHALT PAVEMENT REPAIR DETAIL	140		
<u>SANITARY SEWER AND STORM DRAINAGE</u>			
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SIDEWALK UNDERDRAIN	220		
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<u>WATER</u>			
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DETECTOR CHECK VALVE	315		
DOUBLE CHECK DETECTOR ASSEMBLY	320		
DOUBLE CHECK VALVE	325		
REDUCED PRESSURE BACKFLOW DEVICE	330		
HORIZONTAL THRUST BLOCKS	335		
VERTICAL THRUST BLOCKS	340		

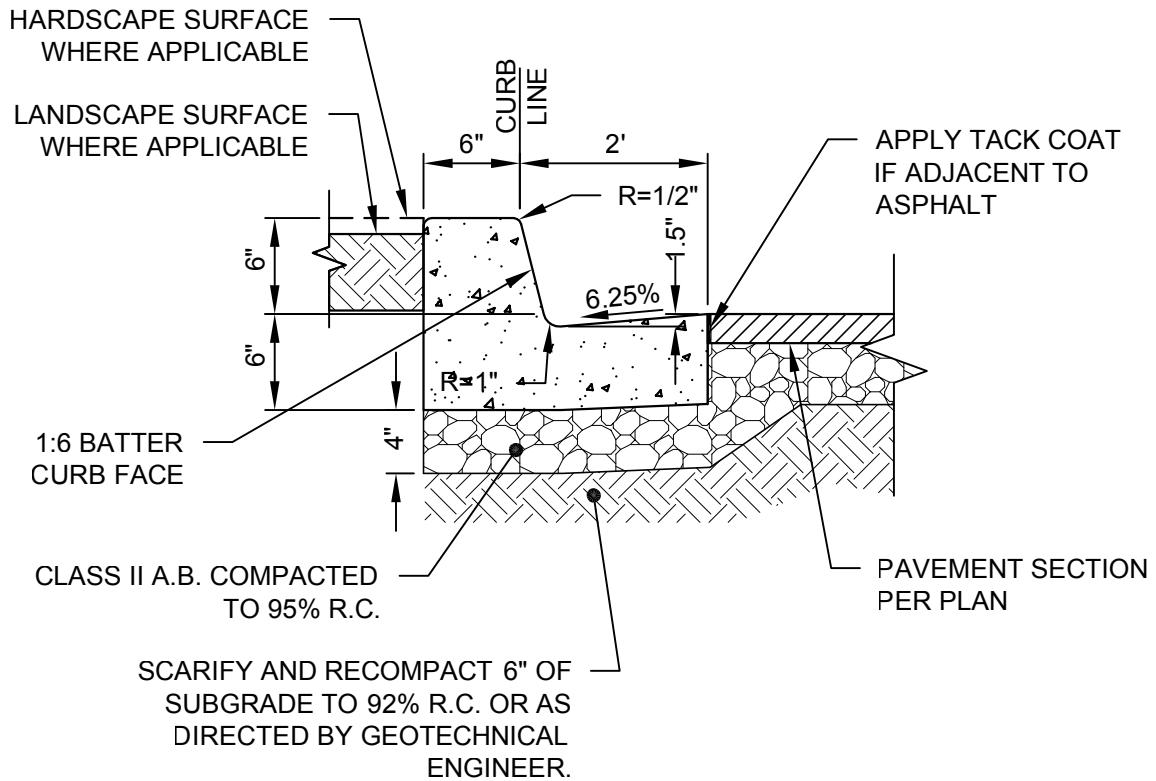
		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS	TABLE OF CONTENTS	
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**NOTES:**


1. WHERE CONCRETE WALK IS ADJACENT TO CURB, PROVIDE ISOLATION JOINT BETWEEN WALK AND BACK OF CURB.
2. CONTROL JOINTS CONSISTING OF 1" DEEP SCORES SHALL BE PLACED AT 10' INTERVALS O.C. - ALL SIDES EXCEPT BOTTOM.
3. WHERE WALK IS ADJACENT TO CURB, THE JOINTS SHALL ALIGN WITH THE JOINTS IN THE CURB.

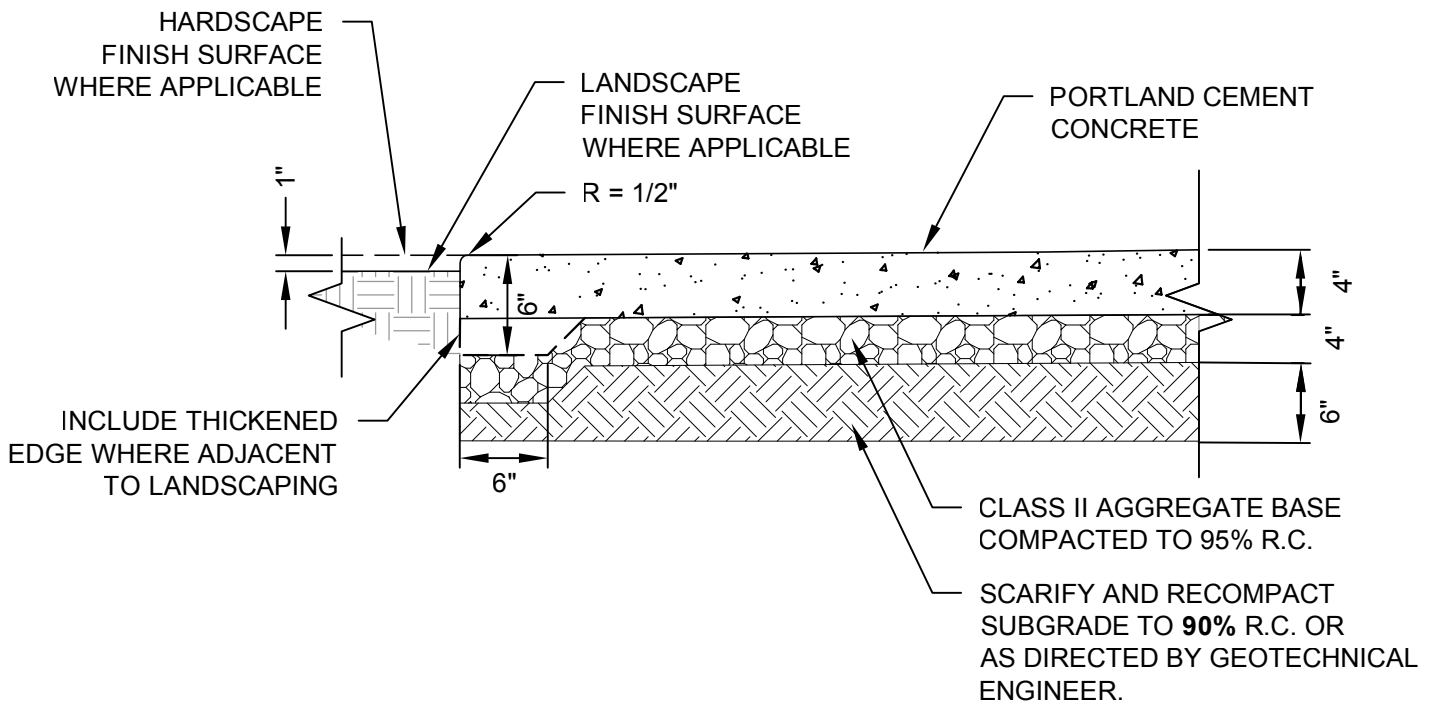
		 <p><b>SOLANO</b> COMMUNITY COLLEGE</p>	<p>SOLANO COMMUNITY COLLEGE DISTRICT</p> <p>STANDARD DETAILS</p>	<p>CONCRETE CURB</p>	
Rev.	Date			<p>DWG. NO. 100</p>	<p>January 2014</p>



**NOTES:**


1. WHERE CONCRETE WALK IS ADJACENT TO CURB, PROVIDE ISOLATION JOINT BETWEEN WALK AND BACK OF CURB.
2. CONTROL JOINTS CONSISTING OF 1" DEEP SCORES SHALL BE PLACED AT 10' INTERVALS O.C. - ALL SIDES EXCEPT BOTTOM.
3. WHERE WALK IS ADJACENT TO CURB, THE JOINTS SHALL ALIGN WITH THE JOINTS IN THE CURB.

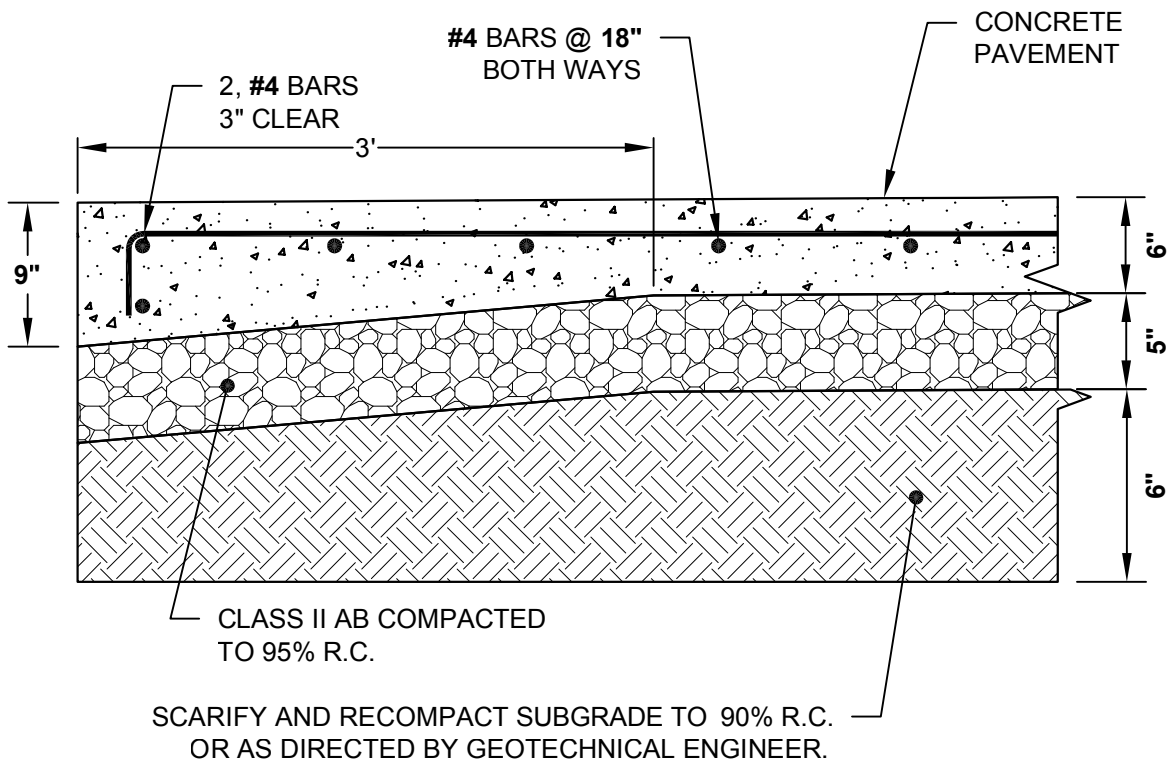
Rev.	Date		SOLANO COMMUNITY COLLEGE DISTRICT STANDARD DETAILS		CONCRETE CURB AND GUTTER	
					DWG. NO. 105	January 2014



**NOTES:**


1. ALL TREAD SURFACES SHALL BE SLIP RESISTANT.
2. REFER TO PROJECT CONSTRUCTION DRAWINGS/ SPECIFICATIONS FOR COLOR, PATTERN, TEXTURE , FINISH, AND LOCATION OF JOINTS.
3. REFER TO GEOTECHNICAL REPORT FOR SUBGRADE PREPARATION.

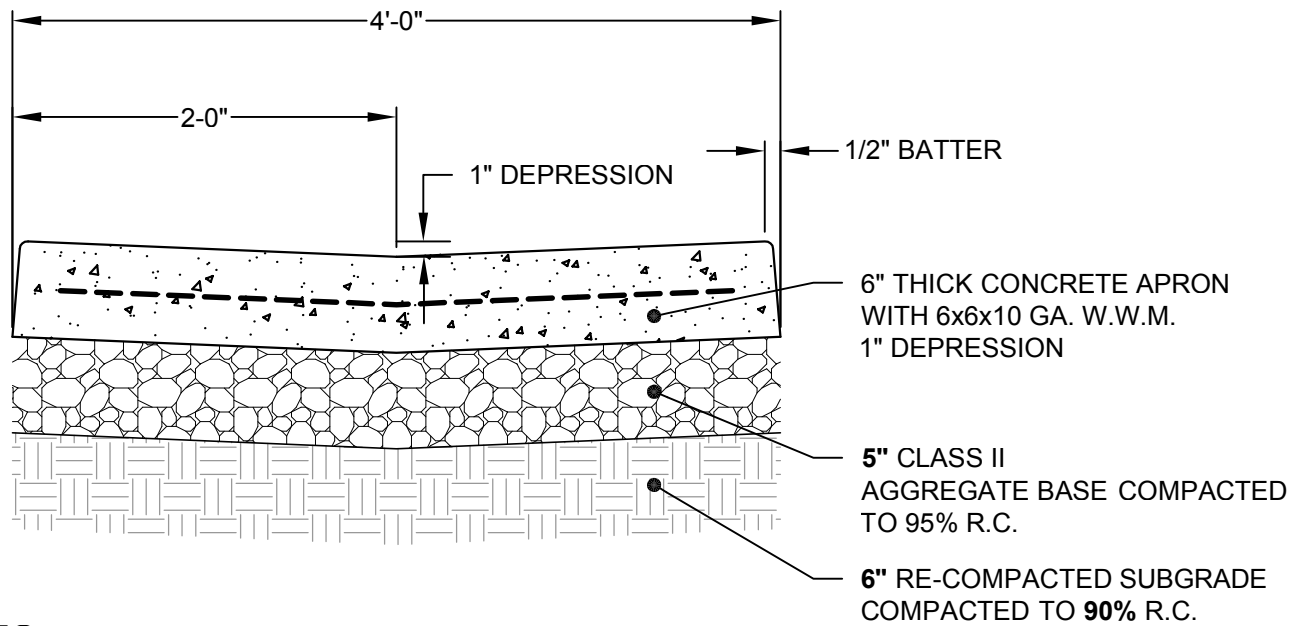
		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS		CONCRETE PEDESTRIAN WALKWAY	
Rev.	Date				DWG. NO. 110	



**NOTES:**


1. PAVEMENT SECTION SHOWN ABOVE ARE MINIMUM VALUES. REFER TO PROJECT GEOTECHNICAL REPORT FOR ACTUAL VALUES.
2. REFER TO ARCHITECTURAL PLANS FOR CONCRETE COLOR, PATTERN, TEXTURE AND FINISH.
3. SEE PROJECT CONSTRUCTION DOCUMENTS FOR DETAILS AND LOCATIONS OF CONTROL JOINTS AND EXPANSION JOINTS.
4. REFER TO GEOTECHNICAL REPORT FOR SUBGRADE PREPARATION.
5. CONCRETE COMPRESSIVE STRENGTH TO BE 4 000 PSI OR GREATER.

Rev.	Date		SOLANO COMMUNITY COLLEGE DISTRICT STANDARD DETAILS	CONCRETE VEHICULAR PAVEMENT	
				DWG. NO. 115	January 2014

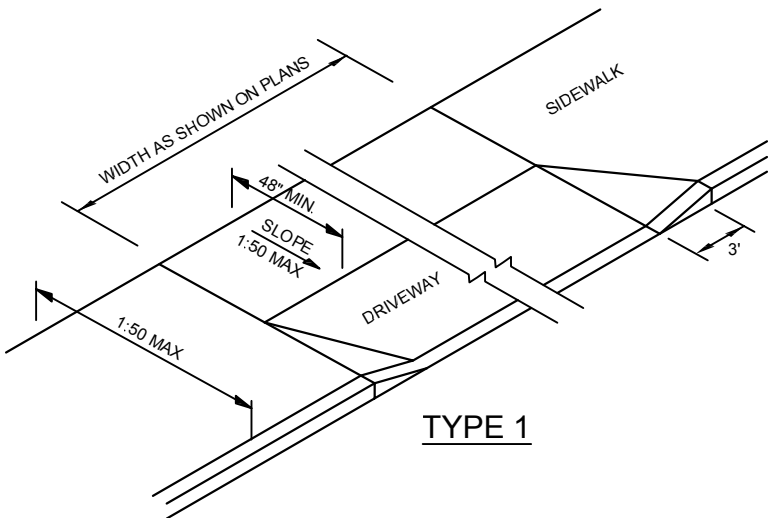


**NOTES:**

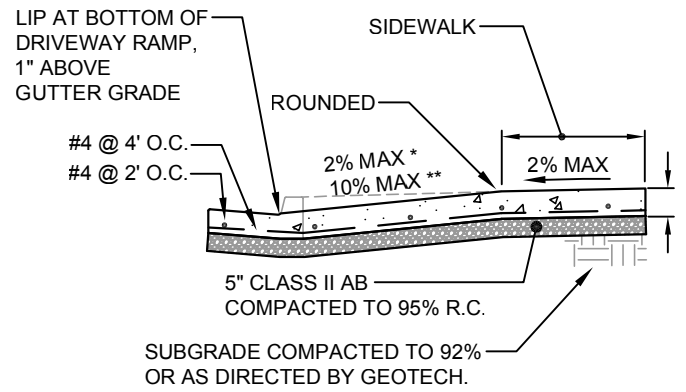
1. CONCRETE SHALL BE CLASS "B" (5 SACK) WITH 1" AGGREGATE.
2. NO CONCRETE SHALL BE PLACED PRIOR TO FORM INSPECTION .
3. ASPHALT CONCRETE SHALL BE 1/4" HIGH AT EDGE OF CONCRETE.
4. CONTROL JOINTS SHALL BE PLACED AT 8' INTERVALS.
5. EXPANSION JOINTS SHALL BE PLACED AT 16' INTERVALS.

			SOLANO COMMUNITY COLLEGE DISTRICT STANDARD DETAILS		CONCRETE VALLEY GUTTER	
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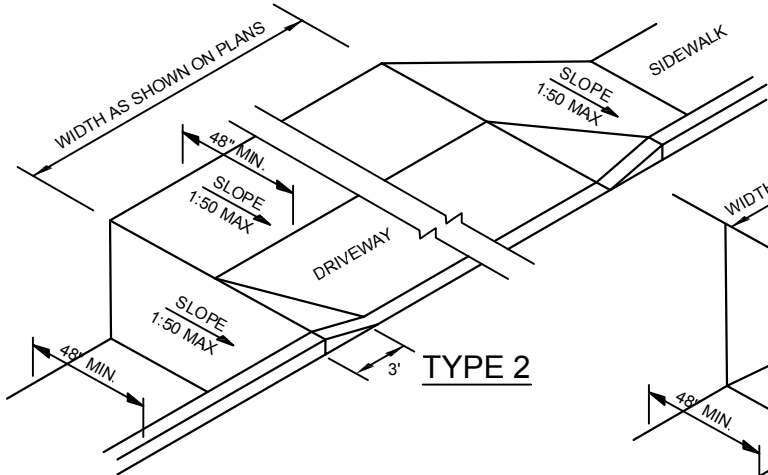
**TYPE 1**



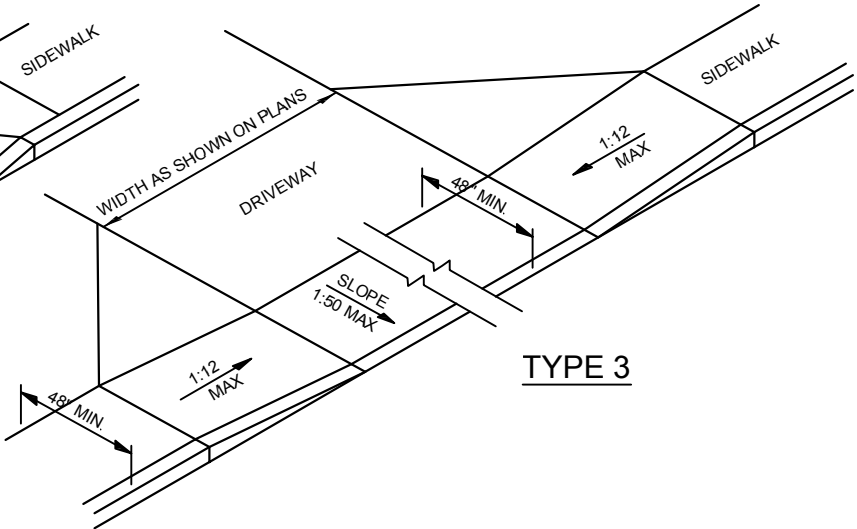
SUBGRADE COMPACTED TO 92% OR AS DIRECTED BY GEOTECH.

\* TYPE 3 DRIVEWAY  
\*\* TYPE 1 and 2 DRIVEWAY

**SECTION VIEW**



**TYPE 2**



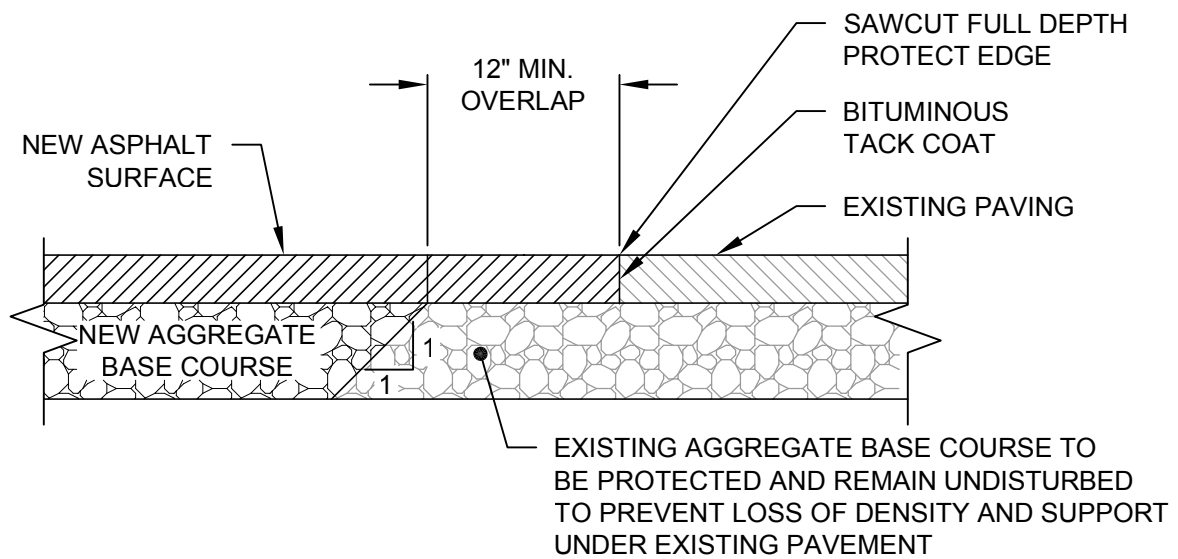
**TYPE 3**

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SOLANO COMMUNITY COLLEGE DISTRICT  
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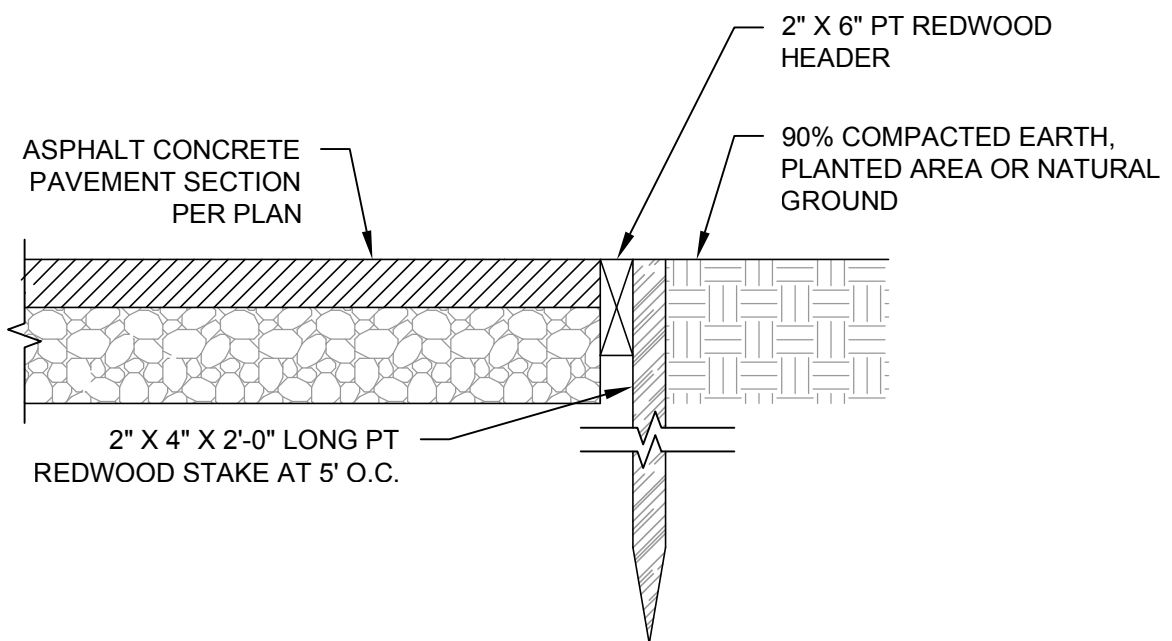
DRIVEWAY APPROACH	
DWG. NO. 125	January 2014



**NOTE:**


1. REFER TO PROJECT CONSTRUCTION DOCUMENTS FOR ASPHALT PAVEMENT SECTION , SUBGRADE PREPARATION AND OTHER REQUIREMENTS.

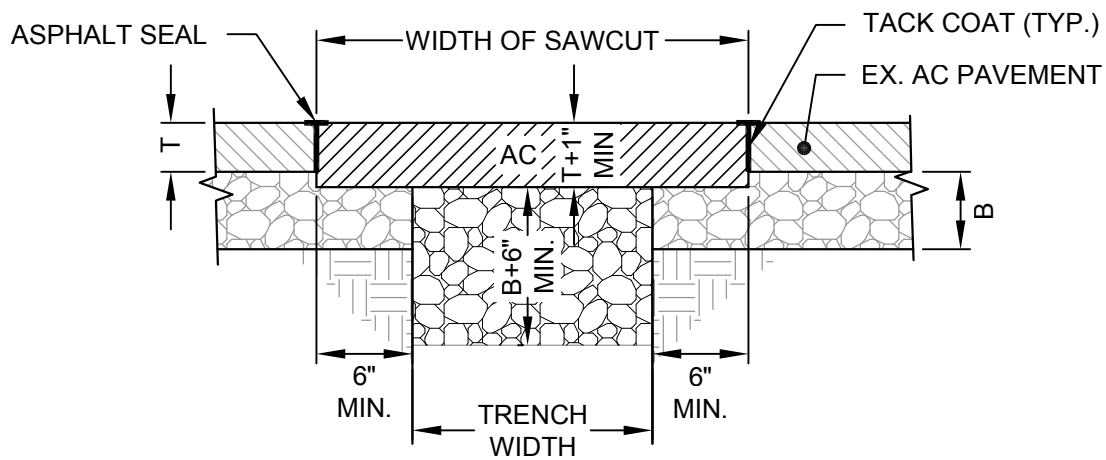
			SOLANO COMMUNITY COLLEGE DISTRICT STANDARD DETAILS	ASPHALT PAVEMENT CONFORM	
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**NOTE:**


1. REFER TO PROJECT CONSTRUCTION DOCUMENTS FOR ASPHALT PAVEMENT SECTION , SUBGRADE PREPARATION AND OTHER REQUIREMENTS.

		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS		ASPHALT PAVEMENT EDGE DETAIL	
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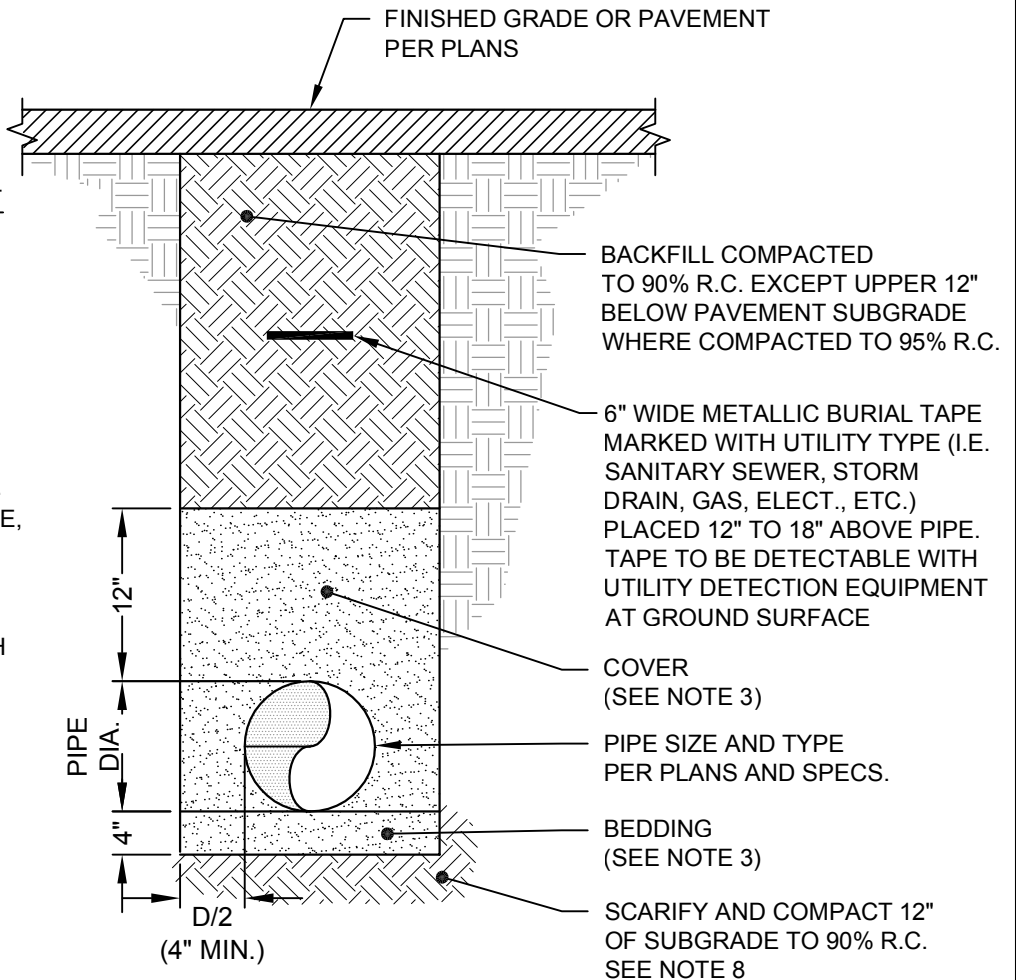
**NOTES:**


1. DURING EXCAVATION AND SUBGRADE PREPARATION, THE CONTRACTOR SHALL TAKE ALL NECESSARY STEPS TO ENSURE THE PROTECTION OF ALL IMPROVEMENTS, WHETHER PUBLIC OR PRIVATE, INCLUDING UTILITIES AND THEIR SERVICES FROM ANY DAMAGE THAT COULD OCCUR DUE TO CONTRACTORS CONSTRUCTION ACTIVITY.
2. IF NOT OTHERWISE SPECIFIED, TRENCH BACKFILL SHALL BE DENSIFIED TO A MINIMUM OF 90% R.C.
3. TEMPORARY PAVEMENT RESURFACING SHALL BE PLACED AT THE CONTRACTORS EXPENSE. IT SHALL BE PLACED LEVEL WITH THE EXISTING PAVEMENT ON COMPACTED TRENCH BACKFILL AND SHALL BE A MINIMUM OF 2" THICK.
4. PERMANENT PAVEMENT RESURFACING SHALL BE DONE WITHIN TWO (2) WEEKS AFTER BACKFILL OF TRENCHES HAS BEEN COMPLETED, ONLY AFTER SETTLEMENT HAS TAKEN PLACE AND THE FILL SURFACE HAS SUFFICIENTLY DRIED. ALL CUTS SHALL BE GROOMED CLEAN AND STRAIGHT.
5. CONTACT SURFACES OF EXISTING PAVEMENT MANHOLE FRAMES AND SHAFTS AND CONCRETE SURFACES SHALL HAVE A TACK COATING APPLIED BEFORE PERMANENT ASPHALT RESURFACING IS PLACED.
6. ASPHALT CONCRETE PAVEMENT SHALL BE AS SPECIFIED.

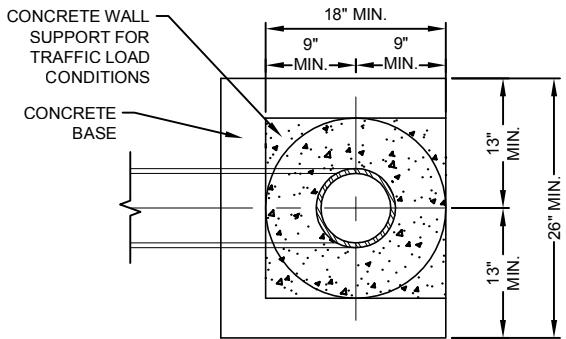
		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS	ASPHALT PAVEMENT REPAIR at UTILITY TRENCH	
Rev.	Date			DWG. NO. 140	January 2014

**NOTES:**

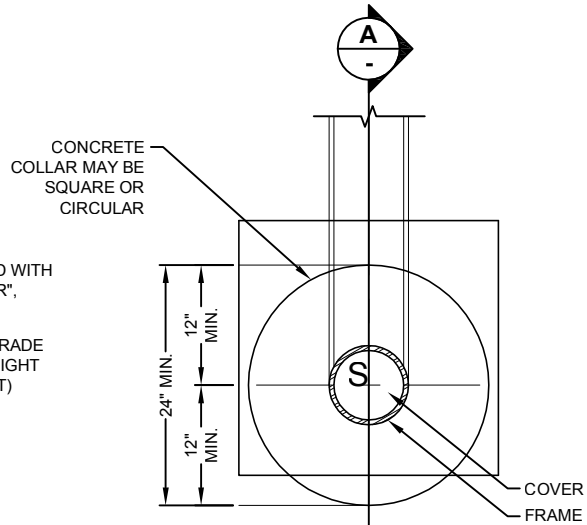
1. UTILITY TRENCH CONSTRUCTION SHALL CONFORM TO THE RECOMMENDATIONS OF THE GEOTECHNICAL REPORT.
2. EXCAVATE FOR BELLS OR HUBS SO FULL LOAD IS CARRIED BY PIPE BARRELS.
3. BEDDING AND COVER: SAND OR FINE GRAVEL WITH LESS THAN 10% FINES.
4. BEDDING SHALL BE PLACED IN A MANNER SUCH AS SLICING, SHOVEL-SPADING, OR SHOVEL RODDING TO ENSURE COMPLETE FILLING OF THE "HAUNCH AREAS" BELOW THE PIPE. JETTING IS NOT PERMITTED
5. SUBGRADE TO BE FREE OF PROTRUDING OBJECTS.
6. BACKFILL MAY BE NATIVE SOIL THAT MEETS THE CRITERIA FOR FILL AS DESCRIBED IN THE GEOTECHNICAL REPORT.
7. WHERE LESS THAN 18" BETWEEN BOTTOM OF PAVING SECTION (I.E. BOTTOM OF A.B.) AND TOP OF PIPE, BACKFILL TO BE CONTROLLED DENSITY FILL (CDF)
8. TRENCH SUBGRADE SHALL BE PREPARED IN ACCORDANCE WITH THE GEOTECHNICAL REPORT.



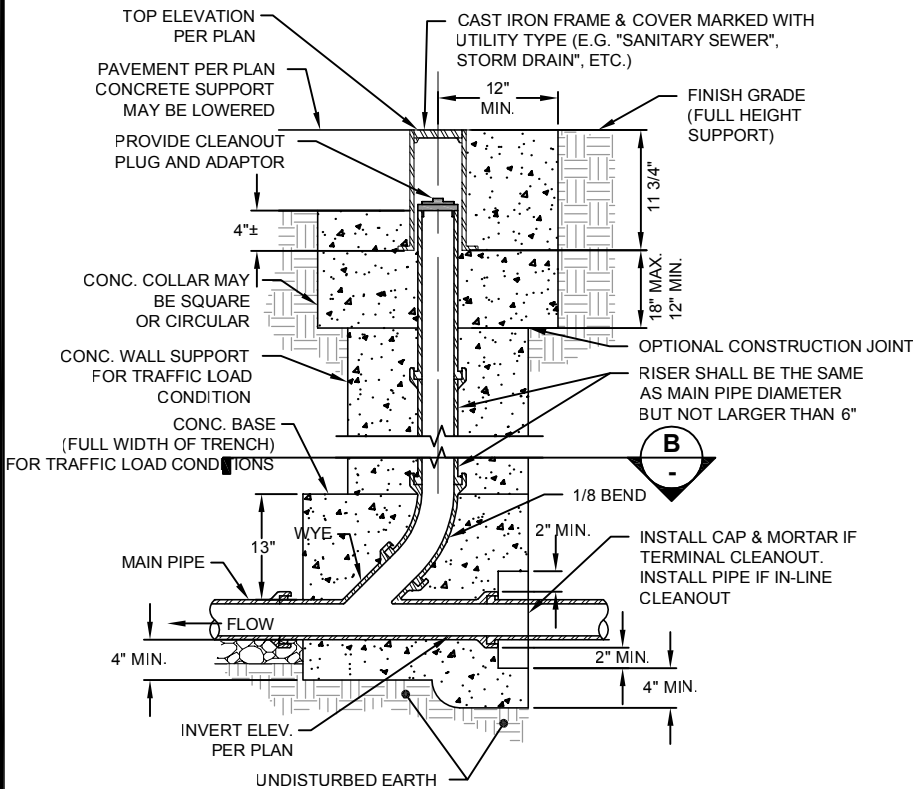
Rev.	Date		SOLANO COMMUNITY COLLEGE DISTRICT STANDARD DETAILS	UTILITY TRENCH	
				DWG. NO. 200	January 2014



**SECTION B**



**PLAN**



**SECTION A**

**NOTES:**

1. SEE PROJECT PLANS FOR INVERT ELEVATION.
2. PIPE AND FITTINGS, EXCEPT AS OTHERWISE SHOWN HEREON, SHALL BE OF THE SAME MATERIAL AS THE SEWER, UNLESS APPROVED ADAPTERS ARE UTILIZED.
3. PIPE AND FITTINGS SHALL BE PROPERLY ALIGNED AND MAINTAINED WHILE CONCRETE IS BEING PLACED AND ALLOWED TO HARDEN. JOINTS FOR PIPES AND FITTINGS SHALL BE MADE PRIOR TO PLACING CONCRETE. CONCRETE FOR BEDDING, ENCASEMENT, AND FITTINGS SHALL BE PLACED UNIFORMLY AROUND THE PIPE AND FITTINGS AS SHOWN HEREON TO MAINTAIN PROPER ALIGNMENT.
4. THE ACCESS FRAME, COVER AND CAP SHALL BE CAST IRON.
5. THE CONTRACTOR, AT HIS OPTION, MAY PLACE EITHER CIRCULAR OR SQUARE CONCRETE PIPE WALL SUPPORTS AS SHOWN HEREON.

Rev.	Date

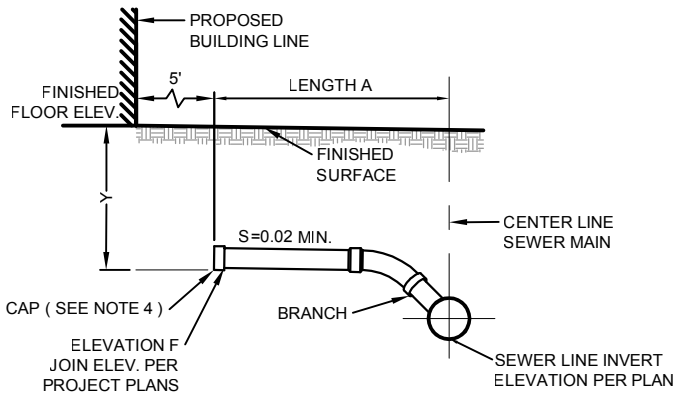


SOLANO COMMUNITY  
COLLEGE DISTRICT  
  
STANDARD DETAILS

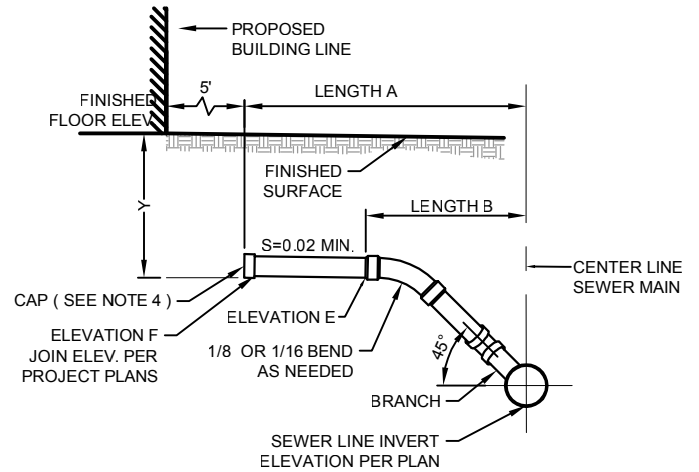
SEWER CLEANOUT

DWG. NO. 205

January  
2014



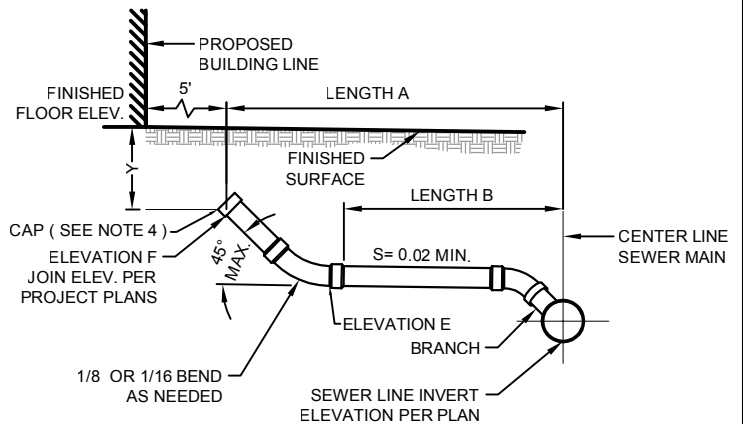
**PROFILE  
TYPE A**



**PROFILE  
TYPE B**

**NOTES:**

1. EXCEPT AS OTHERWISE INDICATED ON THE PROJECT PLANS, ALL SEWERS SHALL BE TYPE "A" AND SHALL BE CONSTRUCTED ON STRAIGHT LINES AND GRADES BETWEEN CONTROL POINTS AND ELEVATIONS.
2. **DIMENSIONS:**  
 Y = VARIES - JOIN ELEVATION PER PROJECT PLANS  
 LENGTHS "A" AND "B" - SEE PROJECT PLANS  
 ELEVATION "E" - SEE PROJECT PLANS  
 ELEVATION "F" - SEE PROJECT PLANS
3. ALL CONNECTION SEWER PIPE SHALL BE 6 INCH UNLESS OTHERWISE INDICATED.
4. IF NOT CONNECTED TO BUILDING SEWER AT TIME OF INSTALLATION, THE UPPER END OF THE SEWER CONNECTION SHALL BE SEALED BY INSTALLING A CAP AND SEALING THE CAP WITH 1" THICK TYPE "F" MORTAR AROUND THE CIRCUMFERENCE OF THE CAP. THE SEAL SHALL BE REMOVED PRIOR TO CONNECTION WITH BUILDING SEWER.
5. EXCEPT AS CONTROLLED BY ELEVATIONS INDICATED ON THE PROJECT PLANS, THE MINIMUM SLOPE FOR ALL PIPES SHALL BE 2.0 PERCENT (S=0.020 MIN.).
6. BRANCHES SHALL BE EITHER TEES OR WYES AND SHALL BE ROTATED UPWARD FROM THE HORIZONTAL TO AN ANGLE OF 22-1/2 DEGREES TO 45 DEGREES WHEN TEES ARE USED. BENDS ARE NOT REQUIRED BUT MAY BE USED AT THE OPTION OF THE CONTRACTOR. WHEN THE BRANCH ROTATION DOES NOT CONFORM TO THE SLOPE OF THE BUILDING CONNECTION SEWER, PULLED JOINTS MAY BE USED FOR ADJUSTMENT.
7. CONNECTION OF A BUILDING SEWER SMALLER THAN 6 INCHES TO A 6 INCH CONNECTION SEWER SHALL BE MADE USING AN APPROVED INCREASER - TEE OR AN INCREASER FOLLOWED BY A TEE.



**PROFILE  
TYPE C**



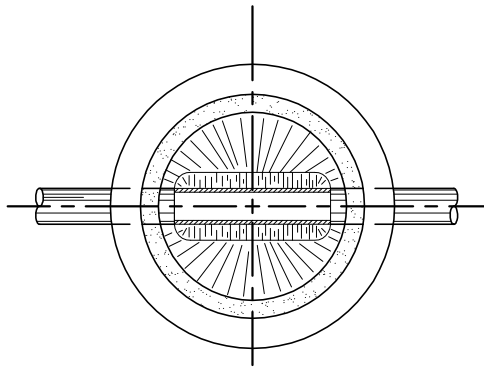
SOLANO COMMUNITY  
COLLEGE DISTRICT  
  
STANDARD DETAILS

SEWER SERVICE

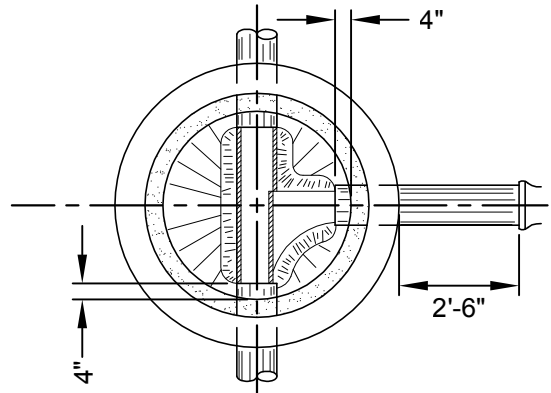
DWG. NO. 210

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2014

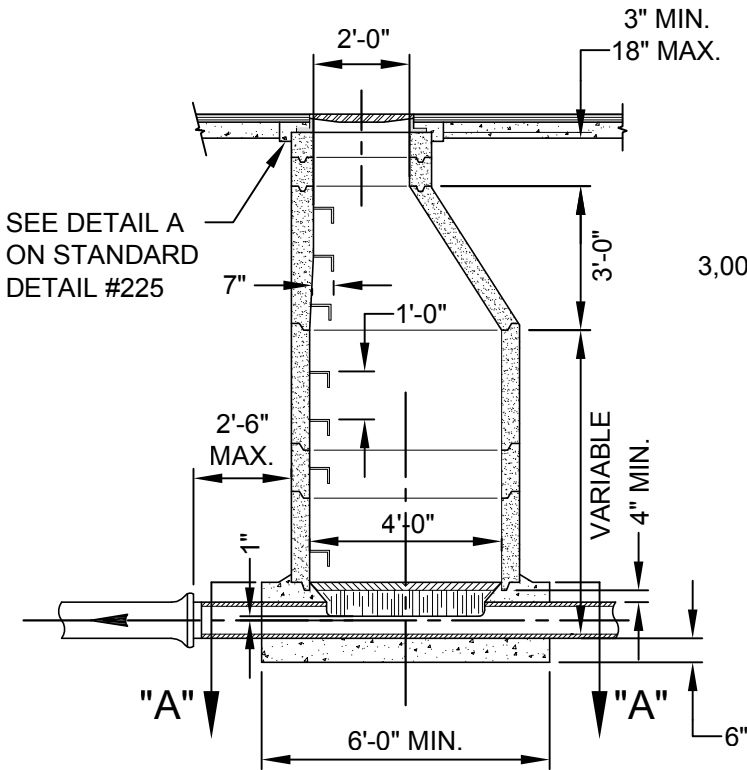
Rev. Date



**SECTION "A-A"**

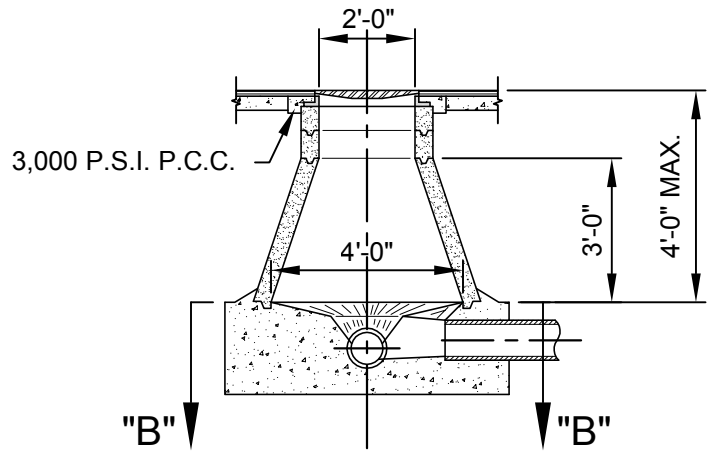


**SECTION "B-B"**



SEE DETAIL A  
ON STANDARD  
DETAIL #225

**SEWER MANHOLE**



**SHALLOW SEWER MANHOLE**

**NOTES:**

1. MANHOLE FRAME AND COVER SHALL BE PINKERTON A-640, D & LA-1024 OR APPROVED EQUAL MARKED "SANITARY SEWER".
2. POURED CONCRETE BASE SHALL BE 4,000 PSI OR APPROVED PRECAST BASE.
3. ALL JOINTS SHALL BE SEALED WITH APPROVED FLEXIBLE JOINT SEALANT.
4. PLACE STEPS ON DOWNSTREAM SIDE OF MANHOLE.
5. LATERALS INTO MANHOLES SHALL HAVE A JOINT AT 2'-6" FROM OUTSIDE WALL.

Rev.	Date



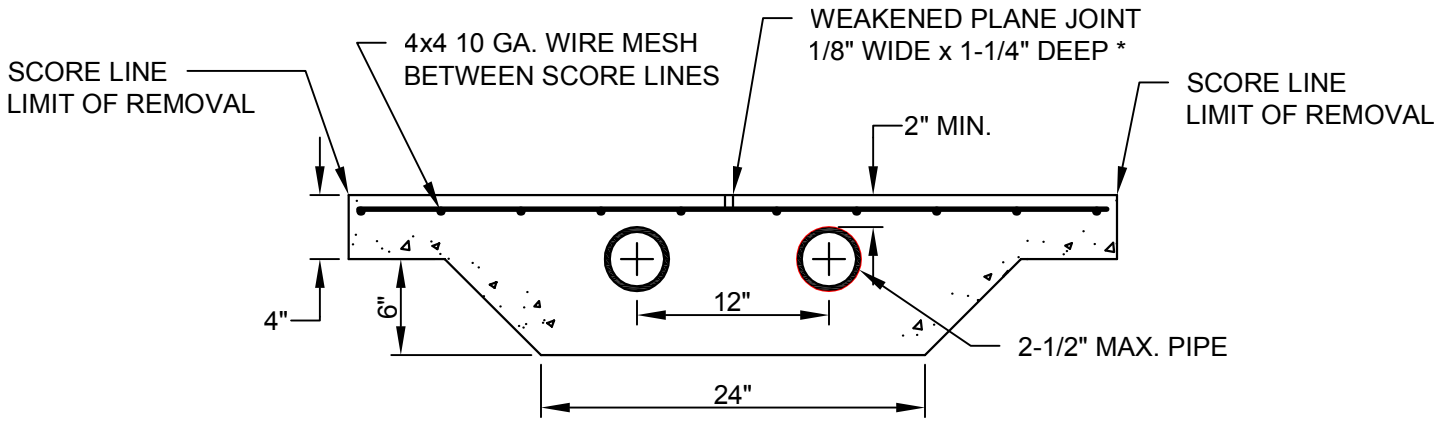
SOLANO COMMUNITY  
COLLEGE DISTRICT  
  
STANDARD DETAILS

SEWER MANHOLE

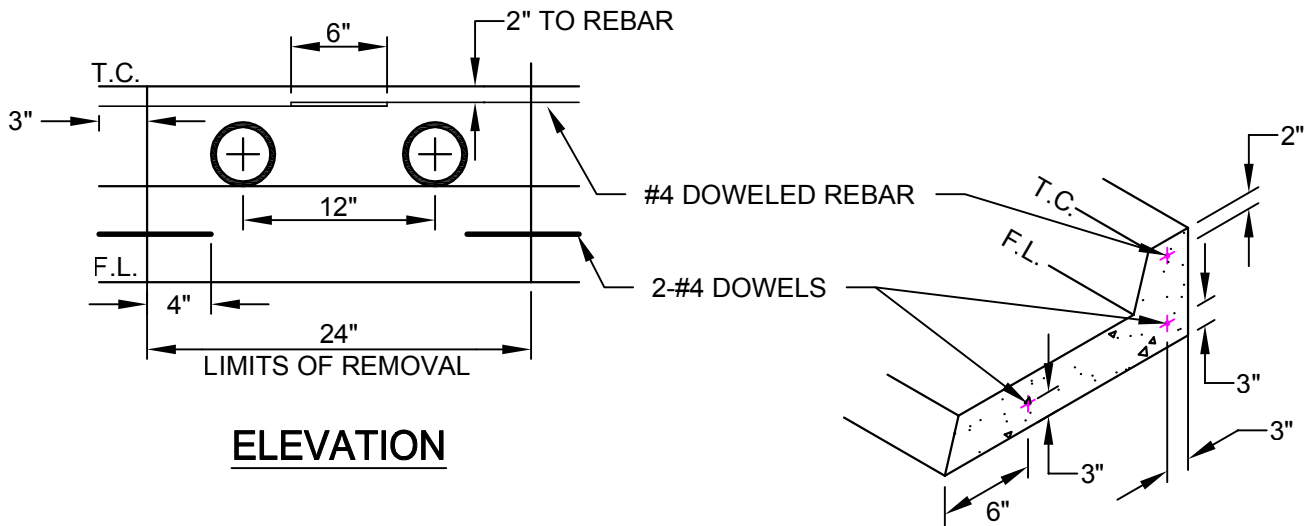
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**SIDE WALKS**




**ELEVATION**

**CURB & GUTTER**

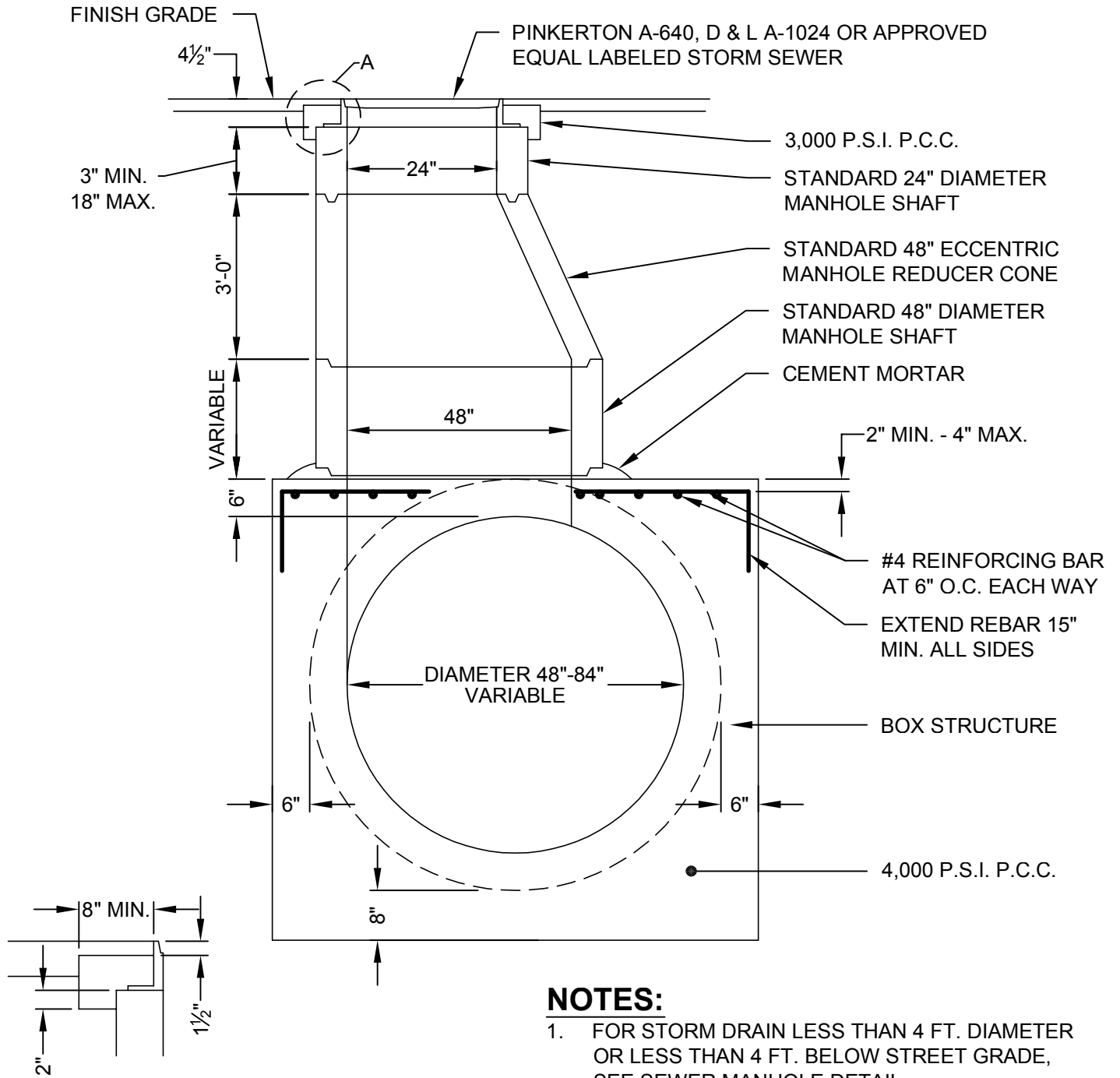
**NOTES:**

1. OWNER SHALL BE RESPONSIBLE FOR CLEANING AND MAINTAINING PIPE.
2. MINIMUM CROSS-SLOPE TO BE 1% FOR DRAIN PIPE.
3. PLACE 4X4 WIRE MESH FULL LENGTH 24" ON EACH SIDE OF PIPE.
4. UNDER SIDEWALK DRAINS TO BE USED ONLY BY APPROVAL OF CITY ENGINEER WHERE A STORM DRAIN DOES NOT EXIST, OR EXTENSION OF AN EXISTING STORM DRAIN IS IMPRACTICAL.

\* WEAKENED PLANE JOINT TO BE LOCATED MIDWAY BETWEEN OUTSIDE PIPES.

		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS	COMMERCIAL MULTIPLE UNDER SIDEWALK DRAINS	
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# STORM DRAIN MANHOLE (CAST-IN-PLACE PIPE)



**DETAIL A**

**NOTES:**

1. FOR STORM DRAIN LESS THAN 4 FT. DIAMETER OR LESS THAN 4 FT. BELOW STREET GRADE, SEE SEWER MANHOLE DETAIL.
2. CONSTRUCT MANHOLE WITHOUT DROP STEPS.
3. GROUT ALL JOINTS.

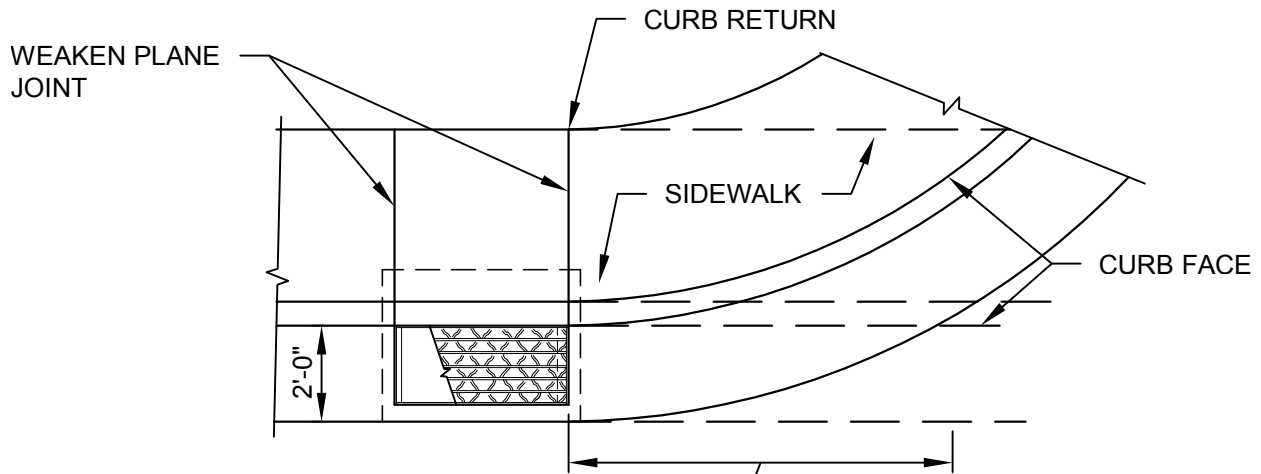
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SOLANO COMMUNITY  
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STANDARD DETAILS

STORM DRAIN MANHOLE	
DWG. NO. 225	January 2014

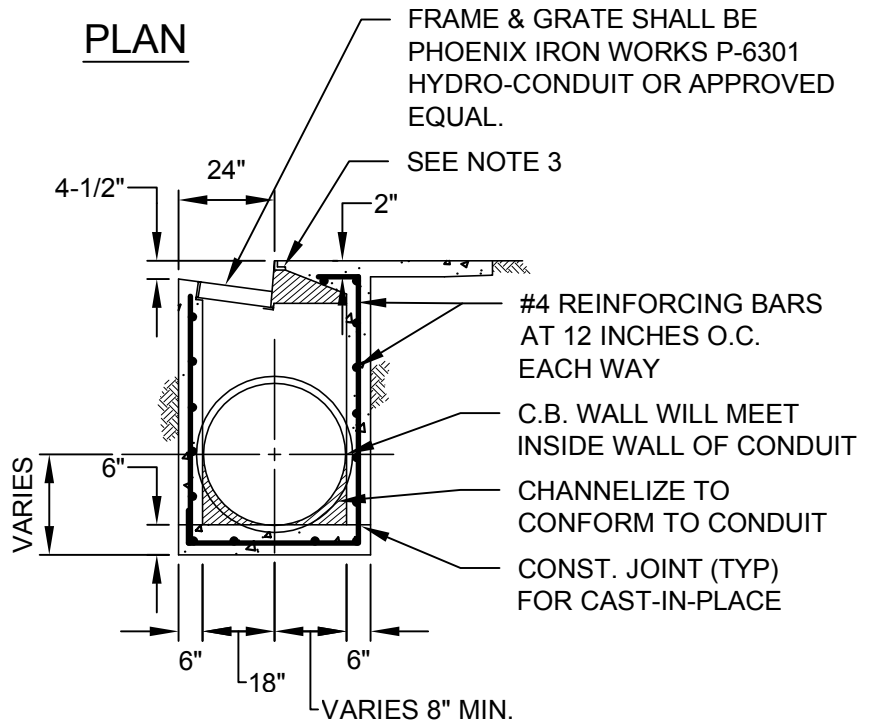
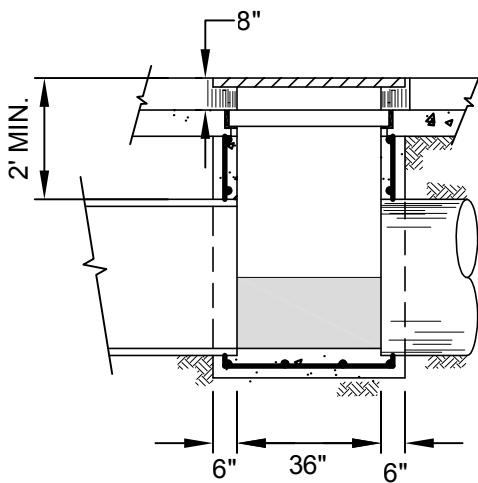


8' CURB HEIGHT VARIES FROM 6" TO 8" ON A STRAIGHT GRADE, BOTH SIDES OF CATCH BASIN.

**PLAN**

FRAME & GRATE SHALL BE PHOENIX IRON WORKS P-6301 HYDRO-CONDUIT OR APPROVED EQUAL.

SEE NOTE 3



**CROSS SECTIONAL VIEWS**

**NOTES:**

1. CONCRETE FOR STRUCTURE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3,000 P.S.I.
2. ALL STRUCTURES SHALL BE GROUTED AND SACKED.
3. NOSING SHALL BE 2 1/2"X2 1/2"X1/4"X4' GALVANIZED ANGLE WITH THREE 6" TIE BARS.
4. FOR STORM DRAIN PIPES LARGER THAN 36", USE STORM DRAIN MANHOLE DETAIL FOR BOX STRUCTURE.



SOLANO COMMUNITY COLLEGE DISTRICT  
STANDARD DETAILS

CATCH BASIN TYPE 1

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2- NO.4 BARS  
ALL AROUND  
TOP

NO. 4 BARS  
AT 6" O.C.  
BOTH WAYS

BACK  
OF  
CURB

48" OR 36"  
FOR 3' TO 6' DEPTH

BACK OF ADJACENT  
SIDEWALK

NO. 4 TRIM  
BARS AROUND  
MANHOLE

SIDEWALK  
MANHOLE,  
FRAME AND  
COVER

36"

DEPRESS

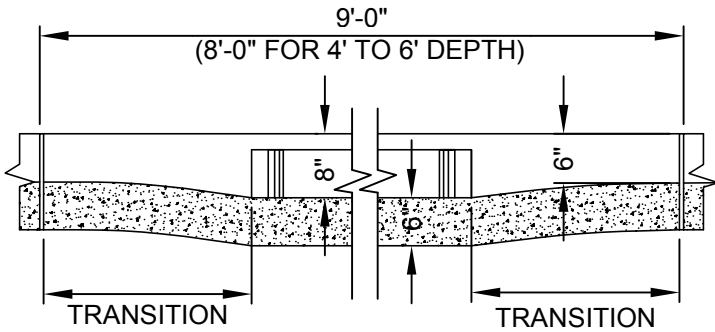
4" RADIUS ON CORNERS

DEPRESS

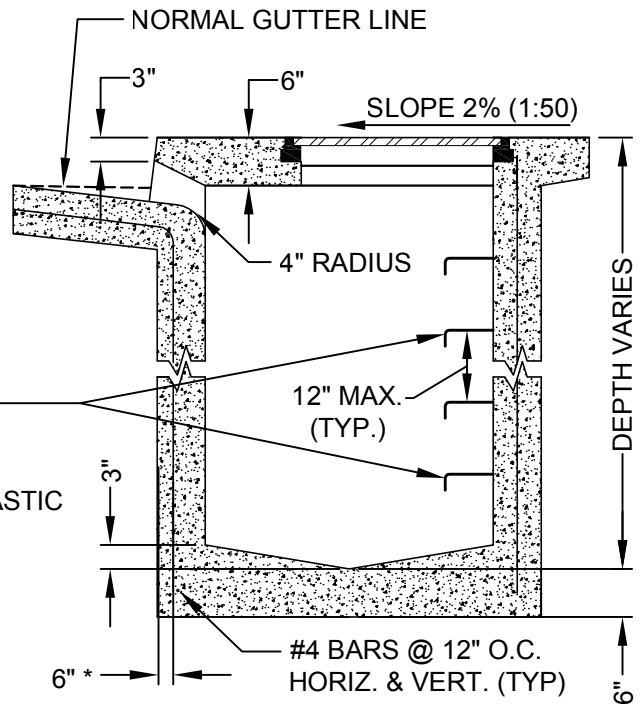
2 - NO. 4 BARS X 8'

DEPRESSED GUTTER

**PLAN**



**GUTTER ELEVATION**



**SECTION**

EPOXY STEPS IN  
PLACE STEPS TO BE  
STEEL REINFORCED  
POLYPROPYLENE PLASTIC

**NOTES:**

1. SEE STANDARD DETAIL #240 FOR GENERAL NOTES.
  2. TOP SHALL BE CAST IN PLACE.
  3. ADJACENT SIDEWALK SHALL BE POURED MONOLITHIC WITH TOP.
- \* 8" WALL FOR DEPTHS GREATER THAN 8'



SOLANO COMMUNITY  
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CATCH BASIN TYPE 2

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2014

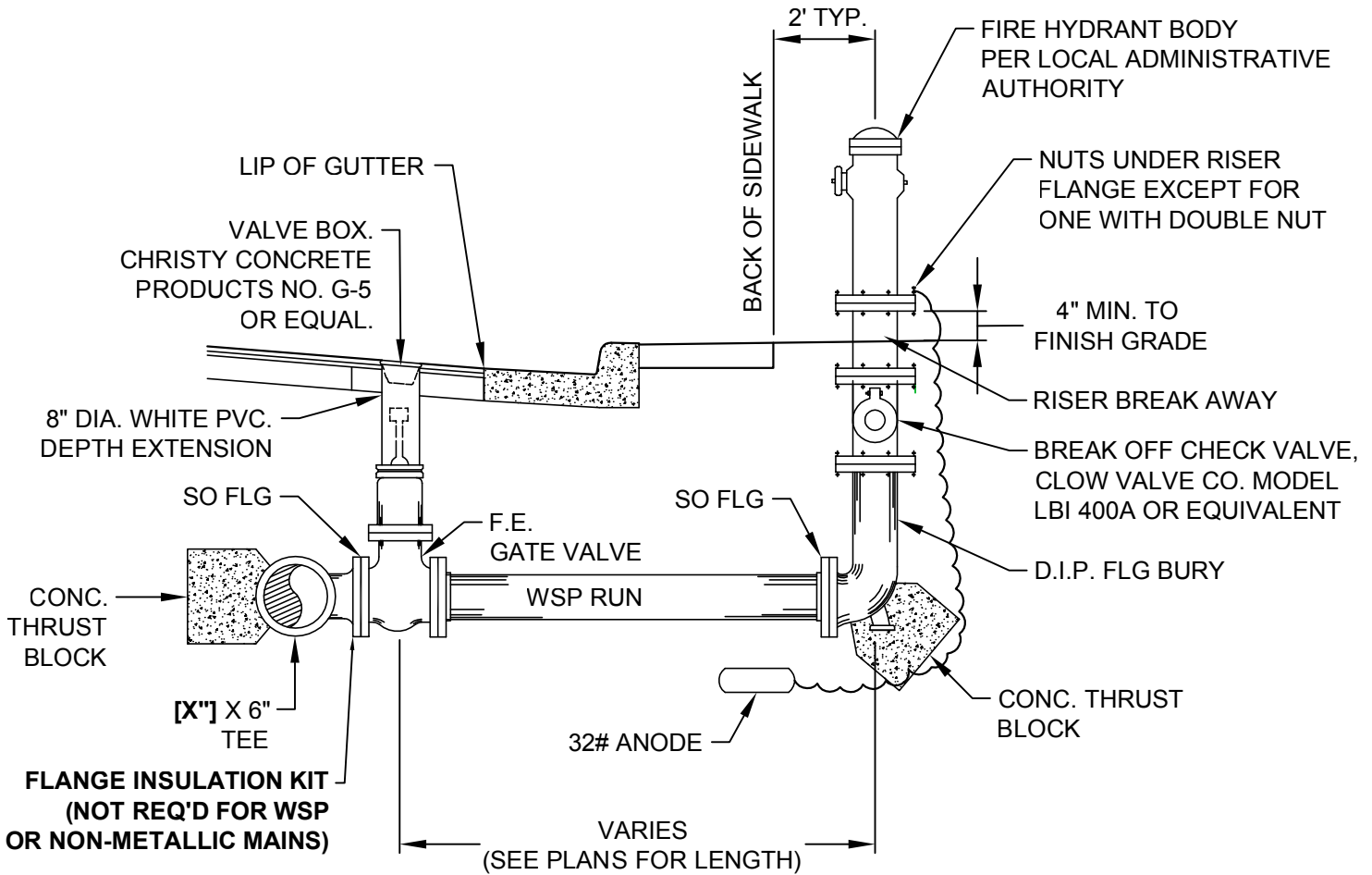
Rev. Date

## NOTES:

1. CONCRETE SHALL BE CLASS "A" (6 SACK MIX) UNLESS OTHERWISE NOTED. STRUCTURE TOPS CAST WITH ADJACENT CURB/SIDEWALK MAY BE CLASS "B" CONCRETE.
2. BASE SHALL BE PLACED AGAINST UNDISTURBED EARTH, SIDES MAY BE FORMED OR PLACED AGAINST UNDISTURBED EARTH.
3. WHERE CONDUITS ARE ENCOUNTERED THAT ARE LARGER IN DIAMETER THAN THE WIDTH OF THE WALL THROUGH WHICH THEY PASS, THE INSIDE DIMENSION OF THE WALLS PERPENDICULAR TO THE DIRECTION OF THE PIPE SHALL BE INCREASED TO 12" WIDER THAN THE OUTSIDE DIAMETER OF THE PIPE.
4. EXPANSION JOINTS SHALL BE PLACED THROUGH CURB AND SIDEWALK AT BOTH SIDES OF CATCH BASINS AND SHALL BE LIMIT OF PAYMENT FOR CURB AND GUTTER. UNIT PRICES FOR DRAINAGE STRUCTURES SHALL INCLUDE CURB, GUTTER AND SIDEWALK POURED WITH DRAINAGE STRUCTURE.
5. NO CONCRETE SHALL BE PLACED PRIOR TO FORM AND STEEL APPROVAL BY THE AGENCY ENGINEER.
6. WALL THICKNESS, REINFORCING, AND STEP (AS REQUIRED BY AGENCY ENGINEER) REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE TABLE BELOW, UNLESS OTHERWISE INDICATED BY THE PROJECT PLANS OR DIRECTED BY THE AGENCY ENGINEER.
7. PLACE 2" WEEPHOLES AS REQUIRED BY THE AGENCY ENGINEER.
8. EQUIVALENT PRECAST STRUCTURES MAY BE SUBSTITUTED AS APPROVED BY THE AGENCY ENGINEER.
9. WALL THICKNESS SHALL NOT EXCEED 10" ON ANY STRUCTURE.
10. PRECAST INLETS AND MANHOLES SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS AND BE DESIGNED TO WITHSTAND H-20 LOADING.


DEPTH	WALL THICKNESS (SEE NOTE #11)	WALL REINFORCEMENT	STEPS REQUIRED
LESS THAN 3'	6"	NO. 4 AT 12" BOTH WAYS	NO
LESS THAN 3'	8"	NONE OUTSIDE ROADWAY. NO. 4 AT 12" BOTH WAYS WITHIN OR ADJACENT TO ROAD.	NO
3' TO 8'	6"	NO. 4 AT 12" BOTH WAYS	AS REQUIRED BY THE AGENCY ENGINEER
OVER 8'	8"	NO. 4 AT 12" BOTH WAYS	AS REQUIRED BY THE AGENCY ENGINEER

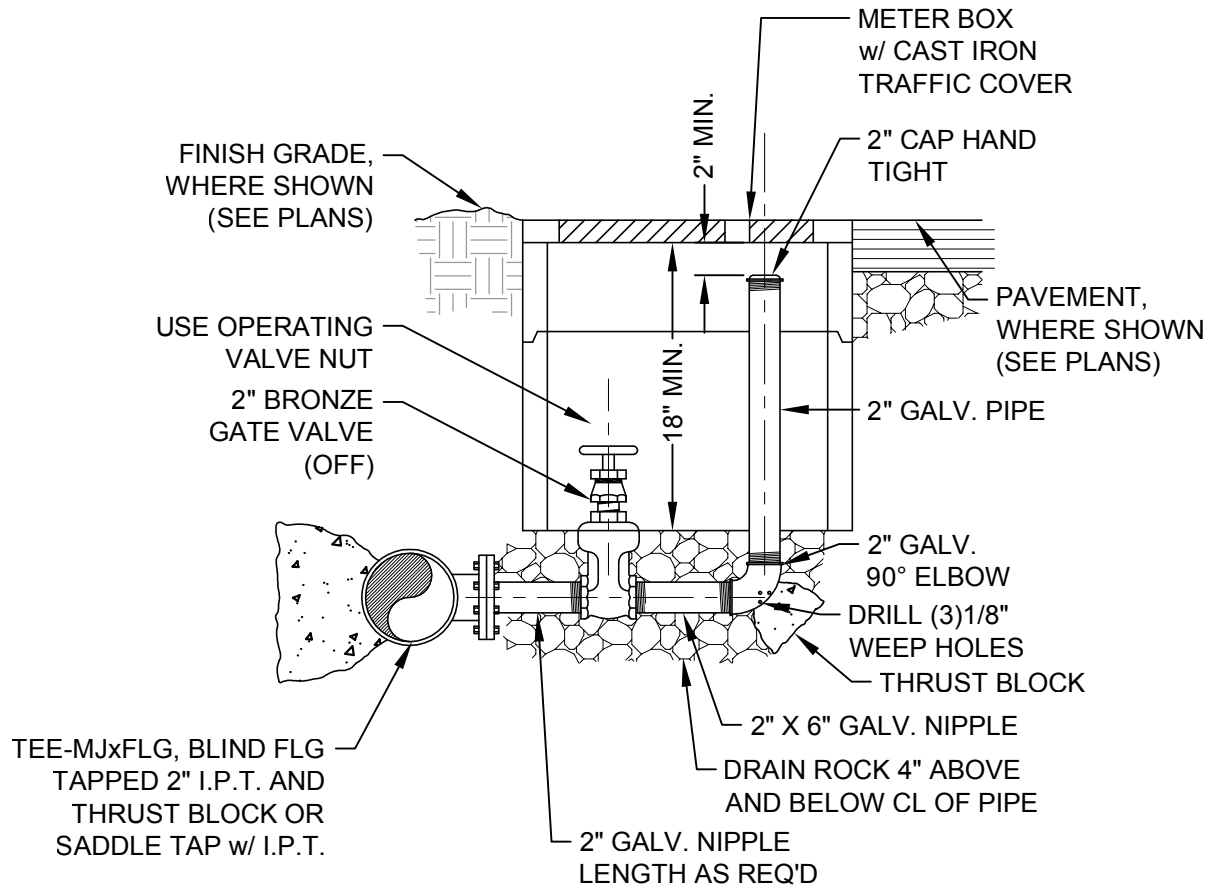
		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS	CATCH BASIN TYPE 2 NOTES	
Rev.	Date			DWG. NO. 240	January 2014




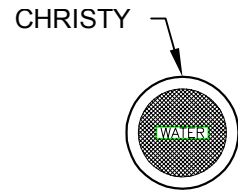
**NOTES:**

1. HYDRANT LOCATION IN RELATION TO THE CURB AND SIDEWALK MUST BE DETERMINED BY THE CONTROLLING FIRE MARSHALL.
2. PRIME AND WRAP ALL BARE METAL INCLUDING HYDRANT BURY AND RISER UP TO BOTTOM OF HYDRANT FLANGES.
3. FIRE HYDRANT SHALL BE INSTALLED PER LOCAL FIRE DEPARTMENT REQUIREMENTS.

Rev.	Date		SOLANO COMMUNITY COLLEGE DISTRICT STANDARD DETAILS	FIRE HYDRANT	
				DWG. NO. 300	January 2014



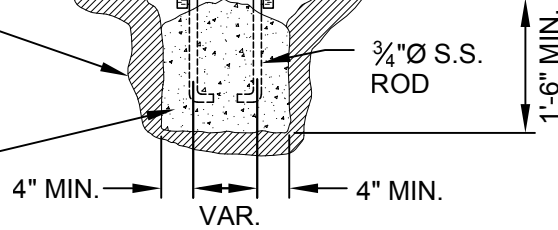
		<p>SOLANO COMMUNITY COLLEGE DISTRICT</p> <p>STANDARD DETAILS</p>	<p>BLOW OFF</p>	
<p>Rev.      Date</p>	<p><b>SOLANO</b> COMMUNITY COLLEGE</p>		<p>DWG. NO. 305</p>	<p>January 2014</p>



VALVE BOX AND COVER

AREA BEARING AGAINST UNDISTURBED EARTH SHALL BE A MIN. OF 9' SQUARE

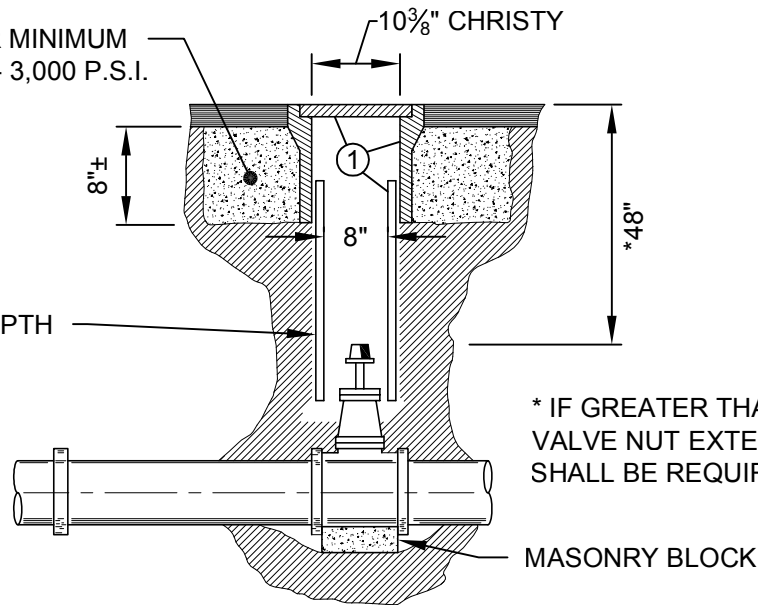
3,000 P.S.I. CONCRETE



TYPICAL SECTION  
GREATER THAN 12" VALVE

2'-6" DIAMETER MINIMUM ENCASEMENT - 3,000 P.S.I. CONCRETE


WHITE PVC DEPTH EXTENSION



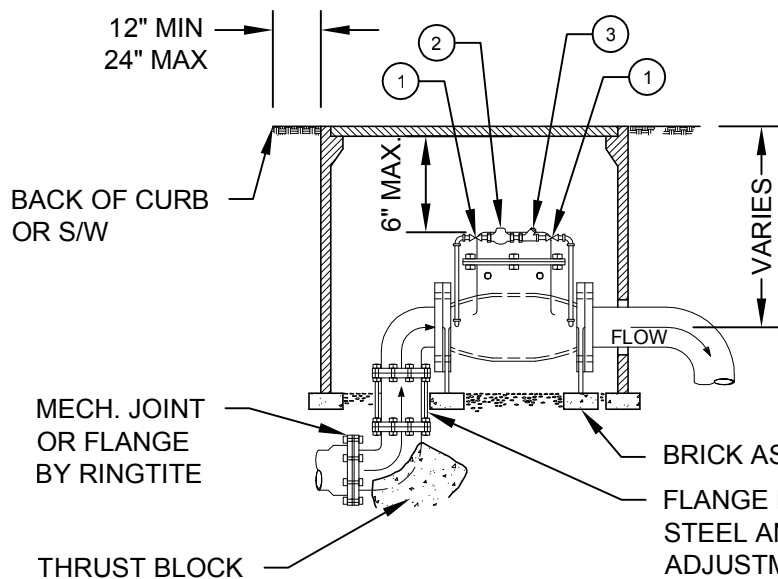
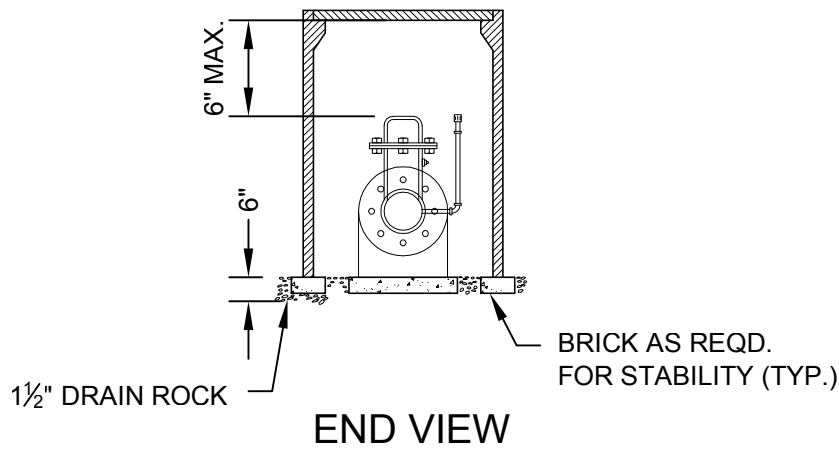
TYPICAL SECTION  
12" VALVE AND SMALLER

**NOTES:**

1. VALVE BOX AND COVER SHALL BE CHRISTY CONCRETE PRODUCTS NO. G-5 OR EQUAL, WITH DEPTH EXTENSIONS AS REQUIRED.
2. ALL VALVES SHALL HAVE FLANGED CONNECTIONS AT ALL TEES AND CROSSES.
3. ALL VALVES SHALL BE SEPARATED FROM JOINTS WITH A 3' TO 6' SECTION OF PIPE.
4. VALVE SHALL BE RESILIENT SEAT GATE (12" OR LESS) OR BUTTERFLY (GREATER THAN 12") PER CITY SPECIFICATION.

			SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS	VALVE INSTALLATION	
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## KEYNOTES

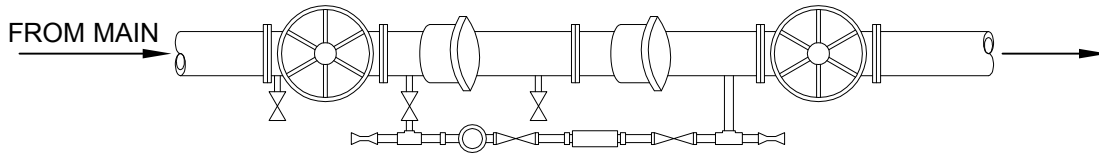
- ① THREADED CURB STOP VALVE
- ② ROCKWELL METER
- ③ FORD HS-11 CHECK VALVE TO MATCH METER SIZE OR EQUAL.

## DETECTOR CHECK UNIT

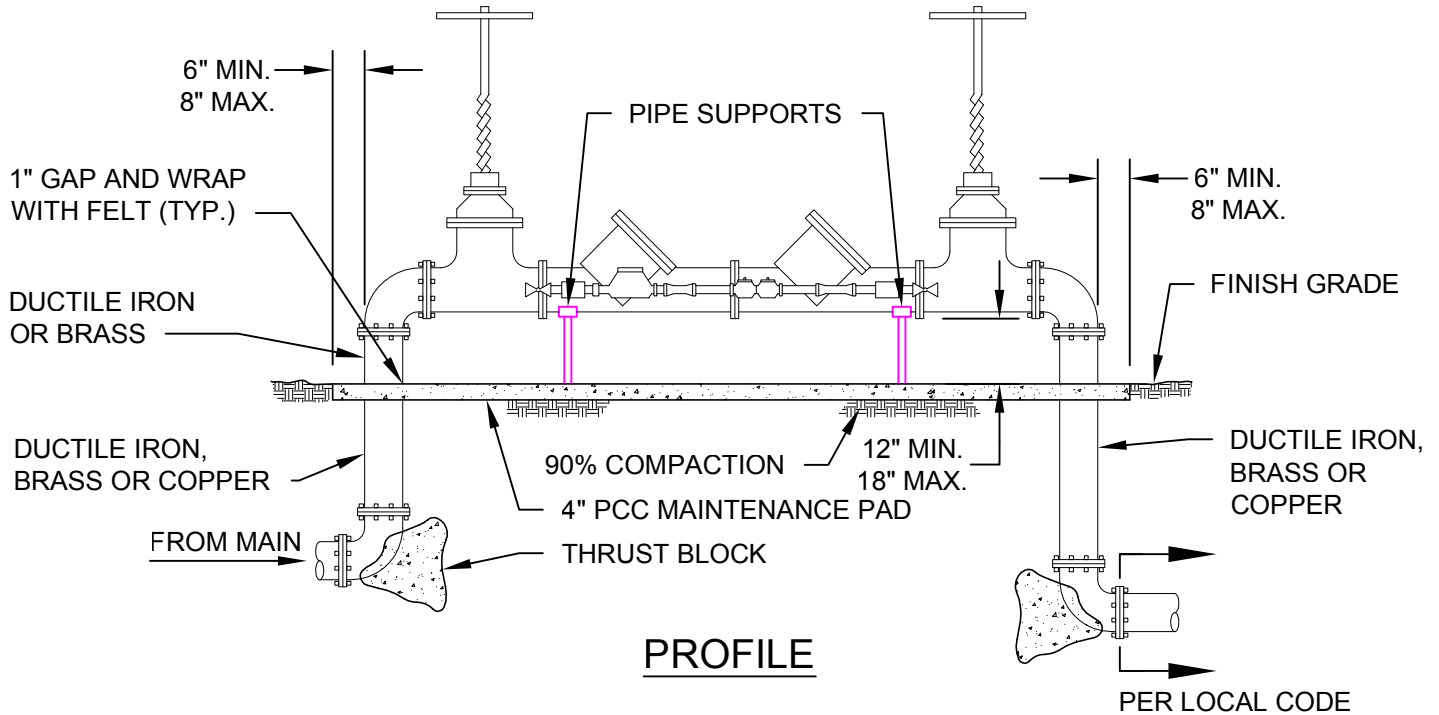
### NOTES:

1. BYPASS METER SHALL BE A SENSUS. FOR 4" AND 6" VALVES USE 3/4" SR METER. FOR 8" VALVES USE 1" SR METER FOR 10" VALVES USE 1-1/2" SR METER. METERS SHALL READ IN CUBIC FEET.
2. VAULT BOX TO BE APPROVED BY THE CITY ENGINEER.
3. DETECTOR CHECK VALVE SHALL HAVE AN INTEGRAL BY-PASS AND WEIGHTED CLAPPER AND BELL & FM LISTED.
4. READING LID TO BE INSTALLED OVER METER.
5. FIRE SERVICE LINE MATERIALS AND INSTALLATION FROM THE WATER MAIN SHALL CONFORM TO STANDARD DETAIL FOR 3" AND LARGER WATER SERVICE INSTALLATION.
6. DETECTOR CHECK VALVE EXTERIOR FINISH SHALL BE HOT DIPPED GALVANIZED OR PAINTED RED.
7. ALL PIPES AND FITTINGS FROM MECHANICAL JOINT TO DETECTOR CHECK SHALL BE DUCTILE IRON. BYPASS SHALL BE COPPER OR BRASS.

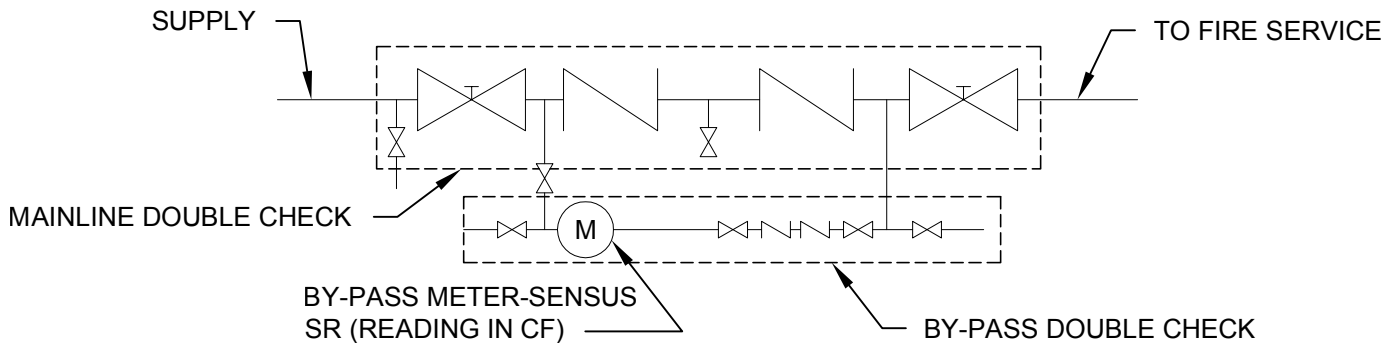
Rev.	Date		SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS	DETECTOR CHECK VALVE	
				DWG. NO. 315	January 2014



**PLAN VIEW**




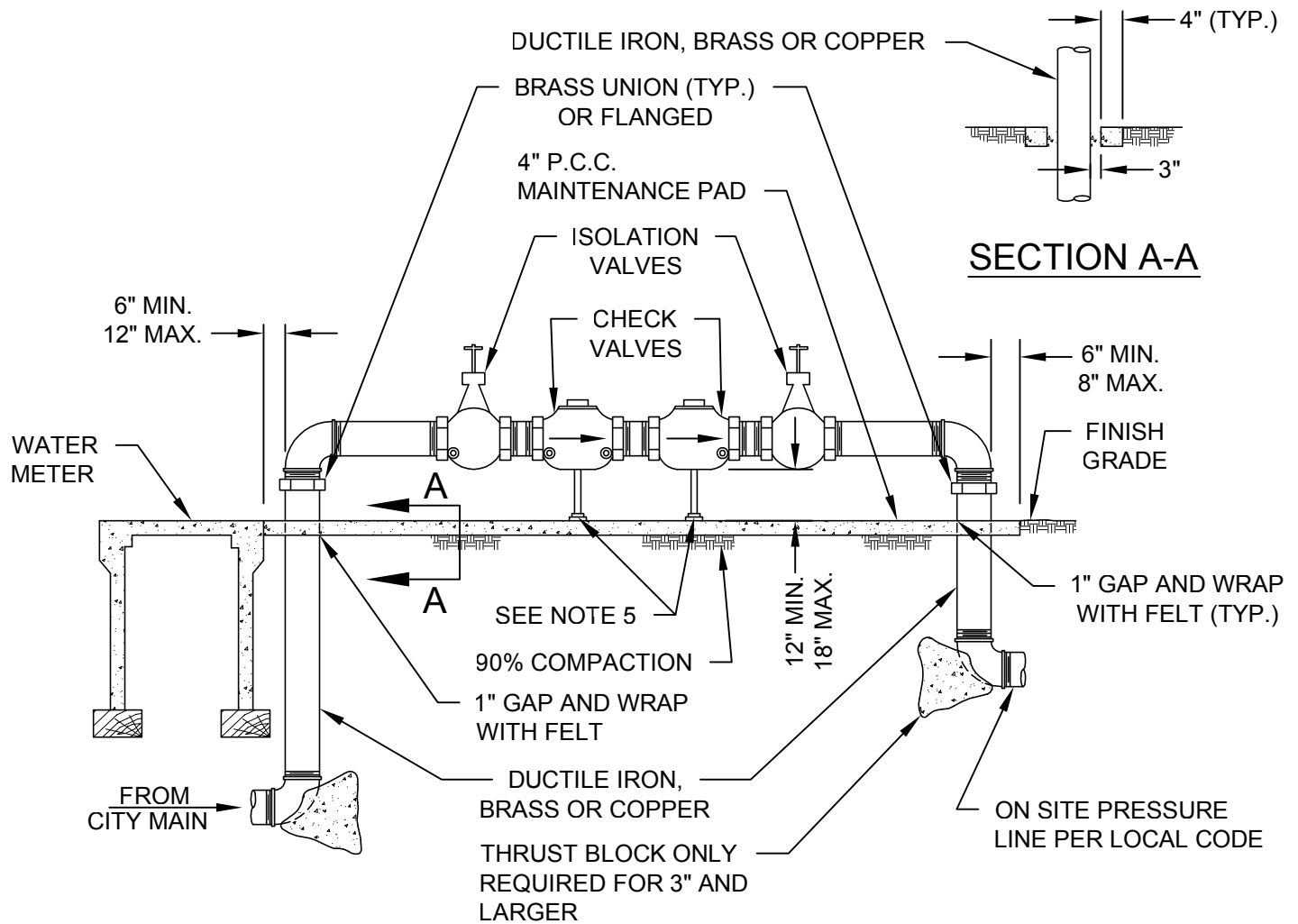
**PROFILE**



**NOTES:**

1. DOUBLE CHECK DETECTOR ASSEMBLY SHALL BE ON THE MOST RECENT LIST APPROVED BY THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES. SHUTOFF VALVES SHALL BE O, S, & Y TYPE (RESILIENT SEAT GATES). UL LISTED FOR FIRELINE SERVICE.
2. THE DOUBLE CHECK DETECTOR ASSEMBLY SHALL BE DELIVERED TO THE PROJECT SITE AS A UNIT ASSEMBLED BY THE MANUFACTURER INCLUDING THE SENSUS SR BY-PASS METER.


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				DWG. NO. 320	January 2014

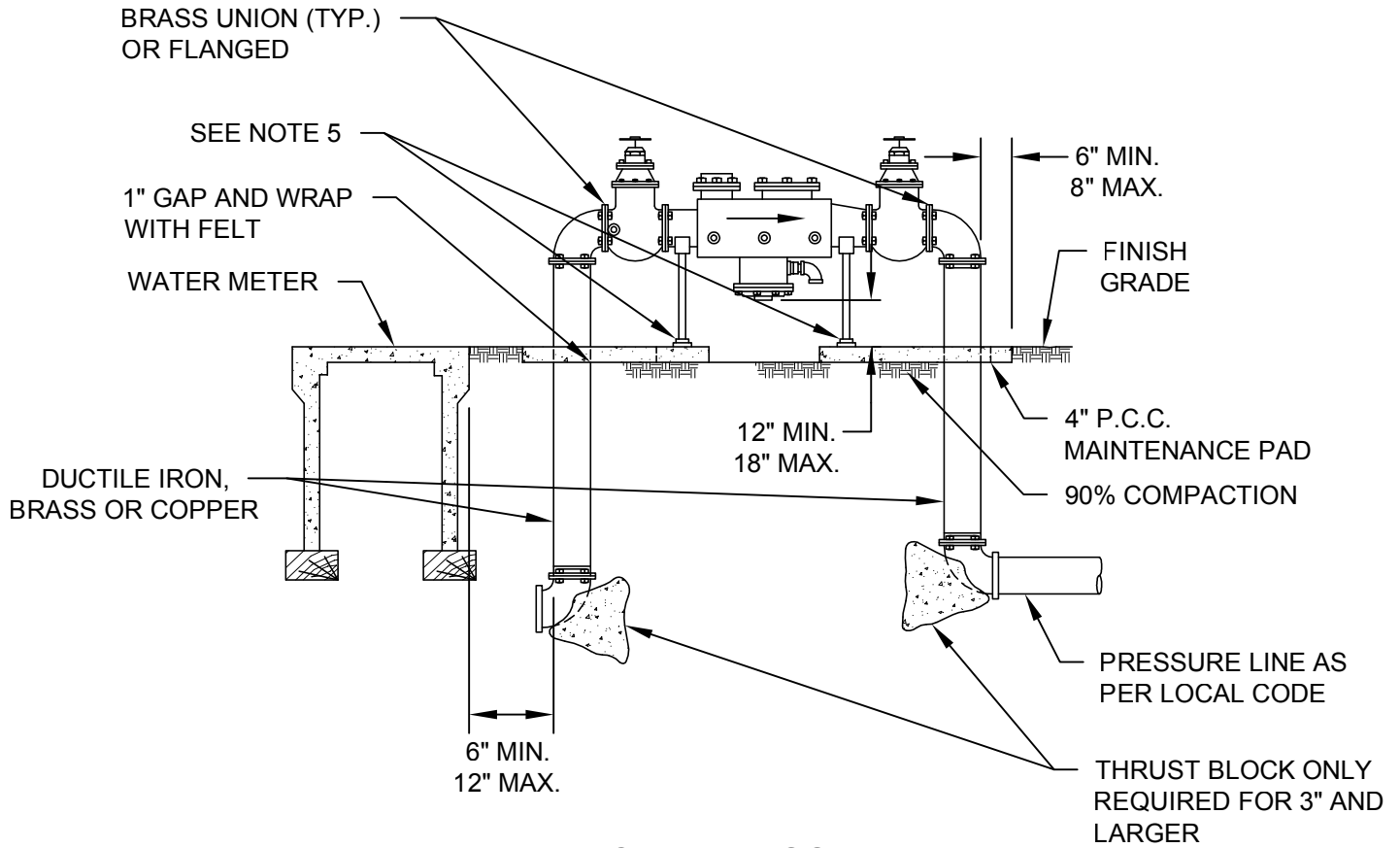


## DOUBLE CHECK VALVE ASSEMBLY

### NOTES:

1. ALL DOUBLE CHECK VALVE ASSEMBLIES AND REDUCED PRESSURE BACKFLOW PREVENTION DEVICES SHALL BE ON THE MOST RECENT LIST OF APPROVED BACKFLOW PREVENTION DEVICES AS PUBLISHED BY THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES. VALVE ASSEMBLY SHALL BE DELIVERED TO THE PROJECT SITE AS A UNIT ASSEMBLED BY THE MANUFACTURER.
2. CITY MAY REQUIRE TWO BACKFLOW PREVENTION DEVICES ON DOMESTIC SERVICE, WITH ONE TO SERVE AS A BYPASS FOR TESTING PURPOSES, IF WATER SERVICE CAN NOT BE SHUT OFF FOR MAINTENANCE OR IF TOXIC CHEMICALS ARE INVOLVED.
3. BACKFLOW PREVENTION DEVICES SHALL BE ONLY REDUCED PRESSURE TYPES FOR ALL LANDSCAPE IRRIGATION APPLICATIONS.
4. COPPER CONNECTIONS SHALL BE COMPRESSION FITTINGS OR SILVER SOLDER (MINIMUM 15% SILVER CONTENT). ALL COPPER SHALL BE RIGID TYPE K.
5. PIPE SUPPORTS SHOULD BE USED IF THE PIPE IS 3" OR LARGER.
6. THE DIAGRAMS DEPICT DOUBLE CHECK/REDUCED PRESSURE ASSEMBLIES LARGER THAN 1 INCH. COMPONENTS SHOWN ARE FOR INFORMATION ONLY.


		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS	DOUBLE CHECK VALVE	
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


## REDUCED PRESSURE BACKFLOW PREVENTION DEVICE

### **NOTES:**

1. ALL DOUBLE CHECK VALVE ASSEMBLIES AND REDUCED PRESSURE BACKFLOW PREVENTION DEVICES SHALL BE ON THE MOST RECENT LIST OF APPROVED BACKFLOW PREVENTION DEVICES AS PUBLISHED BY THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES. VALVE ASSEMBLY SHALL BE DELIVERED TO THE PROJECT SITE AS A UNIT ASSEMBLED BY THE MANUFACTURER.
2. CITY MAY REQUIRE TWO BACKFLOW PREVENTION DEVICES ON DOMESTIC SERVICE, WITH ONE TO SERVE AS A BYPASS FOR TESTING PURPOSES, IF WATER SERVICE CAN NOT BE SHUT OFF FOR MAINTENANCE OR IF TOXIC CHEMICALS ARE INVOLVED.
3. BACKFLOW PREVENTION DEVICES SHALL BE ONLY REDUCED PRESSURE TYPES FOR ALL LANDSCAPE IRRIGATION APPLICATIONS.
4. COPPER CONNECTIONS SHALL BE COMPRESSION FITTINGS OR SILVER SOLDER (MINIMUM 15% SILVER CONTENT). ALL COPPER SHALL BE RIGID TYPE K.
5. PIPE SUPPORTS SHOULD BE USED IF THE PIPE IS 3" OR LARGER.
6. THE DIAGRAMS DEPICT DOUBLE CHECK/REDUCED PRESSURE ASSEMBLIES LARGER THAN 1 INCH. COMPONENTS SHOWN ARE FOR INFORMATION ONLY.


		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS	REDUCED PRESSURE BACKFLOW DEVICES
Rev.	Date			DWG. NO. 330

**REQUIRED BEARING AREA  
TOTAL SQUARE FEET**

FITTING TYPE		45° BEND	90° BEND	22-1/2° BEND	TEE OR DEAD END	TEE W/ PLUG	CROSS W/PLUG
TYPICAL INSTALLATION							
PIPE SIZE	4"	1	2	1	2	2	2
	6"	2	4	1	3	4	4
	8"	5	8	3	6	8	8
	10"	7	14	4	10	14	14
	12"	11	18	6	14	18	18
	16"	19	34	10	23	34	34
	24"	45	83	23	59	83	83




**NOTES:**

1. THRUST BLOCKS TO BE CONSTRUCTED OF 3000 PSI CONCRETE.
2. BLOCKS TO BE POURED AGAINST UNDISTURBED SOIL.
3. THRUST BLOCKS SHALL HAVE CONTACT WITH FITTINGS ONLY AND REMAIN CLEAR OF PIPE AND JOINTS.
4. ALL FITTINGS TO BE SEPARATED FROM JOINTS BY A 3' TO 6' LENGTH OR PIPE.

		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS	HORIZONTAL THRUST BLOCKS	
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# REQUIRED TIE DOWN

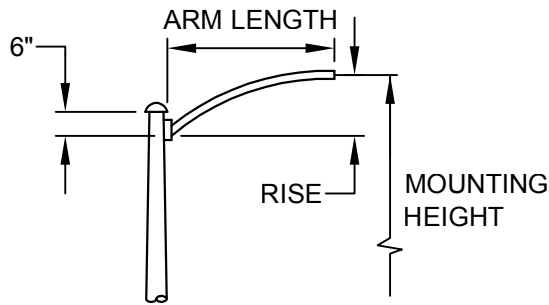
CUBIC FEET OF CONCRETE

FITTING TYPE		22-1/2° BEND	45° BEND	90° BEND
TYPICAL INSTALLATION				
PIPE SIZE	4"	8	27	40
	6"	19	34	60
	8"	31	56	100
	10"	48	89	160
	12"	62	120	220
	16"	121	225	400
	24"	270	530	970

**NOTES:**

1. THRUST BLOCKS TO BE CONSTRUCTED OF 3000 PSI CONCRETE.
2. BLOCKS TO BE POURED AGAINST UNDISTURBED SOIL.
3. THRUST BLOCKS SHALL HAVE CONTACT WITH FITTINGS ONLY AND REMAIN CLEAR OF PIPE AND JOINTS.
4. ALL FITTINGS TO BE SEPARATED FROM JOINTS BY A 3' TO 6' LENGTH OR PIPE.

		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS	VERTICAL THRUST BLOCKS	
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**SINGLE ARM POLE**

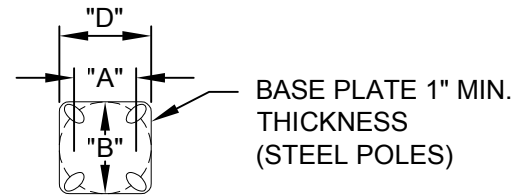
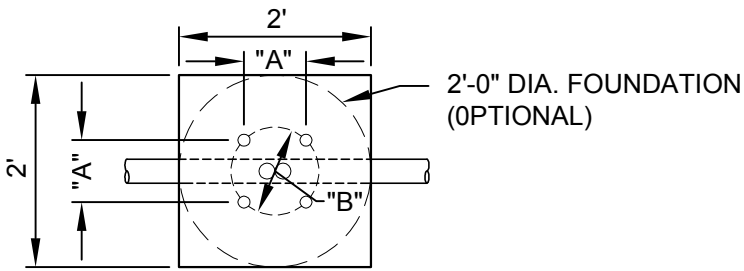
TABLE 1 SINGLE-ARM STEEL POLES

MOUNTING HEIGHT	ARM		CODE	GAUGE	AMERON POLE PRODUCTS	
	LENGTH	RISE			SHAFT SIZE	CAT. NO.
27'-6"	4'	1'-6"	35-7119	10 OR 11	7.5'x3.8"X26'-6"	PL-264
28'-0"	6'	2'-0"	35-7170			PL-266
28'-0"	8'	2'-0"	35-7252			PL-268
32'-6"	6'	2'-0"	35-7120		8.0"x3.7"x31'-0"	PL-316
32'-6"	8'	2'-0"	35-7230			PL-318
35'-0"	6'	2'-0"	35-7122		8.0"x3.4"x33'-6"	PL-336
35'-0"	8'	2'-0"	35-71254			PL-338

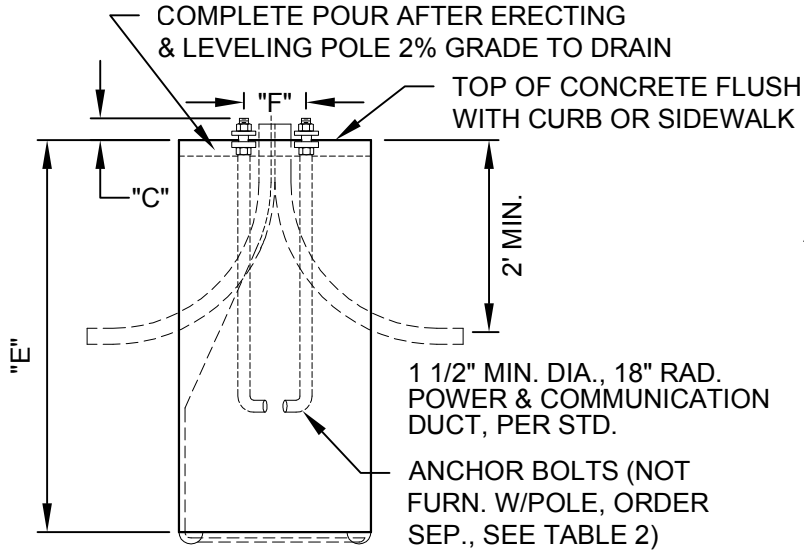
**NOTES:**

- A. POLES SHALL BE IN ACCORDANCE WITH APPLICABLE REQUIREMENTS OF EEI-NEMA STANDARDS FOR STREET LIGHTING POLES, EET PUBLICATION ON. TDJ 135.
- B. ALL STEEL POLES TO HAVE 1/2" SQUARE GROUNDING OR NUT HOLDER IN THE POLE, DIRECTLY OPPOSITE THE HANDHOLE.
- C. ALL STEEL POLES TO BE FURNISHED GALVANIZED. GALVANIZED STEEL POLES AND ANCHOR BOLTS TO BE HOT DIP GALVANIZED PER LATEST REVISION OF ASTM SPEC. A153.
- D. ALL STEEL POLES TO BE FURNISHED WITH HANDHOLE AND HANDHOLE COVER.
- E. POLES TO BE FURNISHED WITH POLE BASE COVERS.
- F. SHIPPING INSTRUCTIONS: SHIP ALL LOOSE PARTS FOR ONE POLE IN ONE PACKAGE.

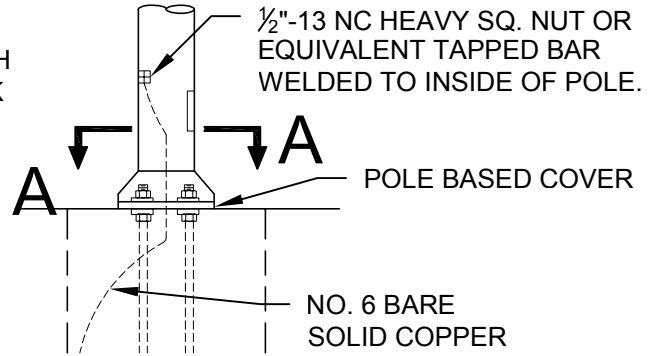
		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS	MAST ARM ASSEMBLIES
Rev.	Date			DWG. NO. 400
				January 2014



**SECTION A-A**  
(COVER REMOVED)



**FOUNDATION**



**BASE DETAILS**

TABLE 2 SIZE	ANCHOR BOLTS CODE
1"x36"x4"	19-0076

TABLE 1 ANCHOR BASE DATA FOR STEEL POLES


STEEL POLE		DIMENSIONS (IN.)							
POLE CODE NO.	MOUNTING HEIGHT	A	B	C	D			E	F
					UNION METAL	AMERON	VALMONT		
35-7119 & 35-7188	27'-6"	7-3/4	11	2-3/4	11-1/2	11-1/2	11-1/2	4'-6"	1"x36"x4"
35-7120 & 35-7189	32'-6"				11-1/2	11-1/2	11-1/2		
35-7122 & 35-7191	35'-0"				11-1/2	11-1/2	11-1/2		

CODE NUMBER PROVIDES FOR SINGLE ANCHOR BOLT, TWO GALVANIZED REGULAR HEX NUTS AND TWO GALVANIZED ROUND WASHERS. ANCHOR BOLTS TO BE FURNISHED WITH 6" MINIMUM THREAD LENGTH.

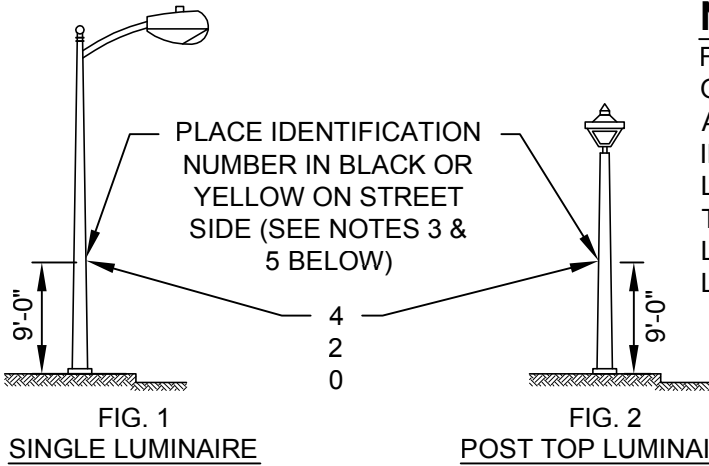
ANCHOR BOLTS TO BE COMPLETELY HOT-DIP GALVANIZED, OR HOT-DIP GALVANIZED ON THREADED END TO 2" MINIMUM BELOW END OF THREADS.

**NOTES:**

- A. WHEN SETTING POLES WITH FLAT STEEL BASES PROVIDE A DRAINAGE HOLE UNDER THE STEEL PLATE TO THE CENTER OF THE POLE. FROM HOLE BEFORE CONCRETE SETS USING A PIECE OF WELDING ROD OR EQUIVALENT.

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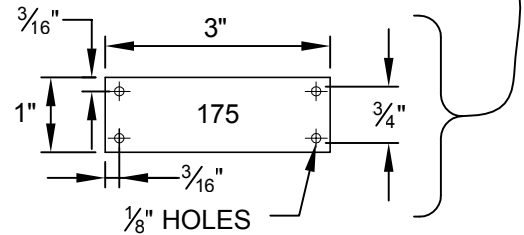
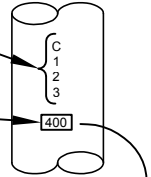




**NOTE:**

FIGURES 1, 2 AND 3 ARE METAL OR CONCRETE POLES OR POSTS. IN THOSE INSTALLATIONS WHERE AESTHETICS IS CONSIDERED IMPORTANT, THE IDENTIFICATION NUMBER MAY BE PLACED ON THE LOWER SIDE OF THE LUMINAIRE IN THE VICINITY OF THE 3x3 LAMP IDENTIFICATION DECAL. ON POST TOP LUMINAIRE, IT MAY BE PUT ON THE BASE OF THE LUMINAIRE OR ON THE POLE BELOW THE LUMINAIRE.

STREET LIGHT IDENTIFICATION NUMBER (SEE NOTE 1 BELOW)  
 LAMP IDENTIFICATION (SEE NOTES 6 & 7 BELOW)



ARRANGEMENT OF NUMBERS ON POLE

TABLE A

LAMP I.D. TAGS MERCURY/HIGH PRESSURE SODIUM LAMP	
TAG MARKINGS	LAMP RATING WATTS
70	70
100	100
150	150
175	175
200	200
250	250
400	400
700	700
1000	1000

TABLE B


NUMERAL ON I.D. DECAL	LAMP WATTAGE
7	70
10	100
15	150
17	175
20	200
25	250
40	400
70	700
X1	1000

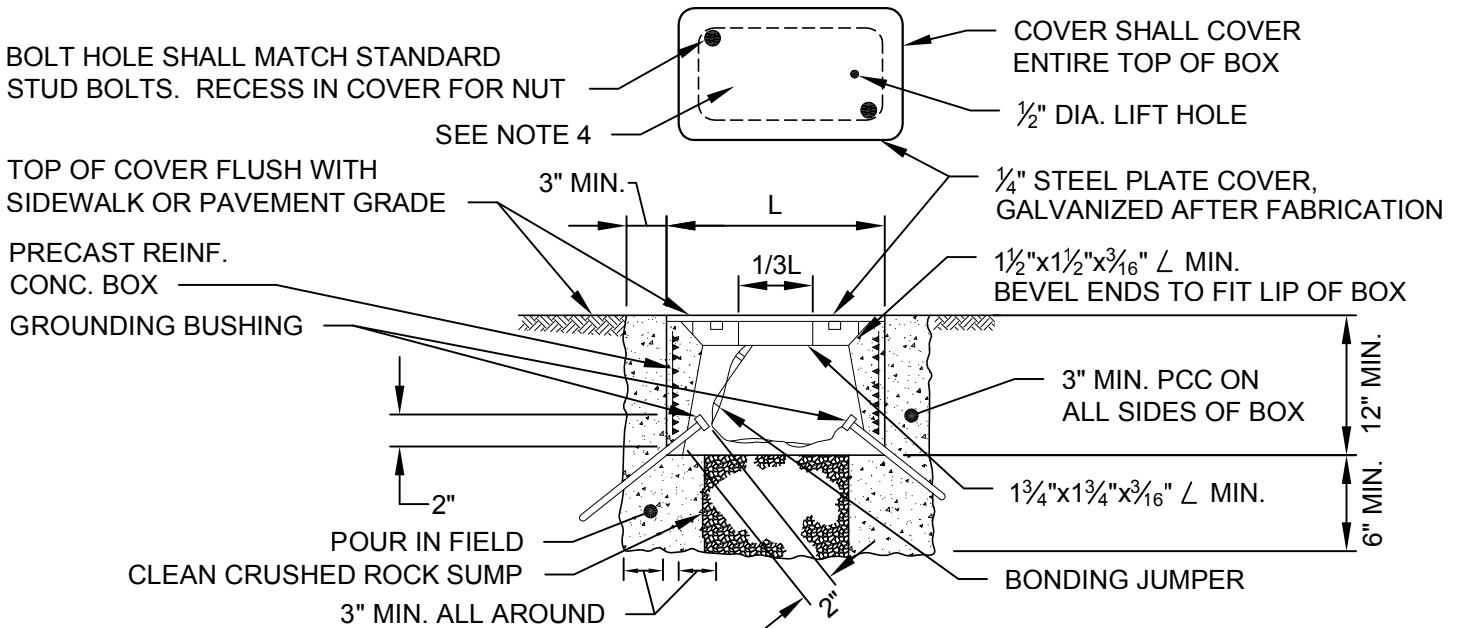
TABLE C

BACKGROUND COLOR ON I.D. DECAL	LAMP TYPE
BLUE	MERCURY
GOLD	HIGH PRESSURE SODIUM
PURPLE	LED

**NOTES:**

1. USE ENAMEL PAINT OR ENAMEL TRANSPARENT STREET LIGHT NUMBERS ON METAL OR CONCRETE POLES OR POSTS. USE 2" LETTERS.
2. USE 2" HIGH ALUMINUM NUMBERS ON WOOD POLES. ATTACH WITH 1 1/2"x0.113" DIA. ALUMINUM NAILS.
3. ON WOOD POLES TAGS ARE ETCHED AND OXIDIZED BLACK. MATERIAL IS NO. 20 GAUGE (0.032 IN. ALUMINUM).
4. ON SPECIAL LAMINATED WOOD POSTS OR POLES MONEL TAPE MAY BE USED.
5. USE BLACK IDENTIFICATION NUMBERS ON LIGHT POLES AND YELLOW IDENTIFICATION NUMBERS ON DARK POLES.
6. USE 1 1/4" ENAMEL PAINT TRANSFERS OR ENAMEL TRANSPARENTS LAMP IDENTIFICATION NUMBERS ON METAL OR CONCRETE POLES OR POSTS.
7. NOT REQUIRED IF THE MANUFACTURER HAS PROVIDED A 3"x3" LAMP IDENTIFICATION DECAL ON THE LOWER SIDE OF THE LUMINAIRE BEHIND THE REFRACTOR. THE IDENTIFYING CODE FOR LAMP WATTAGES AND TYPE IS SHOWN IN TABLES B & C.

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**NO. 3 1/2(T) & NO.5(T) TRAFFIC PULL BOX**  
(CONCRETE BOX ONLY)

**DIMENSION TABLE**

PULL BOX	CONCRETE BOX		PLASTIC BOX		CONCRETE OR PLASTIC COVERS				
	MIN. ** THICKNESS	MIN. DEPTH BOX AND EXTENSION	MIN. ** THICKNESS	MIN. DEPTH BOX AND EXTENSION	L***	W***	R	EDGE THICKNESS	EDGE TAPER
NO. 3 1/2"	1"	NO EXTENSION	5/16"	NO EXTENSION	15 3/8"	10 1/8"	1 1/8"	1 3/4"	1/8"
NO. 5	1"	22"	5/16"	20"	23 1/4"	13 3/4"	1 1/4"	2"	1/8"
NO. 6	1 1/2"	24"	3/8"	20"	30 5/8"	17 5/8"	1 1/4"	2"	1/8"
NO. 6T	2"	11"	DOES NOT APPLY		33"± *	20"± *	0"	1/4"	NONE


\* STEEL COVER

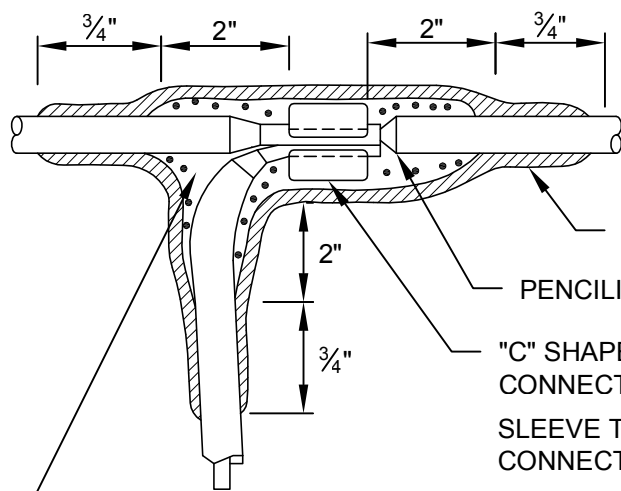
\*\* EXCLUDING CONDUIT WEB

\*\*\* TOP DIMENSION

**NOTES:**

- USE STEEL COVER AND SPECIAL CONCRETE FOOTING, SHOWN, WHEN PULL BOX IS TO BE INSTALLED WHERE SUBJECT TO VEHICULAR TRAFFIC LOADING. STEEL COVER SHALL HAVE EMBOSSED NON-SKID PATTERN.
- TOP OF PULL BOXES SHALL BE FLUSH WITH ADJACENT GRADE, SIDEWALK, CURB, OR OTHER STRUCTURE.
- CONDUIT SHALL NOT EXTEND MORE THAN 3" INTO PULL BOX.
- PULL BOX COVERS SHALL BE MARKED AS FOLLOWS:
  - "SIGNAL" FOR TRAFFIC SIGNAL CIRCUITRY
  - "STREET LIGHTS" FOR STREET LIGHT CIRCUITRY
  - "SPRINKLER-CONTR." FOR SPRINKLER CONTROL CIRCUITRY
- BONDING JUMPER FOR METAL COVERS SHALL BE 36" LONG, MINIMUM.
- PULL BOXES SHALL NOT BE LOCATED IN HANDICAPPED RAMP AREAS OR IN DRIVEWAYS.

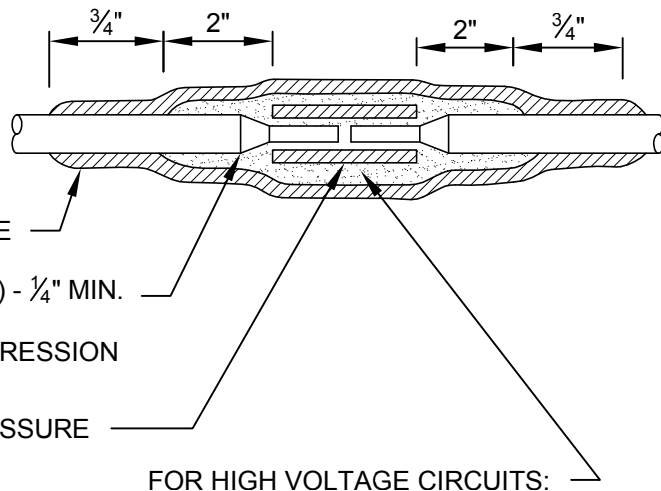
Rev.	Date		SOLANO COMMUNITY COLLEGE DISTRICT STANDARD DETAILS	PULL BOXES	
				DWG. NO. 415	January 2014



FOR LOW VOLTAGE CIRCUITS  
ELECTRICAL FILTER COMPOUND,  
INSULATING PAD OR RUBBER  
TAPE.

### TYPE "C" SPLICE

(BETWEEN 1 FREE-END AND 1 THROUGH CONDUCTOR)

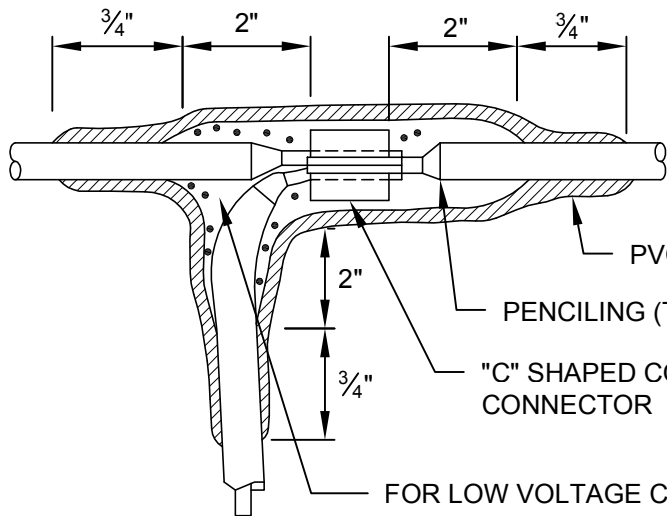


FOR HIGH VOLTAGE CIRCUITS:  
HIGH VOLTAGE TAPE

FOR LOW VOLTAGE CIRCUITS:  
ELECTRICAL FILTER  
COMPOUND, INSULATING  
PAD OR RUBBER TAPE

### TYPE "S" SPLICE

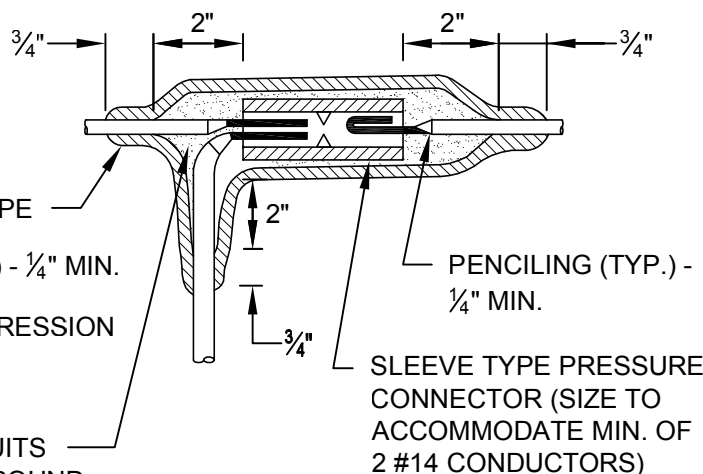
(BETWEEN 2 FREE-ENDS)



FOR LOW VOLTAGE CIRCUITS  
ELECTRICAL FILTER COMPOUND,  
INSULATING PAD OR RUBBER  
TAPE.

### TYPE "T" SPLICE

(FOR 3 FREE-ENDS)



SLEEVE TYPE PRESSURE  
CONNECTOR (SIZE TO  
ACCOMMODATE MIN. OF  
2 #14 CONDUCTORS)

### TYPE "ST" SPLICE

(FOR SIGNAL CONDUCTORS)

Rev.	Date



SOLANO COMMUNITY  
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STANDARD DETAILS

SPLICE DETAILS

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2014

TABLE 1. HORIZONTALLY MOUNTED HIGH PRESSURE SODIUM VAPOR LUMINAIRES

LUMINAIRE DESCRIPTION			LUMINAIRES APPROVED FOR PURCHASE ARE GE OR EQUAL	
LAMP SIZE (WATT)	BALLAST		TWIST LOCK RCPT.	GENERAL ELECTRIC CATALOG NUMBER
	TYPE	RATING VOLTS		
70	REGULATOR	120	YES	M2AR07SIN2AMS22
100	REGULATOR	120	YES	M2AR10SIN2AMS22
200	REGULATOR	120	YES	M2AR20SIN2AMS22


**NOTES:**

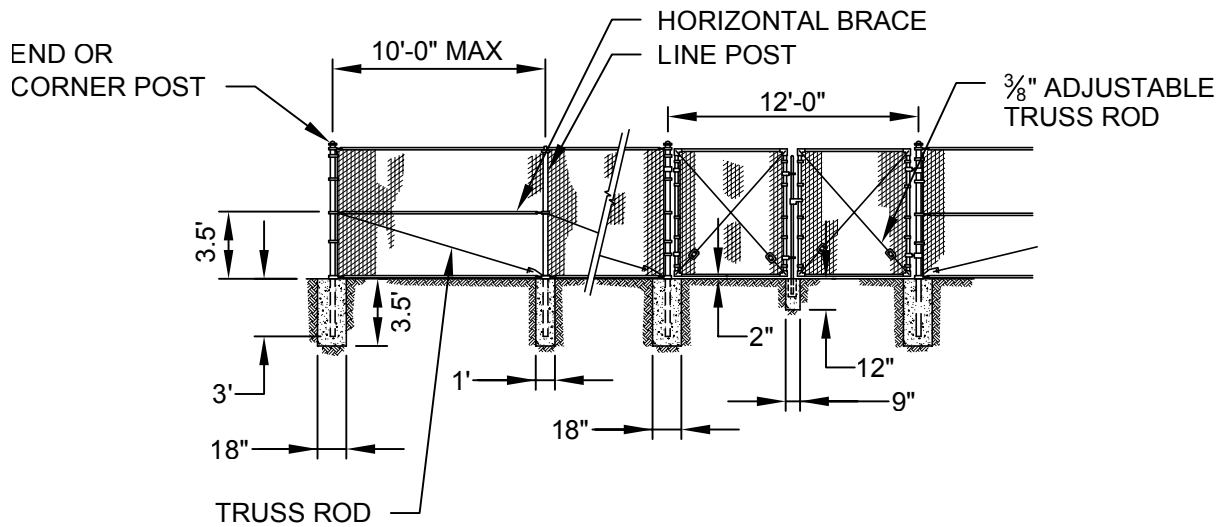
1. ALL DIMENSIONS ARE MINIMAL.
2. RUBBER TAPES SHALL BE ROLLED AFTER APPLICATION.
3. WHEN PVC TAPE IS USED AS FINAL LAYER, PAINT FINISHED SPLICE WITH ELECTRICAL INSULATING COATING.

**INSULATING METHODS:**




LOW VOLTAGE CIRCUITS (0-600 VOLTS)

1. COMPLETELY COVER THE SPLICE AREA WITH AN ELECTRICAL INSULATING COATING AND ALLOW TO DRY.
2. APPLY 2 LAYERS OF ELECTRICAL INSULATING PAD WITH MINIMUM THICKNESS OF 1/8" EACH LAYERS OR 2 LAYERS, HALF LAPPED, SYNTHETIC OIL RESISTANT, SELF FUSING RUBBER TAPE.
3. APPLY 3 LAYERS HALF LAPPED PVC TAPE.

		 <b>SOLANO</b> COMMUNITY COLLEGE	SOLANO COMMUNITY COLLEGE DISTRICT  STANDARD DETAILS		SPLICE NOTES	
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### 6' CHAIN LINK FENCE

TYPICAL MEMBER DIMENSIONS						
LINE POSTS		CORNER	GATE	END POSTS	TOP RAIL & BRACES	
ROUND	ROLL FORM	ROUND			ROUND	
2 3/8" O.D. 3.65 #/FT	2.25"x1.7" 2.64 #/FT	2 7/8" O.D. 5.79 #/FT	3 1/2"x3 1/2" 5.14 #/FT	3"x3"	1 5/8" O.D. 2.27 #/FT	1 1/4" x 1 5/8" 1.35 #/FT

### NOTES:

- FABRIC SHALL BE 9 GAUGE 3 1/2"x5 1/2" MESH WITH PLASTIC PICKETS 2 1/2"x3/8" ATTACHED TO FABRIC USING TWO GALVANIZED STAPLES (CRIMPED ON BACK SIDE). TOP & BOTTOM SELVAGES TO BE KNUCKLED. PLACE FABRIC ON PUBLIC SIDE.
- FABRIC TO BE ATTACHED TO END & CORNER POSTS USING 1/4"x3/4" STRETCHER BARS.
- BOTTOM TENSION WIRE SHALL BE 7 GAUGE GALVANIZED STEEL COIL SPRING WIRE. FABRIC TO BE ATTACHED TO TENSION WIRE USING 9 GAUGE HOG RINGS AT 18" SPACING.
- FABRIC TIES-(a) TO POST USE 6 GAUGE STEEL POST CLIPS OR 9 GAUGE GALVANIZED STEEL WIRE TIES AT 14" SPACING (b) TO TOP RAIL USE 9 GAUGE GALVANIZED STEEL WIRE TIES AT 14" MAX. SPACING.
- TRUSS RODS SHALL BE ADJUSTABLE 3/8" GALVANIZED STEEL RODS.

Rev.	Date		SOLANO COMMUNITY COLLEGE DISTRICT STANDARD DETAILS	CHAIN LINK FENCE	
				DWG. NO. 500	January 2014