

SECTION 33 40 00
STORM DRAINAGE
Construction Specification

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 City of San Mateo; City of Redwood City, City of San Bruno, or State of California Department of Transportation.
1. Storm drain piping.
 2. Storm drain structures including curb inlets, catch basins, area drains, cleanouts, and manholes.
 3. Storm drain outfalls.
 4. Culverts and headwalls.
 5. Storm drain pump station.
- B. Contractor shall provide all labor, equipment, and materials, unless otherwise noted.
- C. Related Sections:
1. Section 02315 – Trenching, Backfilling, and Compacting.
 2. Section 32 50 00 – Restoration Of Surfaces

San Mateo County Community College District is strongly committed to promoting sustainability throughout their campus projects. Section 01 81 13 Sustainability of the Design Standard provides guidelines and recommendations for implementing sustainability strategies. Where relevant, specific sustainability criteria is noted in this section; however, each project team should review and cross reference that front section while developing the specific project and its documentation. Each discipline shall confirm that specific performance and manufacturer information provided in the specification section is in alignment with code requirements, LEED criteria, and any other goals for sustainability.

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 San Mateo Standard Plans and Specifications.
 - 4. American Association of State Highway and Transportation Officials (AASHTO) for H2O Loading.
 - 5. American Concrete Institute (ACI).
 - 6. 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 8 inch - 60 inch (ADS N-12 1B WT pipe or equivalent)
- D. PVC Perforated Pipe: PVC Perforated Pipe shall conform to ASTM D-3034, SDR 26, solvent weld joints for pipe sizes 4", 6" and 8". Perforations shall be 2 rows of ½" holes on 5" centers, 120° apart.

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 Nyloplast drain basin or approved equal.
- 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 "SDCO"; 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 "upgrade" 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 DVD format. The original Disks 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 SECTION