

SECTION 02630 STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes specifications for storm drainage systems including modifications and connections to existing storm drainage systems.

1.02 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO):
1. M36 Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
 2. M190 Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
 3. M218 Specification for Steel Sheet, Zinc-Coated (Galvanized), for Corrugated Steel Pipe
- B. American Society of Testing and Materials (ASTM International):
1. A36 Specification for Carbon Structural Steel
 2. A48 Specification for Gray Iron Castings
 3. A307 Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
 4. B26 Specification for Aluminum-Alloy Sand Castings
 5. C76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
 6. C150 Specification for Portland Cement
 7. C270 Specification for Mortar for Unit Masonry
 8. C443 Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
 9. C478 Specification for Precast Reinforced Concrete Manhole Sections
 10. C882 Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear

11. D1785 Specification for Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
 12. D2564 Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
 13. D2855 Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings
- C. American Water Works Association (AWWA):
1. C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 2. C115/A21.15 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
- D. State of California Department of Transportation Standard Plans (Caltrans)
- E. State of California Department of Transportation Bridge Design Specifications (Caltrans)

1.03 SUBMITTALS

- A. Submit manufacturer's data for pipe, structures, trench drains, and appurtenances.
- B. Submit trench drain installation procedure including anchor method.

PART 2 – PRODUCTS

2.01 PIPE

- A. Reinforced Concrete Pipe:
1. Pipe: ASTM C76, bell and spigot type, Class V, Wall C, unless otherwise indicated
 2. Rubber Gaskets: ASTM C443, oil resistant.
 3. Cement for Concrete Pipe: ASTM C150, Type II
- B. Polyvinyl Chloride (PVC) Pipe:
1. Pipe: ASTM D1785, Type I, Schedule 80
 2. Provide fittings, such as adapters, couplings, tees and caps of same material as pipe
 3. Cements: ASTM D2564
- C. Ductile Iron Pipe:

1. Pipe: AWWA C151, Class 56. Cement lining is not a requirement for ductile iron being used for storm drainage.
 2. Joints: AWWA C111, push-on type.
- D. Corrugated Metal Pipe:
1. Pipe: AASHTO M36, Type II. Metal thickness shall be 12 gage for 36 inch diameter pipes or larger and 14 gage for smaller diameter pipe. Pitch shall be 2-2/3 inch by 1/2 inch. Pipe, coupling bands and other components shall be bituminous coated in accordance with AASHTO M190.
 2. Corrugated metal coupling bands: AASHTO M36, Section 20. Coupling bands may either be one or two piece construction. Coupling bands shall not be more than two thickness' (as listed in AASHTO M218, Table 4), lighter than the thickness of the pipe to be connected and in no case lighter than 0.064 inch. Bolts and nuts for coupling bands shall conform to ASTM A307.

2.02 DRAINAGE STRUCTURES

- A. Unless otherwise indicated, precast concrete drainage structures shall conform to ASTM C478, supplemented by the following:
1. Portland cement: ASTM C150, Type II A
 2. Mastic gaskets at joints of precast concrete sections shall be Kent Seal No. 2 joint sealant or Engineer approved equal.
- B. Fabricate precast concrete catch basins to the sizes indicated on Contract Drawings. Unless otherwise indicated by in Contract Drawings, catch basins shall have a minimum sump of 24 inches measured from the lowest inlet/outlet pipe invert indicated on the Contract Drawings to the bottom slab of the structure (interior face).
- C. Drainage inlets (Catch Basins or Grate inlets): Caltrans Standard Plans, Drainage Inlet, Standard Type G1, unless otherwise noted. Drainage inlets may be cast-in-place concrete or equivalent precast inlets.
- D. Fabricate frames and covers with provisions for adjustment to grade.

2.03 CEMENT MORTAR

- A. Cement mortar: ASTM C270, Type M, fabricated with ASTM C150, Type IIA Portland Cement. Use cement mortar for brick and concrete work, grout collars for pipe connections to structures, lifting holes and other locations indicated in the Contract Documents.

2.04 NON-SHRINK GROUT

- A. Non-metallic, fast setting, waterproof, non-shrink, cement-based.

- B. Minimum compressive strength at 28 days: 5000 psi.
- C. Minimum bond strength: As required to store full bond to reinforcing bars and concrete surfaces, but not less than 3000 psi at 7 days per ASTM C882.
- D. Wire Mesh Wrapping: 12 gauge galvanized steel; 2 inches square welded grid pattern.
- E. Bonding Agent: Solvent-free moisture-insensitive structural epoxy adhesive; recommended for bonding fresh concrete or repair mortar to steel or hardened concrete.

2.05 FRAMES, COVERS, AND GRATINGS FOR DRAINAGE STRUCTURES

- A. Frames, Grates, and Covers: ASTM A48, Class 30, cast iron. Castings shall withstand H20 loadings requirements as defined in Caltrans Bridge Design Specifications.
- B. Provide appropriate Caltrans standard grates for Caltrans standard inlets. Where standard inlets of a jurisdictional authority are used, provide frames, grates, and covers in accordance with that jurisdictional authority's standards.
- C. Place concrete collars around all drainage structure castings.

2.06 TRENCH DRAINS AND DOWN SPOUTS

- A. Trench Drain and Down Spout: ASTM A36. Comply with ADA guidelines; 1/2 inch maximum slot openings. Trench trough, overlap splice, anchors, and down spout pipe shall be steel, galvanized after assembly of each trench section. Fabricate trench drain corners using mitered sections of trough, welded. Trench drain trough and trench grate shall be as shown in the Contract Documents or equal.
 - 1. Trench drain trough: 11 gage steel
 - 2. Down spout pipe wall thickness: 0.12 inches
 - 3. Cast iron trench grates: ASTM A48. Grates shall be cast iron unless indicated as cast aluminum in the Contract Documents.
 - 4. Cast aluminum trench grates: ASTM B26

PART 3 - EXECUTION

3.01 PIPE INSTALLATION

- A. General:
 - 1. Perform trench excavation, backfill, and related earthwork as specified in Section 02300, Earthwork.

2. Examine each pipe prior to laying. Use no defective or damaged pipe. Lay pipe to the elevations, inverts, grades, and alignment as indicated on the Contract Drawings.
 3. Provide proper equipment for lowering sections of pipe into trenches.
 4. Under no circumstances lay pipe in water. Do not lay pipe when trench conditions or weather are unsuitable for such work.
- B. Laying Pipe:
1. Lay corrugated metal pipe with the outside laps of circumferential joints pointing upstream and with longitudinal laps on the sides. Cut pipe requiring cutting by mechanical means only (no torch burning or cutting is allowed). Remove burrs and ragged edges from edges of cut pipe.
 2. Lay pipe upgrade, unless otherwise noted.
- C. Joining Pipe:
1. Lay drainage pipe with the separate sections joined firmly together.
 2. Keep the space between the pipe and connecting bands or joints free from dirt and grit so that the connections fit snugly.
 3. Protect jointing materials from the air and sun to prevent drying or deterioration.
 4. Join PVC pipe in accordance with ASTM D2855.
- D. Repair or Replacement of Pipe:
1. Repair bituminous coating on corrugated metal pipe and connecting bands that has been damaged or scored during culvert installation equal to original coating prior to backfilling. Make repairs in accordance with the manufacturer's specifications.
 2. Remove and replace pipe which has been damaged to such extent that satisfactory field repairs cannot be made.

3.02 DRAINAGE STRUCTURES

- A. Set drainage structures in the proper location at the invert elevations indicated on the Contract Drawings with rim at the proper elevation. Set structures plumb and true on well compacted gravel base. Provide for adjustment of frames and covers using precast concrete rings or bricks, with a cement mortar or non-shrink grout to close the opening between the frame and structure. Under no condition remove a portion of the structure to allow adjustment of the frame and cover or grate to the proper grade.
- B. Install precast reinforced concrete drainage structures in a manner to ensure watertight construction. Repair or replace precast concrete units as required to obtain watertight construction. Install risers and tops using approved gaskets

for sealing joints. Install units level and plumb. Prevent water from rising over newly made joints until after joints have been inspected and accepted. Make joints water tight.

- C. Perform field cutting of openings in the precast utility structure risers so as not to damage the riser. Replace damaged risers. Install risers and tops with the steps in alignment.
- D. Install catch basins so as to preclude sediment from any tributary areas from entering the basins until such areas have been stabilized.
- E. Where new pipe manholes or pipe inlets are located in areas to be paved or surfaced, construct no individual structure to final grade until the paving or surfacing has been completed immediately adjacent to said structure.

3.03 EXISTING DRAINAGE SYSTEMS

- A. Cleanly cut new openings in existing drainage structures, to accept new pipe. Carefully install the new piping and join the new pipe to the existing structure. Make connection using an appropriate saddle where indicated in the Contract Drawings, or grouted as required to provide a neat, sturdy, watertight connection. Make connection in accordance with the standards of the agency having jurisdiction over storm drainage system. Repair any existing or new pipes or structures damaged as a result of the Contractor's work.
- B. Seal abandoned storm drain lines which are not removed with masonry plugs.

END OF SECTION