SECTION 33 40 00

STORM DRAINAGE UTILITIES

1. PART 1 GENERAL

1.1 RELATED WORK

A. Section 31 23 00: Excavation and Fill

B. Section 32 00 01: Site Restoration and Rehabilitation

C. Special Conditions for Water Discharge Management and Environmental Pollution Prevention

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A615 Deformed and Plain Billet-Steel Bars for Reinforcement.
   2. B32 Solder Metal.
   3. C76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
   5. C478 Precast Reinforced Concrete Manhole Sections.
   7. D3034 Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
   8. D2729 Perforated PVC Drain Pipe.
   9. F2648 High Density Polyethylene Pipe (HDPE)
   10. DMS 6200 Filter Fabric

B. California Department of Transportation (Caltrans) Standard Specifications:
   1. Section 51 Concrete Structures
   2. Section 52 Reinforcement
   3. Section 55 Steel Structures
   4. Section 61 Culvert and Drainage Pipe Joints
5. Section 62 Alternative Culverts
6. Section 63 Cast in Place Concrete Pipe
7. Section 64 Plastic Pipe
8. Section 65 Reinforced Concrete Pipe
9. Section 68 Subsurface Drains
10. Section 70 Miscellaneous Facilities
11. Section 72 Slope Protection
12. Section 75 Miscellaneous Metal
13. Section 90 Portland Cement Concrete

C. California Code of Regulations Title 8, Industrial Relations and CAL/OSHA Construction Safety Orders

1.3 SUBMITTALS

Provide manufacturers specification and literature for all material furnished.

1.4 DELIVERY AND HANDLING

A. General: Reinforced concrete pipe, precast concrete manhole sections, inlet frames and grating, and fittings must be handled carefully at all times. Only suitable and proper equipment and appliances shall be used for the safe loading, hauling, unloading, handling, and placing of materials. Material that is checked, spalled, or damaged shall not be installed and must be permanently removed from the job site.

2. PART 2 PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) PIPE

A. Polyvinyl chloride pipe and fittings shall conform to ASTM D3034, SDR 35 with bell and spigot type rubber-gasketed joints.

2.2 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

A. High Density Polyethylene pipe and fittings shall conform to ASTM F2648, ASTM 3212 and ASTM C969 with watertight bell and gasketed joints. One foot minimum cover shall be provided over the pipe crown for 4 inch through 48 inch diameter pipes installed in traffic areas (AASHTOP H-25 or HS-25 loads). Backfill envelope shall conform to the requirements of ASTM D2321.

2.3 REINFORCED CONCRETE PIPE (RCP)
A. Reinforced concrete pipe 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.

2.4 PERFORATED UNDERDRAIN

A. Perforated underdrain shall be polyvinyl Chloride (PVC) pipe up to and including 15 inches in diameter, conforming to ASTM D3034, SDR 26.

2.5 CATCH BASINS AND MANHOLES

A. Precast drainage structures shall conform to Sections 70-1.02H and 71-1.03 of the CDT Standard Specifications and ASTM C478 and shall be of the size and shape shown on the drawings. Equivalent poured-in-place structures may be used at Contractor's option.

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 24" clear opening with the words "STORM DRAIN" in letters not less than 2" high cast into the cover (except where grated covers are shown on the drawings). Manhole frames and covers shall be Stanford University “Rosette” pattern as supplied by D&L Supply, manufactured in the United States. Foreign made frames and covers will not be accepted.

C. Grates for catch basins shall have reticuline bars as shown on the plans suitable for use in areas with bicycle traffic. Area drains in non-paved areas shall have a “beehive” type grate by East Jordan Iron Works, part No. 3715 or equivalent.

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.

2.6 PORTLAND CEMENT CONCRETE

A. Concrete shall be Class A concrete conforming to Section 90 of the CDT Standard Specifications.

B. Cement shall be Type II cement conforming to ASTM Designation C150 as modified by Section 90 of the CDT Standard Specifications.

C. Aggregate shall be 3/4" maximum size conforming to Section 90 of the CDT Standard Specifications.

D. Water shall be clear and free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substances.

E. Reinforcing bars shall conform to the requirements of ASTM A615 Grade 40 and deformed in accordance with Section 52 of the CDT Standard Specifications.

F. No admixtures will be allowed without prior approval of the Water Shop.
2.7 SLOTTED EDGE DRAIN

A. The slotted edge drain pipe sections and hugger bands will be purchased from Contech by the Contractor. The slotted edge channel is to be primed and painted black prior to installation.

B. An alternative joint sealant or sealing method that will provide a watertight joint may be used provided said alternative sealant or method is approved, in writing, by the Water Resources and Civil Infrastructure representative.

2.8 FILTER FABRIC

A. Filter fabric may be one of the following:

1. Mirafi 140N
2. Typar four (4) oz.
3. True Tex MG-100
4. Bidim C-22

2.9 ROCK SLOPE PROTECTION

A. Rock slope protection shall conform to the requirements of CDT Section 72. Facing rock, method B placement shall be used in the Stanford Avenue, Serra Street and Galvez Street ditches.

2.10 STORM DRAIN MARKINGS

A. Metal storm drain markings shall be Almatek Industries, Inc. 4-inch diameter round aluminum disc markers in blue embossed with the fish symbol and text, NO DUMPING DRAINS TO BAY.

B. Thermoplastic storm drain markings shall be Hi-Way Safety sized 29 inches wide by 5 inches tall with the fish symbol and text, NO DUMPING! DRAINS TO BAY.

3. PART 3 EXECUTION

3.1 PIPE INSTALLATION:

Pipe shall be installed in conformance with Section 31 23 00 – Excavation and Fill.

A. No pipe shall be laid until the Water Shop's representative inspects and approves the condition of the bottom of the trench. Pipe laying shall proceed upgrade with the spigot section of bell and spigot pipe pointing in the direction of flow.

B. All above-grade piping shall be securely attached to building wall or anchored to ground as required to maintain the grades shown on the drawings.
C. All new connections to the storm drain system shall be made at manholes or catch basins, unless otherwise expressly approved by the Water Resources and Civil Infrastructure representative.

3.2 SLOTTED EDGE DRAIN

A. Trench: Trench excavation for the slotted edge drain will be completed during the roadway excavation phase at the cost of the Contractor.

B. Pipe: Slotted edge drain and hugger bands shall be stored, handled and laid in such a manner as to prevent bruising, scaling or breaking of the surface or protective coating.

1. The Contractor shall develop and propose a method for positioning the slotted edge drain to the specified line and grade shown on the plans prior to placing the concrete encasement. The top of the slotted edge drain shall not deviate from the specified horizontal position more than 1/2 inch per 20 foot section of pipe. The vertical position of the pipe shall conform to the slopes shown on the plans.

2. The pipe slot shall be covered with a heavy duty tape or other covering, approved by the Project Administrator, prior to placing the concrete encasement and any paving operations to prevent infiltration of material into the pipe.

C. Concrete Encasement: Concrete Encasement for the slotted edge drain shall be placed in accordance with the details shown on the plans and shall conform to the requirements for Class C concrete in Section 90, "Portland Cement Concrete", of the CDT Standard Specifications. Concrete Encasement shall be placed against the bottom and undisturbed sides of the trench or forms, and consolidated in a manner that will prevent floating or shifting of the pipe, and voids in, or segregation of, the concrete. Where necessary, earth plugs shall be constructed and compacted at the ends of the planned concrete backing to contain the concrete within the trench. Foreign material which falls into the trench, prior to or during placing of the concrete, shall be immediately removed.

D. Loads shall not be placed on the Concrete Encasement sooner than 8 hours after placement.

3.3 POURED-IN-PLACE CONCRETE

A. All 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 Standard Specifications. Unless otherwise noted herein, all exposed surfaces of structure shall have a Class 1 surface finish.

C. Curing shall conform to applicable portions in Section 90 of the 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 Construction Administrator 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 (6’0”). Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

3.4 TRENCH DRAIN

A. The trench drain shall be excavated and lined with filter fabric with a twelve inch (12”) overlap on the top of the trench. The perforated pipe shall be installed with perforations down and backfilled with class I permeable material per Section 68-1.025 of the Caltrans Standard Specifications.

3.5 FIELD QUALITY CONTROL

A. Prior to the encasement of the slotted edge drain pipe, the Contractor shall have the Field Surveyor verify the accuracy of the alignment and grade of the pipe. All adjustments to the alignment and grade shall be the Contractor's responsibility before the pipe is encased.

3.6 GRADE ADJUSTMENTS TO SURFACE STRUCTURES

A. Frames, Grates and Covers

1. Frames, grates and covers of all surface structures (manholes, drain inlets, catch basins, etc.) shall be adjusted to within 1/8” +/- of proposed finish grade. Grade rings shall be supplied and installed as required.

2. Frames of new or adjusted surface structures shall be supported by concrete with minimum dimensions as follows: 12 inches wide by 10 inches deep in paved areas, and 6 inches wide by 10 inches deep in non-paved areas.

B. Structures Within Paved Areas

1. A structure located in an area to be resurfaced with asphaltic concrete shall not be constructed to final grade until the adjacent pavement or surfacing has been completed.

2. The Contractor shall be responsible for referencing structures prior to paving and locating them after paving operations are complete.

3. After asphaltic concrete resurfacing is complete, the asphalt shall be cut out six inches (6”) wider than the frames of all surface structures. Each frame shall then be raised to finished grade (sloped as necessary) and concrete shall be placed to approximately 1-1/2 inches below finish grade as noted above. After the concrete collar has cured, a tack coat shall be applied and asphaltic concrete placed to finish grade.

3.7 FLUSHING CLEANING AND VIDEO INSPECTION
A. General

1. After all backfilling and pavement restoring operations have been completed, the Contractor shall flush, clean and perform a video inspection of all new storm drain lines, including service laterals, under the supervision of the Water Shop's representative.

2. During the flushing and cleaning operation, a wire screen with a 1/4 inch mesh or smaller shall be placed over the downstream outlet of the lower manhole to prevent any debris from being washed into the existing storm drain system.

3.8 REMOVING AND ABANDONING EXISTING STORM DRAINS AND RELATED STRUCTURES

A. General

1. Contractor shall remove, plug and fill, or break open, storm drains and related structures as shown on the plans, or where necessary for the proper completion of the work, including all excavating, backfilling, restoring pavement, and other incidental work.

2. All openings and outlets of storm drains or related structures abutting sections to be removed or broken open shall be satisfactorily sealed at all open ends with caps or concrete and all contained storm runoff and debris removed unless otherwise specified.

3. Inverts of partially removed storm drains, manholes and structures shall be broken open to freely drain, and the facility backfilled, or if specified, filled with slurry grout.

B. Remove

1. Existing storm drains, manholes, structures and appurtenances, including laterals, which have been or are to be abandoned, and lie within a storm drain trench or structure excavation, shall be removed from within the limits of required excavation necessary for the work.

2. All storm drains, manholes, structures and appurtenances, except laterals, identified to be removed shall be removed to a depth of at least three feet below finished grade and broken in a manner that will prevent water entrapment, and all contained storm runoff and debris removed.

C. Abandon
1. All storm drains identified to be abandoned shall be plugged and filled as described below.

   a. **Plug and Fill:** Main storm drains to be abandoned, which lie three feet or deeper below street grade or ground surface, shall be thoroughly sealed at all open ends, and at the structures in which they terminate, as applicable, and shall be filled with an approved slurry grout.

      The plugging at the ends of storm drains to be filled with slurry grout may be accomplished by the use of temporary plugs or bulkheads which shall be removed after the slurry mix has set.

   b. **Plug:** Storm drain mains and laterals to be plugged shall be sealed at all open ends and at the structures in which they terminate, as applicable, with 12-inch thick concrete plugs.

   c. **Fill with Slurry Grout:** Storm drains and related structures to be plugged and filled shall be filled with a slurry mixture containing a minimum of 2 sacks of Type II cement per cubic yard of mixture.

      Filling with slurry may be accomplished by pumping or gravity, at the option of the Contractor, and will be checked by comparing the computed volume of the storm drain with the volume of mixture used. If the computed volume is more than 10 percent greater than the actual volume of slurry used, the Contractor shall excavate two exploratory holes where directed, and shall do all work necessary to satisfactorily fill any encountered voids.

      Any damage to existing facilities resulting from the use of slurry grout shall be satisfactorily repaired by the Contractor at his own expense and no direct or additional payment will be made for such repair.

      Storm drain laterals shall not be filled with slurry grout, unless specified.

3.9 INSTALLING STORM DRAIN MARKINGS

Contractor shall furnish and install storm drain markings on all new or modified existing storm drain inlets and catch basins, and those that are within the boundaries of a construction or pavement project.

   A. Metal storm drain markers shall be installed with manufacturer’s recommended adhesive on curbs where storm drain inlets and catch basins are located. These markers shall be installed on center with the storm drain inlets and catch basins on top of the curb and offset one inch away from the edge of curb.
B. Thermoplastic storm drain markings shall be installed per the manufacturer’s installation methods on asphalt surfaces at storm drain inlet and catch basin locations where there are no curbs.

END OF SECTION