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SECTION 39 MANHOLES

39-1 GENERAL

Sewer and storm drain manholes, consisting of precast concrete manholes or saddle manholes as shown on the Plans, shall be in accordance with these Specifications.

39-2 PRECAST CONCRETE MANHOLES

39-2.01 Precast Concrete Sewer Manholes

Precast sewer manhole barrels, risers, cones, flat tops, and grade rings shall conform to ASTM Designation: C 478 with the additional requirement that the cement used shall be Type II. Sewer manhole sections shall be manufactured without the provision for steps.

Flat slab tops shall be constructed of Class "A" concrete conforming to Section 50-5, "Portland Cement Concrete", of these Specifications and shall conform to either Standard Drawing 7-2B (for a Type B standard sixty-inch (60") sewer manhole) or Standard Drawing 7-2D (for a Type B standard seventy-two-inch (72") sewer manhole).

Sewer manhole bases may be precast or cast-in-place. If precast, sewer manhole bases shall be placed on a minimum of four inches (4") of three-quarter-inch (3/4") maximum size crushed rock. Stubs or couplings provided in precast bases shall be of the same material as the pipe to which they connect, unless otherwise approved by the Agency. Connections shall be made to sewer manholes using a resilient connector conforming to ASTM Designation: C 923 such as Kor-N-Seal, A-LOK, or approved equal. Mortar used in finishing the sewer manhole and the method of placement shall conform to Section 51-1.135, "Mortar", of the State Specifications. The surface finish shall conform to Section 51-1.18A, "Ordinary Surface Finish", of the State Specifications. TV channels conforming to Standard Drawing 7-1A and 7-1B are required for all eight inch (8") and ten inch (10") collector lines.

Precast sewer manhole barrels shall consist of cylindrical sections, all with joints, slab tops, and base construction as detailed on Standard Drawings 7-1 and 7-2A through 7-2E.

Elevation differentials of inlets and outlets shall conform to the Plans. Channelization shall conform to Standard Drawings 7-1, 7-1A, 7-1B and 7-2A through 7-2D, and these Specifications. The use of a precast base with six-inch (6") stubs for the connection of four-inch (4") service sewers is not allowed. If a precast base is installed with a sewer manhole at the end of a cul-de-sac, it shall be manufactured with four-inch (4") stubs for the service sewers with the crown of the service sewers a minimum of one inch (1") above the crown of the exit pipe.

Standard concentric cones conforming to ASTM Designation: C 478 shall be used on all sewer manholes shown on the Plans unless otherwise specified. Where depth is insufficient for cones, flat slab tops shall be used. Eccentric cones shall be used where shown on the Plans. An eighteen-inch (18") high cone, as shown on Standard Drawing 7-1, may be used for standard forty-eight inch (48") sanitary sewer manholes where the depth is less than six feet eleven inches (6'-11"). If the depth is less than four feet (4') on cul-de-sac manholes or five feet eight inches (5'-8") on through lines, a flat slab top shall be used. Lifting holes on precast cones and grade rings shall be sealed with non-metallic, non-shrink grout.

Joints in precast sewer manhole shafts shall be sealed with Gulf States Pre-Extruded Concrete Joint Sealant or approved equal. If a leak occurs, the shafts shall be sealed by buttering them with a non-metallic, non-shrink grout during vacuum testing, or shall be sealed with preformed plastic sealing compound conforming to Federal Specifications SS-S-0021A and installed as recommended by the manufacturer. All joint surfaces shall be thoroughly cleaned

prior to placing the sealing compound. The inside and outside of sealed joints shall be plastered with non-metallic, non-shrink grout and the inside brushed to a smooth finish with a wet brush. Special precautions shall be taken to see that the entire joint space is filled with grout and is watertight.

Sewer manhole frames and covers shall be of the type and size shown on the Plans and shall conform to Section 50-34, “Sewer and Storm Drain Castings”, Standard Drawings 7-11 through 7-12C, and this Section 39 of these Specifications unless otherwise shown or specified in the Contract. The CSD-1 logo covers (see Standard Drawings 7-11 and 7-12) shall be used on all County Sanitation District 1 sewer lines. The SRCSD logo covers (see Standard Drawing 7-12B) shall be used on all Sacramento Regional County Sanitation District sewer lines. Sewer manholes located in easements shall use the locking type frame and cover per Standard Drawing 7-11A or 7-12A unless otherwise specified. The joint between the sewer manhole frame and the cone or grade ring shall also be sealed by buttering the joint space with non-metallic, non-shrink grout, or the joint shall be sealed using an epoxy adhesive. The adhesive shall be as described in Section 95-2.05, “Standard Set Epoxy Adhesive for Pavement Markers”, of the State Specifications.

All castings for sewer manhole frames, covers, and other purposes shall be tough gray iron or ductile iron free from cracks, holes, swells and cold sheets, be of workmanlike finish, and conform to the details shown on the Plans. The cast iron shall conform to ASTM Designation: A 48, Class 30; the ductile iron shall conform to ASTM A 536-80.

All castings shall be manufactured true to pattern and with satisfactory fit of all component parts. Round frames and covers shall have machined bearing surfaces. All sewer manhole covers that do not fit neatly and bear firmly in the ring will be rejected.

Unless the sewer manhole is cast around the pipe, connections shall be packed with Class “A” concrete conforming to Section 50-5, “Portland Cement Concrete”, of these Specifications. Aggregate grading of the fine aggregate shall be No. 16 sieve size conforming to Section 90-3.03, “Fine Aggregate Grading”, of the State Specifications, or as directed by the Agency. Connections may also be made using a resilient connector conforming to ASTM Designation: C 923.

Inside drop connections shall be as detailed on Standard Drawing 7-3.

Cast-in-place grade adjustment rings shall be Class “A” concrete conforming to Section 50-5, “Portland Cement Concrete”, of these Specifications. Aggregate grading of the fine aggregate shall be No. 16 sieve size conforming to Section 90-3.03, “Fine Aggregate Grading”, of the State Specifications, or as directed by the Agency.

39-2.02 Precast Concrete Storm Drain Manholes

Precast manhole barrels, risers, cones, flat tops, and grade rings shall conform to ASTM Designation: C 478 with the additional requirement that the cement used shall be Type II. Manhole sections shall be manufactured without the provision for steps.

Flat slab tops shall be constructed of Class "A" concrete conforming to Section 50-5, "Portland Cement Concrete", of these Specifications and shall conform to Standard Drawing 9-7A.

Manhole bases shall be precast when the internal diameter of the largest pipe is less than thirty-three inches (33”). Precast manhole bases shall be placed on a minimum of four inches (4”) of three-quarter-inch (3/4”) crushed rock conforming to Section 50-16, "Clean Crushed Rock", of these Specifications. Pipe connections to manholes shall be made using a resilient connector conforming to ASTM Designation: C 923. For precast bases the connection shall be made with a flexible compression gasket, which is set during the precast process, or a boot connector. For cast in place bases the connection shall be made with a water stop. All connections shall be water and soil tight. Mortar used in finishing the manhole and the method of placement shall conform to Section 51-1.135, "Mortar”, of the State Specifications. The

surface finish shall conform to Section 51-1.8A, "Ordinary Surface Finish", of the State Specifications.

When the inside diameter of the largest pipe is thirty-three inches (33") or greater, the manhole base may be cast-in-place. The base shall not be cast higher than six inches (6") above the outside top of the main incoming or outgoing pipe. Concrete used shall be Class "A" conforming to Section 50-5, "Portland Cement Concrete", of these Specifications. Slump shall not exceed two inches (2") as determined by the slump cone method of ASTM Designation: C 143, or an equivalent slump as determined by Test Method No. California 533. Minimum and maximum wall thickness for the cast-in-place sections shall conform to the following Table 39-1 and shall be strictly adhered to:

TABLE 39-1
MINIMUM/MAXIMUM WALL THICKNESSES
FOR CAST-IN-PLACE SECTIONS

Manhole Diameter (inches)	Minimum Wall Thickness (inches)	Maximum Wall Thickness (inches)
48	5	7
60	6	8
72	7	9
84	8	10
96	9	11

Inside diameters of the cast-in-place portions shall equal the diameter of the manhole specified. Standard precast manhole riser sections and other components as specified in this Section shall be used above the cast-in-place base to bring the manhole rim to grade. Manholes with cast-in-place bases and all of the associated connections and joints shall be capable of passing the leakage test as specified in this Section.

Concrete on the cast portion may be placed against undisturbed earth provided wall thickness requirements are met; otherwise outside forms shall be required. Forms shall be removed and the structure visually inspected prior to backfill. All rock pockets, cracks, or other defects shall be patched in conformance with Section 51-1.135, "Mortar", of the State Specifications or, as an alternate, Section 30-15.05, "Concrete Repair", of these Specifications.

Standard concentric cones conforming to ASTM Designation: C 478 shall be used on all manholes shown on the Plans unless otherwise specified. Where depth is insufficient for cones, concentric flat slab tops shall be used.

Joints in precast manhole shafts shall be sealed by buttering the joint space of the previously laid barrel section or base with mortar, or shall be sealed with preformed plastic sealing compound conforming to Federal Specifications SS-S-0021A and installed as recommended by the manufacturer. All joint surfaces shall be thoroughly cleaned prior to placing the sealing compound or buttering with mortar. The inside and outside of mortared joints shall be plastered with mortar and the inside brushed to a smooth finish with a wet brush. Special precautions shall be taken to see that the entire joint space is filled with mortar and is watertight.

Manhole frames and covers shall be of the type and size shown on the Plans and shall conform to Section 50-34, "Sewer and Storm Drain Castings", of these Specifications, Standard Drawing 9-9 or 9-10 in paved areas or Standard Drawing 9-11 in unpaved areas, and these

Specifications, unless otherwise shown on the Plans or specified in the Special Provisions. The joint between the manhole frame and the cone or grade ring shall be sealed by buttering the joint space with mortar, or the joint shall be sealed using an epoxy adhesive. The adhesive shall be as described in Section 95-2.05, "Standard Set Epoxy Adhesive for Pavement Markers", of the State Specifications. A concrete collar shall be placed on all manhole frames per Standard Drawing 9-7A. The concrete collar shall be Class "A-2" in conformance with Section 50-5, "Portland Cement Concrete", of these Specifications. The in-place depth of the twenty-four-inch (24") manhole opening shall not exceed eighteen inches (18") from the top of the frame to the top of the cone or from the top of the frame to the soffit of the flat slab top. If the depth of the twenty-four inch (24") opening must exceed eighteen inches (18"), a thirty-six inch (36") frame and cover with the corresponding thirty-six inch (36") manhole components shall be used. The depth of a thirty-six inch (36") opening as described above shall not exceed twenty-four inches (24"). Components for construction of manholes shall be selected to provide the least achievable vertical dimension between the finished frame surface and the top of the cone or soffit of the flat slab top. The depth of precast grade rings or cast-in-place grade rings shall not exceed eight inches (8") on new or reconstructed manholes.

All castings shall be manufactured true to pattern and with satisfactory fit of all component parts. Round frames and covers shall have machined bearing surfaces. All manhole covers which do not fit neatly and bear firmly in the ring will be rejected.

39-3 SADDLE SEWER MANHOLES

39-3.01 Saddle Sewer Manholes

Saddle sewer manholes shall be constructed in accordance with Standard 7-2B or 7-2D. Risers, cones, grade rings, flat tops, eccentric cones, and other features of the sewer manholes shall be constructed in accordance with these Specifications.

The sewer manhole frame and cover shall be in conformance with Standard Drawings 7-12 or 7-12A unless otherwise shown or specified in the Contract.

Portland cement concrete shall conform to Section 50-5 "Portland Cement Concrete"; reinforcing steel shall conform to Section 50-32, "Reinforcing Steel", of these Specifications.

39-3.02 Saddle Storm Drain Manholes

Saddle storm drain manholes shall be constructed in accordance with either Standard Drawings 9-8A (for cast-in-place pipe) or 9-8B (for all other pipe). The concrete shall be Class "A" in conformance with Section 50-5, "Portland Cement Concrete", of these Specifications. Reinforcing steel shall conform to Section 50-26, "Reinforcing Steel", of these Specifications. Manhole frames and covers, risers, cones, grade rings, flat tops, and other features of the manholes shall be constructed in accordance with Section 39-2.02 in this Section of these Specifications.

39-4 SEWER MANHOLE TESTING

39-4.01 Sanitary Sewer Manholes

All sanitary sewer manholes shall be tested and meet the requirements of ASTM Designation: C 1244 prior to acceptance.

Sewer manholes shall be tested prior to backfill. If the sewer manhole fails the test, the manhole shall be repaired by the Contractor and retested. This procedure shall be repeated until the sewer manhole passes the required test. The Agency may also require a sewer manhole to be tested using this method after backfilling if there is reason to suspect that the sewer manhole has been disturbed during the backfilling operation, or at other times during construction.

In order to prepare a sewer manhole for this test, the following shall be accomplished:

- All lift holes shall be plugged.
- All pipes entering the sewer manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the sewer manhole.

The test procedure shall be as follows:

1. The test head shall be placed at the top of the sewer manhole in accordance with the manufacturer's recommendations.
2. A vacuum of ten inches (10") of mercury shall be drawn on the sewer manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to nine inches (9") of mercury.
3. The sewer manhole will pass the test if the time for the vacuum to drop from ten inches (10") to nine inches (9") of mercury meets or exceeds the values indicated in Table 1 of ASTM Designation: C 1244 with the following constraint: a minimum of nine inches (9") of mercury shall be held for a minimum of one (1) minute.

The vacuum gauge used for this test shall be supplied by the Contractor and have maximum scale divisions of 0.1 psi and an accuracy of 0.04 psi. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six (6) month intervals, or when requested by the Agency. In addition, the Agency may compare the Contractor's gauge with an Agency-owned gauge at any time. During testing, the vacuum gauge shall be located such that it is readily visible.

39-4.02 Storm Drain Manholes

All new manholes shall be tested for leakage after assembly but prior to back-filling around the manhole. The contractor shall furnish all labor, tools, and equipment necessary to make the test and to perform any work incidental thereto. The Contractor shall correct any excess leakage, and repair any damage to the manhole and its appurtenances at the Contractor's own expense.

The manholes shall be tested for leakage by the following method:

Manhole vacuum test—All lift holes, connections, and inside and outside joints shall be sealed as described in this Section. All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendations. In the case of flat top manholes, the test head shall be placed at the top surface of the flat top. A vacuum of ten inches (10") of mercury [approximately five pounds per square inch (5 psi)] shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine inches (9"). The manhole shall pass if the time is greater than the times listed in the following Table 39-2 for the particular manhole size.

TABLE 39-2 MINIMUM VACUUM PASS TIMES	
Manhole Size (inches)	**Minimum time to drop to 9" Hg (seconds)**
48	60
54	67
60	75
72	90
84	105
96	120

If the manhole fails the initial test, necessary repairs shall be made while the vacuum is still being drawn. Re-testing shall proceed until a satisfactory test is obtained.

39-5 ADJUST STORM DRAIN MANHOLES TO GRADE

Existing manholes shall be adjusted to grade or elevation as indicated on the Plans and shall conform to Section 15-2.05A of the State Specifications, with the exception that raising devices are not allowed. Adjustment may be made by utilization of precast grade rings or by a cast-in-place ring. Cast-in-place rings shall be Class "A-2", in conformance with Section 50-5, "Portland Cement Concrete", of these Specifications. The cast-in-place rings shall have a minimum height of three inches (3") and a maximum of six inches (6"). The concrete pour shall extend to one inch (1") below the top of the frame.

Adjusting manholes to grade within publicly used traffic lanes shall be completed, including placing paving material around and to the level of the frame and cover, by the end of the same day on which work is started. If permanent pavement backfill cannot be completed by the end of the work day, the Contractor shall place temporary paving material to the finished grade level of the frame and cover. The Contractor shall maintain the temporary paving smooth and level with the frame and cover until such time as the permanent paving is placed.

39-6 RECONSTRUCT STORM DRAIN MANHOLES

The Contractor shall reconstruct storm drain manholes as shown or specified in the Contract.

In order to access and maintain storm drain facilities, the maximum depth of a twenty-four inch (24") manhole opening is eighteen inches (18") and the maximum depth of a thirty-six inch (36") manhole opening is twenty-four inches (24"). The depth of the opening is measured from the top of the finished grade of the frame to the top of the cone or to the soffit of the flat slab top. When the depth of the opening exceeds this requirement, it is necessary to reconstruct the manhole by placing additional barrel sections to bring the top of the cone or soffit of the flat slab top to within eighteen inches (18") of the finished surface.

The Contractor shall remove and dispose of the existing frame and cover and demolish the remaining structure down to the elevation where a standard precast barrel section or combination of barrel sections will bring the top of the cone or soffit of the flat slab top to within a maximum of eighteen inches (18") of the finished surface or as indicated on the Plans. The resulting debris and hardware become the property of the Contractor. Standard precast barrel sections are available in depths of twelve, eighteen, twenty-four, thirty-six, and forty-eight

inches (12”, 18”, 24”, 36”, and 48”). The top of the remaining structure shall be trimmed to provide a suitable foundation for the new barrel components. The joint between the existing structure and the new component shall be sealed in conformance with Section 39-2.02, "Precast Concrete Storm Drain Manholes" in this Section of these Specifications. The remaining structure shall be constructed in conformance with Sections 39-2.02 or 39-3.02. If not called out on the Plan, it is the responsibility of the Contractor to determine whether the existing structure is precast, cast-in-place, or a precast structure with a cast-in-place base.

39-7 ABANDON STORM DRAIN MANHOLES

When indicated on the Plans or directed by the Agency, storm drain pipes, manholes, and other structures shall be abandoned in conformance with Section 15-1.04, "Abandonment of Pipes and Manholes”, of these Specifications.

39-8 MEASUREMENT AND PAYMENT

The quantity of sewer manholes, consisting of precast concrete manholes or saddle manholes, will be measured by the unit.

The unit price paid for sewer manholes includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing sewer manholes, complete in place, including excavation and backfill, manhole bases, mortar, concrete, reinforcement, and acceptance testing, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

The quantity of storm drain manholes, consisting of precast concrete manholes or saddle manholes, will be measured by the unit.

The unit price paid for storm drain manholes includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in construction of storm drain manholes, complete in place, including excavation and backfill, manhole bases, mortar, concrete, reinforcement, and acceptance testing, as shown or specified in the Contract, and as directed by the Agency.

Payment for adjusting storm drain manholes shall conform to Section 15-2.07 of the State Specifications, with the following exceptions: 1) the unit price paid includes all necessary excavation, backfill, sealing, and concrete; and 2) the unit price paid will be the average of all depths and limits of adjustment required.

The unit price paid for storm drain manhole reconstruction includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in reconstructing manholes, complete in place, including excavation and backfill, demolition, disposal, mortar, concrete, and reinforcement as shown or specified in the Contract, in these Specifications, and as directed by the Agency.