SECTION 39 - MANHOLES
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SECTION 39 MANHOLES

39-1 GENERAL

All sewer facilities constructed within the Sacramento Area Sewer District service area (http://www.sacsewer.com/pdf/map-servicearea.pdf) must be constructed in accordance with the Sacramento Area Sewer District Standards and Specifications available at http://www.sacsewer.com/pdf/ord/2011-SASD-Standards-and-Specifications-v1.pdf

Storm drain manholes, as shown on the Plans, must be in accordance with Standard Drawing 9-7A or 9-8A and these Specifications.

39-2 CONCRETE MANHOLES

39-2.01 NOT USED

39-2.02 Concrete Storm Drain Manholes

All manholes must be precast unless specified as Cast-In-Place in the project plans. If a Cast-In-Place manhole is specified, but a precast manhole can be constructed per specifications, the precast manhole must be installed. The substitution of manhole types (Precast/Cast-In-Place) will not warrant additional compensation.

Precast manhole barrels, risers, cones, flat slab tops, and grade rings must conform to ASTM C478 with the additional requirement that the cement used must be Type II. Manhole sections must be manufactured without the provision for steps. Precast manholes must be vacuum tested by the manufacturer per Section 39-4.02.A of these Specifications prior to delivery.

Manhole bases must be precast when the internal diameter of the largest pipe is less than 33 inches. Precast manhole bases must be placed on a minimum of 4 inches of 3/4-inch crushed rock conforming to Section 50-16, "Clean Crushed Rock", of these Specifications. Pipe connections to manholes must be made using a resilient connector conforming to ASTM C923. For precast bases the connection must be made with a flexible compression gasket set during the precast process or a boot connector. For cast-in-place bases the connection must be made with a water stop. All connections must be water and soil tight. Mortar used in finishing the manhole and the method of placement must conform to the State Specifications. The surface finish must conform to the State Specifications.

When the inside diameter of the largest pipe is 33 inches or greater, the manhole base may be cast-in-place. The base must not be cast less than 4-inches or more than 12-inches above the outside top of the main incoming or outgoing pipe. Concrete used must be Class "A" conforming to Section 50-5, "Portland Cement Concrete", of these Specifications. Slump must not exceed 2 inches as determined by the slump cone method of ASTM C143, or an equivalent slump as determined by California Test Method 533. Minimum and maximum wall thicknesses for the cast-in-place sections must conform to the following Table 39-1 and must 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 must equal the diameter of the manhole specified. Standard precast manhole riser sections and other components as specified in this Section must 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 must be capable of passing the leakage test as specified in these Specifications.

Cast-In-Place manholes must maintain the specified internal diameter throughout the manhole base and riser sections. The internal diameter must not be decreased until the cone section or flat slab top is placed. Cast-In-Place manhole base bottoms must be placed on a minimum of 4 inches of 3/4-inch crushed rock conforming to Section 50-16, “Clean Crushed Rock”, of these Specifications. Cast-In-Place manhole bases must be 8 inches thick with #4 steel reinforcing bars placed at 12 inches on center each way. The reinforcing must be centered between the manhole invert and bedding.

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

Standard concentric cones conforming to ASTM C478 must be used on all manholes shown on the Plans unless otherwise specified. Where depth is insufficient for cones, concentric flat slab tops must be used.

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

Manhole frames and covers must be of the type and size shown on the Plans and must conform to Section 50-34, “Storm Drain Castings”, of these Specifications, Standard Drawing 9-9A/9B or 9-10, and these Specifications. Use of grate-type manhole covers conforming to Standard Drawing 9-9A/9B or 9-11 might be approved by the Agency on a case-by-case basis. In unpaved areas, grate-type manhole frames and covers must be set 1 inch below adjacent grade. The joint between the manhole frame and the cone or grade ring must be sealed by buttering the joint space with mortar or using an epoxy adhesive. The adhesive must be as described in the State Specifications. A concrete collar must be placed on all manhole frames per Standard Drawing 9-7A. The concrete collar must be Class "A-2" in conformance with Section 50-5, "Portland Cement Concrete", of these Specifications. The in-place depth of the

24-inch manhole opening must not exceed 18 inches from the top of the frame to the top of the cone. If the manhole is a flat slab top, or if the depth of the opening must exceed 18 inches, a 36-inch frame and cover with corresponding 36-inch manhole components must be used. The depth of a 36-inch opening as described above must not exceed 24 inches. Components for construction of manholes must 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 must not exceed 8 inches on new or reconstructed manholes.

At the Contractor's option, the manhole frame and cover size may be increased from 24 to 36 inches if necessary to facilitate testing of the storm drain system. No additional compensation will be paid to the contractor if the contractor elects to increase the size, and the manhole frame and cover will be paid for at the unit price bid for the 24-inch frame and cover. If the Contractor elects to install a 36-inch frame and cover, it must remain as a permanent part of the improvements (i.e. it must not be replaced with a 24-inch frame and cover after testing).

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

Unless otherwise specified, exposed surfaces of the castings with the parts assembled and disassembled must be painted with commercial quality asphaltum paint after testing and assembly.

39-3 SADDLE SEWER MANHOLES

39-3.01 NOT USED

39-3.02 Saddle Storm Drain Manholes

Saddle storm drain manholes must be constructed in accordance with Standard Drawing 9-8A (for cast-in-place pipe). Saddle storm drain manholes are not allowed for any other type of pipe. The concrete must be Class "A" in conformance with Section 50-5, "Portland Cement Concrete", of these Specifications. Reinforcing steel must conform to Section 50-26, "Reinforcing Steel", of these Specifications. Manhole frames and covers, risers, cones, grade rings, flat slab tops, and other features of the manholes must be constructed in accordance with Section 39-2.02 of these Specifications.

39-4 MANHOLE TESTING

39-4.01 NOT USED

39-4.02 Storm Drain Manholes

All new manholes must be tested for leakage after assembly but prior to back-filling around the manhole. The Contractor is responsible for conducting all leakage tests. The Contractor is responsible for providing all equipment, materials, and labor for performing and making measurements of the leakage tests. The Agency must witness all leakage tests and verify the accuracy and acceptability of the equipment utilized. The Agency may require a manhole to be tested after backfilling if there is reason to suspect that the manhole has been disturbed during the backfilling operation or at other times during construction.

When leakage exceeds the amount allowed by these Specifications, the Contractor, at its own expense, must determine the source, or sources, of leakage and repair or replace all defective materials and workmanship to the satisfaction of the Agency. The extent and type of repair that may be allowed, as well as results, are subject to the approval of the Agency. The completed manhole installation must then be retested and required to meet the requirements of this Section. Any individually detectable leaks must be repaired, regardless of the results of the tests.

Manholes must be tested for leakage by the following method:

39-4.02.A Manhole Vacuum Test

All lift holes, connections, and inside and outside joints must be sealed as described in this Section. All pipes entering the manhole must be plugged, taking care to securely brace the plug from being drawn into the manhole. Plugs and the ends of pipes connected by flexible boots must be blocked to prevent their movement during the vacuum test. When plugs are being placed, the pipe adjacent to the manhole must be visually inspected to detect any evidence of shear in the pipe due to differential settlement between the pipe and the manhole. A probable point of leakage is at the junction of the manhole and the pipe, therefore the plug must be placed in the connected pipes outside of the manhole base. The test head must 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 slab top manholes, the test head must be placed at the top surface of the flat slab top. A vacuum of 10 inches of mercury (approximately 5 psi) must be drawn and the vacuum pump shut off. With the valves closed, the time must be measured for the vacuum to drop to 9 inches. The manhole passes the test if the measured 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 (seconds) to drop to 9" Hg
48	60
54	67
60	75
72	90
84	105
96	120

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

39-4.02.B Test by the Exfiltration Method

At the discretion of the Agency, the Contractor can substitute the Exfiltration Method of testing for the Vacuum Test described in Section 39-4.02.A. This method can only be used when ground water is not present. If ground water is present, a Vacuum Test must be used unless otherwise directed by the Agency. All backfilling and compaction must be completed prior to the commencement of testing.

The procedures for the test include the following:

1. Manhole section interiors must be carefully inspected; units found to have through-wall lift holes, or any penetration of the interior surface by inserts provided to facilitate handling, will not be accepted. Coating must be applied after the testing unless coating is applied before field assembly, or at the factory. All lift holes and exterior joints must be plugged with an acceptable non-shrink grout. Grout must not be placed in horizontal joints. Tests must be performed before grouting the invert or around pipe penetrations and before coating the interior surfaces of the manhole or junction box.
2. After cleaning the interior surface of the manhole, the Contractor must place and inflate pneumatic plugs in all of the connecting pipes to isolate the manhole; sealing pressure within the plugs must be as recommended by the plug manufacturer.

3. Concrete manholes must be filled with water or otherwise thoroughly wetted for a period of 24 hours prior to testing.
4. At the start of the test, the manhole must be filled to the top with water. The test time is 1 hour. The Inspector must be present for observation during the entire time of the test. Permissible loss of water in the 1-hour test time is 0.025 gallons per diameter foot, per foot of manhole depth. For a 4-foot diameter manhole, this quantity converts to a maximum permissible drop in the water level within the 2-foot diameter manhole opening of 0.05 inches per foot of manhole depth or 0.5 inches for a 10-foot deep manhole.

39-4.02.C Failure to Pass the Test - Records of Tests

If the manhole fails to pass the initial test method as described in Section 39-4.02.A, “Test by the Vacuum Method”, of these Specifications, and, if allowed, the Exfiltration Test Method, per Section 39-4.02.B, of these Specifications, or if visible groundwater leakage into the manhole is observed, the Contractor must locate the leak, if necessary by disassembling the manhole. The Contractor must check the gaskets and replace them if necessary. The Contractor may re-lubricate the joints and re-assemble the manhole, or the Contractor may install an acceptable exterior joint sealing product on all joints and then retest the manhole. If the Contractor chooses to attempt to repair the manhole rather than replace it, the manhole must be retested until it passes. Cold applied preformed plastic gaskets cannot be used for repair. Records of all manhole testing must be made available to the Agency at the close of each working day, or as otherwise directed by the Agency. Any damaged or visually defective products or any products out of acceptable tolerance must be removed from the site.

39-4.02.D Inspection

The Agency must make a visual inspection of each manhole after it has passed the testing requirements and is considered to be in its final condition. The inspection must determine the completeness of the manhole; any defects must be corrected to the satisfaction of the Agency.

39-5 ADJUST STORM DRAIN MANHOLES TO GRADE

Existing manholes must be adjusted to grade of elevation as indicated on the Plans and must conform to the State Specifications. Should an expanding ring raising device be used, the mechanism for ring expansion must be a turnbuckle linkage that has pivoting connections at both ends. Expanding ring raising devices are not allowed for areas where the roadway is to be raised by a non-uniform thickness over the area of the manhole structure. Cast-in-place rings must be Class "A-2”, in conformance with Section 50-5, "Portland Cement Concrete", of these Specifications. The cast-in-place rings must have a height between 3 and 6 inches. The concrete pour must extend to 1 inch below the top of the frame.

Adjusting manholes to grade within publicly used traffic lanes must 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 must place temporary paving material to the finished grade level of the frame and cover. The Contractor must maintain the temporary paving smooth and level with the frame and cover until the permanent paving is placed.

39-6 RECONSTRUCT STORM DRAIN MANHOLES

The Contractor must 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 24-inch manhole opening is 18 inches and the maximum depth of a 36-inch manhole opening is 24 inches. 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 18 inches of the finished surface.

The Contractor must 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 18 inches 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 12, 18, 24, 36, and 48 inches. The top of the remaining structure must be trimmed to provide a suitable foundation for the new barrel components. The joint between the existing structure and the new component must be sealed in conformance with Section 39-2.02, "Precast Concrete Storm Drain Manholes" of these Specifications. The remaining structure must 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 must 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 each type of manhole will be measured by the unit.

The unit price paid for each manhole includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing 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.

Payment for adjusting drain manholes will conform to 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 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.