

## **Subsection 5.02 Storm Sewer Manholes and Inlets**

**I. Scope:** This item includes the construction of inlets, junction boxes, and manholes as shown on the plans and itemized in the project plans. The Contractor will furnish any and all materials, including, but not confined to manhole, inlets, junction boxes, manhole rings and lids, and any and all other materials, labor, equipment, and supplies for the completion of this project in accordance with the plans and specifications.

### **II. Materials**

**A. General:** Concrete placed in the field will conform to Subsection 4.07 "Concrete." Precast manholes, inlets, risers, and appurtances are acceptable unless shown on the plans.

**B. Water:** Water usage shall conform to Subsection 3.04 "Requirements for Water Usage."

**C. Manhole Frames, Covers, and Accessories:** Manhole rings, cleanout rings and covers, and steps shall be the City of Amarillo standard as shown by details. All ductile iron castings shall be manufactured true to pattern; component parts shall fit together in a satisfactory manner. All ductile iron castings shall conform to AASHTO M 306 and ASTM A536. Sewer manhole rings and covers are to be machined or milled flat for no wobble or rattle. They shall be of uniform quality, free from blow holes, porosity, hard spots, shrinkage distortions or other defects. They shall be cleaned by shot blasting and sharp edges shall be ground off. Castings shall be with  $\pm 1/16$  inch per foot of plan dimensions and within  $\pm 5\%$  of plan weight.

1. Any manhole cover found to wobble or rattle after installation shall be immediately removed and replaced with an acceptable ring and cover.

2. If an equivalent accessory is proposed, a catalog cut showing all details and weights, manufacturers name and all pertinent data shall be furnished the Engineer for approval before any order is placed.

### **D. Fiberglass Manholes**

1. **General:** All fiberglass reinforced polyester manholes shall comply with ASTM D 3753.

2. **Marking:** Manholes provided under this specification shall be marked with the following information:

a) Manufacturer's name or trademark;

- b) Manufacturing serial number;
- c) Installation assist marks (vertical lines 90° apart at the base of the manhole);
- d) Installation instructions; and
- e) Manhole total length.

**3. Strength:** Manhole cylinders shall have a minimum pipe stiffness of 800 psi when tested in accordance with ASTM Method D 2412. If the cylinder stiffness is obtained by incorporation of a circumferential rib structure in the manhole cylinder, all ribs shall be inside the manhole to provide a smooth exterior surface and minimize dragdown effects. Rib spacing shall not exceed 12 inches center to center to ensure composite action of the ribs and manhole wall.

**E. Waterstop in Base:** Manhole cylinders shall have a minimum 1 inch wide flange attached to the cylinder a maximum of 2 inches from the end of any cylinder which is to be embedded in a precast or poured-in-place concrete base. The flange may be an integral formed rib or a flange attached with an approved adhesive or bonding agent in order to provide a waterstop around the manhole cylinder.

**F. Precast Manholes**

- 1. **General:** All precast manholes shall comply with ASTM C 478.
- 2. **Marking:** Manholes provided under this specification shall be marked with the following information:
  - a) Manufacturer's name or trademark;
  - b) Manufacturing serial number;
  - c) Installation assist marks (vertical lines 90° apart at the base of the manhole);
  - d) Installation instructions; and
  - e) Manhole total length.

**G. Precast Concrete Boxes:** The precast concrete boxes shall be constructed of concrete to the dimensions shown on the plans. The construction shall be in accordance with ASTM C-857 and ACI 350R.

**III. Construction:** The Contractor shall design, produce, transport, and place the class of concrete in accordance with requirements of this Subsection. The Contractor will perform quality assurance (QA) testing at the scope and frequency outlined in Table 1. QA testing conducted by the Contractor will be submitted to the ODR for review to determine payment and make acceptance decisions. The Contractor may perform quality control (Q/C) testing. The Contractor is allowed to submit Q/C testing to the ODR. The ODR reserves the right to take additional Q/A tests.

**Table 1  
Concrete Testing Frequency**

Test For	Test Number	Sampling Location	Frequency of Testing	Remarks
Compressive Strength	Tex-418-A	At point of placement	4 cylinders for each 60 CY or fraction thereof for 3000 psi concrete	Sampling shall be in accordance with Tex-407-A. 2 cylinders shall be tested at 7 days and if the average is below the design strength as defined in Table 1 of Subsection 4.07 Concrete”, the remaining 2 cylinders shall be tested at 28 days. If the average value of the 2 cylinders broken at 7 days the 2 remaining cylinders are not required to be tested.
Slump	Tex-415-A	At point of placement	When cylinders are taken.	Maximum slump is 4 inches
Entrained Air	Tex-416-A or Tex-414-A	At point of placement	When cylinders are taken.	A minimum of 3% and a maximum of 7% entrained air is required.
Temperature	Tex-422-A	At point of placement	When cylinders are taken.	A maximum temperature of 90°F is allowed at placement.

**A. Protection of Public or Private Property:** The Contractor shall exercise precautions to protect all property. Contractor is responsible for any and all damage to property either private or public, due to his operations.

Should roots or tree branches be removed or damaged, the damage claims resulting from such work shall be settled by the Contractor satisfactorily to the property owner.

The Contractor shall uncover pipes, tees, elbows, and other conduits or utilities which are close to the proposed pipe.

**B. Protection of Utilities:** The Contractor shall familiarize himself with all utilities locations by consulting with the utility companies, private owners, and by visiting the site. All utility companies should cooperate in locating their properties. The Contractor shall protect utilities and repair all damage he may do at his expense and to the satisfaction of the affected utility company. Where sanitary sewers laterals or services, telephone, traffic or electrical conduits, poles, cables or poles, gas mains or services, water mains, or any other public utilities are encountered, proper protection shall be provided by means of blocks, supports or by some other means acceptable to the affected company or owner so that such property will remain intact and in service. All damage by the Contractor must be repaired in accordance with the affected utility company. Such repair must be done with the least inconvenience to the affected utility company.

**C. Excavation and Subgrade Preparation:** Excavated shall be to lines and grades as shown on the plans. Excavation and backfill of structures will conform to Subsection 5.07, "Structural Excavation and Backfill."

**D. Setting and Removing Forms:** All forms shall be approved by the Engineer prior to the beginning of pour. Forms which, in the opinion of the Engineer, are defective in any way will not be used, and be removed from the project site.

**E. Concrete Placement**

Grading, proportioning, moving and placement of the concrete shall produce a homogeneous concrete mixture conforming to this specification. The concrete shall be transported in such a manner as to insure delivery and placement in the forms without loss or segregation of ingredients and within 1 hour of the time of mixing. Intervals between loads of a continuous pouring shall not exceed 30 minutes or in any case not so great as to allow the concrete already in place to set up or become partially hardened. Continuous mixing shall occur during transit. Concrete shall be consolidated.

**F. Temperature:** The concrete temperature shall not exceed 90°F. Whenever the air temperature at the project site falls below 40°F. for more than 1/2 day, the concrete shall be maintained above 50°F. for at least six 6 days after it is placed. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying. If concrete is placed when the concrete temperature would exceed 90°F. The Contractor shall employ effective means, such as precooling of aggregates and mixing water and placing at night, as necessary to maintain the temperature of the concrete, as it is placed below 90°F.

**G. Finish:** The surface shall be better than a wood float finish and have no voids on surfaces.

**H. Repair:** As soon as possible after placement remove forms and repair any, rock pockets, honeycombs, cracks, or indentations. No mortar, concrete, or repair material shall be applied to the surface that has not been moistened and properly cleaned.

**I. Curb Inlets:** The curb inlets shall be constructed at locations shown on the plans. In new construction, when curb and gutter abuts against an inlet, the two shall be tied together with two 1/2 inch deformed reinforcing bars with minimum lengths of 2 feet. One bar shall be centered in the top 6 inches of the curb and the other shall be centered in the outer 6 inches of the toes.

The backfill shall be in accordance with Subsection 5.06, "Structural Excavation and Backfill." The Contractor shall exercise extreme care in the backfilling of all inlets. Any inlet that is damaged shall be removed and replaced at the Contractor's expense.

**J. Standard Manholes:**

1. **Concrete:** Provide in accordance with Subsection 4.07, "Concrete."
2. **Mortar:** Furnish mortar composed of 1 part hydraulic cement and 2 parts clean sand.
3. **Rings:** Concrete rings must come from an approved supplier.

Manholes shall be constructed at the locations of such section and to such depths as are shown on the plans.

In placing of the concrete used in construction of the manholes, the maximum free-fall of the concrete shall be 3 feet.

The inverts through the manholes shall be well formed of concrete and shall be steel toweled.

**K. Precast Manholes:** Precast manholes shall be set straight and true with all joints mortared. The manhole ring and cover shall be set to finish grade and securely anchored to the manhole.

**L. Poured in Place Manholes:** Poured in place manholes shall be set straight and true with smooth forms. The wall thickness shall be 8 inches, it shall have #4 bars at 9 inches on center vertically, and #4 bars at 12 inches on center horizontal. The manhole ring and cover shall be set to finish grade and securely anchored to the manhole.

**M. Backfilling and Restoration of Surface:**

**a) Backfill** Backfilling shall be in accordance with Subsection 5.06, "Structural Excavation and Backfill."

**b) Pavement Cuts:** Pavement cuts shall be made in accordance with Subsection 4.01, "Utility Construction in City of Amarillo Right of Way and Easements."

**2. Protection of Public:** The Contractor shall furnish, place, erect, and maintain adequate barricades, construction signs, guards, and warning devices necessary for the protection of the public and private property. Whenever required, watchmen shall be provided at the Contractor's expense for this protection. When any thoroughfare will be closed to traffic, the Contractor shall notify all ambulance services, the Central Fire Station, and the Traffic Engineering Department of the City of Amarillo at least 24 hours prior to such closing as follows:

A traffic plan shall be submitted to the Traffic Engineer for his approval a minimum of 24 hours prior to the actual closing of the street. This plan shall include the proposed time and date of closure and the estimated time limits the street will be closed during the project. Work should be scheduled, if possible, so that peak-hour traffic, 7 a.m. to 8 a.m. and 5 p.m. to 6 p.m., can utilize the street or area under construction. The Contractor shall include on his plan and provide all necessary barricades, signs, flagmen, and other warning devices to accommodate traffic movements and detours.

Should it be necessary to detour traffic at any point, the Contractor shall erect proper barricades and post definite detour directions at all points to be travelled by those who must detour. If the Contractor uses a dirt street for a detour, he shall keep the dust settled on the detour so that it will not be obnoxious to those living adjacent to or near the detour. No extra remuneration will be paid for dust abatement.

Prior consideration must be given so that no storm drain, storm sewer, inlet, ditch, gutter, or any other storm water carrier will be stopped or partially stopped so as to hinder the natural flow of water being carried to or by one or more of these structures.

**3. Protection of Work:** It is the responsibility of the Contractor to protect his work against weather, vandals, and any and all things that may mar the finish, surface, or the appearance of the product.

The Contractor shall maintain proper crossings, to protect and to repair damaged property, to keep the backfill completed to acceptable limits, and to clean up waste materials and surplus excavation. Failure to do any or all of these things shall be just claim for the City of Amarillo to withhold estimates until such faults shall have been corrected.

Should the Contractor remove or damage any curbs, sidewalks, driveways, shrubbery, plants, trees, fences, sod, or any other private or public property outside of the normal trench width, he shall replace same to condition equal to or better than that before the work began at his own expense, furnishing all labor, materials, supplies, equipment, and any and all things necessary. Replacements within the normal trench width will be paid at the unit prices bid. Repairs and replacement are to be made as soon as practicable, in the opinion of the Engineer.

**4. Clean Up:** The Contractor shall remove all surplus construction materials, equipment, scraps, broken pipe, debris, and rubbish from the site and leave the site in a first-class workmanlike manner. At no time shall complete clean-up be more than 1000 feet behind the laying of the pipe. Dust is to be kept at an absolute minimum by sweeping and/or wetting of fill in the ditch.

**IV. Measurement:** All measurements of all manholes and inlets completed satisfactorily will be by the each.

**V. Payment:** The fittings, manholes, inlets shall be paid for at the unit prices as set forth in the proposal. The furnishing and installation of manhole rings, lids, foundation and floor, testing, backfill, excavation, labor, and any and all things necessary for a complete installation will be included in the bid price of manholes, inlets, junction boxes, and other appurtenances. The depth for cuts shall be figured from the pipe invert to the top of the natural ground.

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