

## **SECTION 700 – WASTEWATER SPECIFICATIONS**

### **ITEM 701. CONCRETE MANHOLES (WASTEWATER)**

#### **701.1 SCOPE OF WORK**

- A. This specification covers the requirements to install precast concrete manholes, frames and covers, and appurtenances as shown on the Plans and as specified herein.

#### **701.2 SUBMITTALS**

- A. Within 30 days after the Notice to Proceed, the Contractor shall provide a list of materials to be used from the Approved Materials List (AML) or submit to the Engineer or City Staff for approval, shop drawings, product data, materials of construction, and details of installation shall be submitted in accordance with Section 211- SUBMITTALS. Submittals shall include the following: base sections, riser sections, eccentric conical top sections, flat slab tops, grade rings with notarized certificate indicating compliance with ASTM C478, pipe connection to manhole, manhole frame and cover with notarized certificate indicating compliance with ASTM A48, Class 30, method of repair for minor damage to precast concrete sections, manhole lining system.

B. Design Data

1. Precast concrete structures:

- a. Six (6) copies of sectional plan(s) and elevations showing dimensions and reinforcing steel placement.
- b. Six (6) copies of concrete design mix.

C. Test Reports

1. Precast concrete structures:

- a. Six (6) copies of concrete test cylinder reports from an approved testing laboratory certifying conformance with specifications.

#### **701.3 REFERENCE STANDARDS**

A. American Society for Testing and Materials (ASTM)

1. ASTM A48 - Specification for Gray Iron Castings.
2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3. ASTM C33 - Specification for Concrete Aggregates.
4. ASTM C150 - Standard Specification for Portland Cement.
5. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
6. ASTM D4101 - Specification for Propylene Plastic Injection and Extrusion Materials.



- B. American Concrete Institute (ACI)
  - 1. ACI 318 - Building Code Requirements for Reinforced Concrete.
  - 2. ACI 350R - Concrete Sanitary Engineering Structures.
- C. American Association of State Highway and Transportation Officials (AASHTO)
  - 1. Standard Specifications for Highway, Streets and Bridges.
- D. Occupational Safety and Health Administration (OSHA)
- E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

701.4 QUALITY ASSURANCE

- A. All material shall be new and unused.
- B. Materials' quality, manufacturing process and finished sections are subject to inspection and approval by Engineer or other City representative. Inspection may be made at place of Manufacture, at work site following delivery, or both.
- C. Materials will be examined for compliance with ASTM specifications, these Specifications and approved Manufacturer's drawings. Additional inspection criteria shall include: appearance, dimensions(s), blisters, cracks and soundness.
- D. Materials shall be rejected for failure to meet any Specification requirement. Rejection may occur at place of manufacture, at work site, or following installation. Mark for identification rejected materials and remove from work site immediately. Rejected materials shall be replaced at no cost to City.
- E. Repair minor damage to precast concrete sections by approved method, if repair is authorized by Engineer or the City.

701.5 PRODUCTS

- A. Reference to a Manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials/equipment shall be the end products of one Manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts and Manufacturer's service.
- C. Provide lifting lugs or holes in each precast section for proper handling.

701.6 PRECAST CONCRETE MANHOLE SECTIONS

- A. Precast concrete base sections, riser sections, transition top sections, flat slab tops and grade rings shall conform to ASTM C478 and meet the following requirements:
  - 1. Bottom slab thickness shall be 12-inches.
  - 2. Top section shall be flat slab with a minimum clear opening of 30-inches diameter.
  - 3. Base, riser and transition top sections shall have tongue and groove joints.
  - 4. Sections shall be cured by an approved method.



5. Precast concrete sections shall be shipped after concrete has attained 3,000 psi compressive strength.
  6. Design precast concrete base, riser, transition top, flat slab top and grade ring for a minimum HS-20 loading plus earth load. Calculate earth load with a unit weight of 130 pounds per cubic foot.
  7. Mark date of manufacture, name and trademark of Manufacturer on the inside of each precast section.
  8. Construct and install precast concrete base as shown on the Plans.
- B. Manhole diameter shall be as shown on the Plans, but not less than required in the wastewater construction standards and details.
- C. Pipe Sections
- Pipe sections shall conform to current specifications for Precast Reinforced Manhole Sections, ASTM Designation C478, with the following additions:
1. Pipe shall be made by a process which will provide for uniform placement of concrete in the form and compaction which will assure a dense concrete in the finished product.
  2. Aggregates for the concrete shall consist of limestone aggregates in the proportion of at least 75% by weight of the total aggregates.
  3. Minimum wall thickness for the manhole risers shall be as listed under Wall "B" in the "Class Tables" of ASTM C76 for Class III pipe.
- D. Joints
1. Joints shall conform to the joint specifications in ASTM C478, C76, and ASTM C443. The joints shall be furnished and installed with the bell down to resist groundwater infiltration. All joints shall be sealed with mortar or an approved non-shrink grout on the inside and a 6" joint wrap on the outside of the manhole after testing. Grade rings shall be sealed with adhesive to each other and on the inside and outside to provide a waterproof seal.

701.7

MANHOLE FRAME AND COVER

- A. Manhole frames and covers shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind which render them unfit for the service for which they are intended. Manhole covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30.
- B. Manhole covers shall be per the wastewater construction standards and details and as listed on the AML.



701.8 JOINTING PRECAST MANHOLE SECTIONS

- A. Seal tongue and groove joints of precast manhole sections with rubber gasket. Gasket shall conform to ASTM C443.
- B. Completed joint shall withstand 13 psi internal water pressure without leakage or displacement of gasket or sealant.

701.9 PIPE CONNECTIONS TO MANHOLE

- A. Connect pipe to manhole in the following ways:
  - 1. Flexible sleeve - Integrally cast sleeve in precast manhole section or install sleeve in a formed or cored opening. Fasten pipe in sleeve with stainless steel clamp(s). Coat stainless steel clamp(s) with bituminous material to protect from corrosion. Flexible sleeve shall be Lock Joint Flexible Manhole Sleeve; Kor-N-Seal connector; PSX Press-Seal Gasket or equal.
  - 2. Compression gasket - Integrally cast compression gasket in precast manhole section. Insert pipe into compression gasket. Compression gasket shall be A-Lok, or equal.

701.10 INSTALLATION

- A. Manhole Installation
  - 1. Manholes shall be constructed to the dimensions shown on the Plans and as specified herein. Protect all work against flooding and flotation.
  - 2. Place manhole base on a bed of gravel six (6) inches in depth as shown on the Plans. Set manhole base so that a maximum grade adjustment of one (1) foot is required to bring the manhole frame and cover to final grade. When located under pavement, a minimum grade adjustment of four (4) inches is required to bring the manhole frame and cover to final grade.  
  
Use precast concrete grade rings with adhesive to adjust manhole frame and cover to final grade.
  - 3. Set precast concrete barrel sections plumb with a 1/4-inch maximum out of plumb tolerance allowed. Seal joints of precast barrel sections with either a rubber "O" ring set in a recess or preformed flexible joint sealant in sufficient quantity to fill 75 percent of the joint cavity. Fill the outside and inside joint with non-shrink mortar and finished flush with the adjoining surfaces. Caulk the inside of any leaking barrel section joint with non-shrink grout to the satisfaction of the Engineer and the City.
  - 4. No thru lifting holes will be allowed.
  - 5. Core holes in precast sections to accommodate pipes prior to setting manhole sections in place to prevent jarring which may loosen the mortar joints.
  - 6. Backfill carefully and evenly around manhole sections.
- B. Manhole Pipe Connections
  - 1. Construct manhole pipe connections, including pipe stubs, as specified above. Close or seal pipe stubs for future connections with a gasketed watertight plug.



C. Setting Manhole Frame and Cover

1. Set manhole covers and frames in an adhesive bed. Utilize precast concrete grade rings, a maximum of one (1) foot thick (a minimum of four (4) inches when under pavement), to assure frame and cover are set to the finished grade. Set manhole frame and cover to final grade prior to placement of permanent paving.

701.11

INTERIOR COATING

- A. The interior of wastewater manholes accepting influent from force mains shall be coated with a minimum 100 mils of Raven 405 Lining System, or approved equivalent.

1. Interior surface of each manhole shall be prepared in accordance with applicable industry standards and specific product specification requirements. Sandblasting and/or hydro-demolition with high pressure water may be used to remove existing deterioration, chemical salts, dust, loose concrete, and other debris.
2. Application of bug-hole filler material with primer application prior to application of sprayed epoxy. Coating shall not be sprayed over surfaces with exposed aggregate or un-filled bug-holes.
3. All coating terminations shall be keyed in at the top and bottom of walls, gates, thimbles, pipes, etc.
4. All grease, oils and grime shall be removed by washing with an emulsifying alkaline water-base cleaner with no bio-stimulants, manufactured or approved by the coating manufacturer. Follow with a thorough rinsing.
5. Application of the coating shall be performed by a qualified work crew meeting the manufacturer's standards.
6. Application of the coating shall be in accordance with the manufacturer's standards and shall be a minimum of 100 mils.
7. A certified manufacturer's representative shall be present to observe application of coating and after completion to inspect and certify that product was properly applied.

701.12

TESTS

- A. Test each manhole in accordance with Section 213- TESTING OF PIPELINES AND MANHOLES. Engineer or the City's representative shall observe each test (i.e. hydrostatic test, vacuum test).

701.13

CLEANING

- A. Thoroughly clean all new manholes of all silt, debris and foreign matter of any kind, prior to final inspections.

701.14

PAYMENT

- A. Payment for furnished and installed manholes shall be paid according to the unit price per each in the proper item of the Proposal and Bid Schedule.
- B. All work and materials to complete the reinforced concrete pipe including but not limited to excavation, bedding, backfill, connection to pipe, etc. shall be subsidiary to this item.

**END OF SECTION**



## **SECTION 700 - WASTEWATER SPECIFICATIONS**

### **ITEM 702. POLYVINYL CHLORIDE (PVC) PIPE-WASTEWATER**

#### **702.1 SCOPE OF WORK**

- A. This specification covers the requirements to install and test polyvinyl chloride (PVC) pipe and fittings, including excavation, sheeting, storing, dewatering, pipe laying, jointing, testing, backfilling, and any other work that is required or necessary to complete the installation as shown in the Plans as specified herein, complete as shown on the Plans and as specified herein.

#### **702.2 SUBMITTALS**

- A. Within 30 days of the Notice to Proceed, the Contractor shall provide a list of materials to be used from the Approved Materials List (AML) or submit to the Engineer or City Staff for approval, technical product literature including the names of the pipe and fittings suppliers, a list of materials to be furnished, shop drawings on required pipes and fittings, certified test reports that the pipe for this Contract was manufactured and tested in accordance with the ASTM Standards specified herein, and all other pertinent data to illustrate conformance to the specification found within.

#### **702.3 QUALITY ASSURANCE**

- A. All PVC pipe and fittings of a given size shall be from a single Manufacturer. The Supplier shall be responsible for the provisions of all test requirements specified in ASTM D3034 or ASTM F789 as applicable. In addition, all PVC pipe to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the City. The Contractor shall require the Manufacturer's cooperation in these inspections. The cost of plant inspection of disapproved pipe, will be borne by the Contractor.
- B. Inspections of the pipe may also be made by the Engineer or other representatives of the City after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

#### **702.4 POLYVINYL CHLORIDE (PVC) WASTEWATER PIPE AND FITTINGS**

- A. Pipe and fittings shall be Type PSM, PVC SDR 26 (pipe) or SDR 35 (fittings) with full diameter dimensions and shall conform to ASTM D3034, or Type PS-46 PVC conforming to ASTM F789, for sizes 4 through 15-inch and shall conform to ASTM F679 for sizes 18 through 27-inch. Straight pipe shall be furnished in lengths of not more than 13-14 feet and wyes shall be furnished in lengths of not more than three (3) feet. Saddle wyes will not be allowed.
- B. PVC pipe and fittings shall have bell and spigot push-on joints. The bell shall consist of an integral wall section with a solid cross-section elastomeric gasket securely locked in place to prevent displacement during assembly. Elastomeric gaskets shall conform to ASTM F477.
- C. All fittings and accessories shall have bell and/or spigot configurations compatible with the pipe.



HANDLING AND CUTTING PIPE

- A. Pipe and fittings are slightly brittle. Care shall be taken in shipping, handling and laying to avoid damaging the pipe and fittings. Extra care will be necessary during cold weather construction.
- B. Any pipe or fitting showing a crack or which has received a blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- C. All pipe ends shall be square after cutting.
- D. While stored, pipe shall be adequately supported from below at not more than three (3) foot intervals to prevent deformation. Pipe shall not be stacked higher than six (6) feet. Pipe and fittings shall be stored in a manner which will keep them at ambient outdoor temperatures and out of direct sunlight. Temporary shading as required to meet this requirement shall be provided. Simple covering of the pipe and fittings which allows temperature buildup when exposed to direct sunlight will not be permitted.

JOINTING POLYVINYL CHLORIDE (PVC) WASTEWATER PIPE AND FITTINGS

- A. PVC wastewater pipe and fittings shall be jointed in accordance with the recommendations of the latest ASTM Standards and detailed instructions of the Manufacturer.
- B. All manhole connections shall be as shown on the Plans.

INSTALLING POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- A. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than  $\frac{1}{16}$ -inch per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the Manufacturer shall be explicitly followed.
- B. Any pipe or fittings discovered to be defective after laying shall be removed and replaced with a sound piece.
- C. The Engineer or the City may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such, and immediately removed from the job site.
- D. All pipe shall be sound and clean before laying. When laying is not in progress, including lunch time, the open ends of the pipe shall be closed by watertight plugs or other approved means.
- E. Pipe and fittings shall be installed in accordance with the instructions of the Manufacturer, ASTM D2321 and as specified herein. As soon as the excavation is complete to normal grade of the bottom of the trench, bedding shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Plans. The specified embedment shall be accurately shaped and trimmed to receive the pipe barrel and each pipe section, when in place, shall have a uniform bearing on the subgrade for the full length of the pipe barrel. Pipe shall not be laid unless the subgrade is free of water and in a satisfactory condition. Adjustments of the pipe to line and grade shall be made by scraping away or filling in with granular material, and not by wedging or blocking up the bell. Blocking under the pipe will not be permitted. The bedding as shown in the details of the Plans, shall be placed evenly on each side of the pipe to mid-diameter and hand tools shall be used to force the bedding under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe. The bedding shall then be placed to 12-inches above the top of the pipe. The initial three (3) feet of backfill above the bedding backfill shall be placed in twelve (12) inch layers and carefully compacted. Generally, the compaction shall be done



evenly on each side of the pipe and compaction equipment shall not be operated directly over the pipe until sufficient backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe. Equipment used in compacting the initial three (3) feet of backfill shall be approved by the pipe Manufacturer's representative prior to use.

- F. Joints shall not be "pulled" or "cramped". Each joint of pipe shall be completed in compliance with Manufacturer's recommendations.
- G. Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it.
- H. Precautions shall be taken to prevent flotation of the pipe in the trench.
- I. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the backfill. Trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened material shall be placed to fill any voids created and the screened material and backfill shall be re-compacted to provide uniform side support for the pipe.
- J. Pipe stubs for manhole connections shall not exceed 1-joint in length unless directed otherwise by the Engineer or the City. Install caps where required. When connecting to an existing manhole, the opening for the connection of the wastewater pipe and the manhole shall be cored using an approved coring machine to the dimensions and size required to install the flexible "SEAL BOOT" resilient connector that meets the requirements of ASTM C-923. The connection shall be watertight when complete and meet the requirements of Section 704- CONCRETE MANHOLES.

702.8 TESTING

- A. Testing and cleaning of pipe shall be as specified in Section 213- TESTING OF PIPELINES AND MANHOLES.

702.9 PAYMENT

- A. The wastewater line, complete in place, will be measured for payment in linear feet along the centerline of the pipe actually installed. Measurement shall be through all manholes and no deduction in length will be made for such appurtenances. Installation of the wastewater line will be paid for at the unit contract price per linear foot as provided in the Proposal and Bid Schedule.
- B. Payment of the unit contract price for the items of work performed shall be the total compensation for furnishing all labor, materials, tools, testing equipment and incidentals and performing all work that is necessary for the installation of the pipe, fittings, embedment or encasement, and all other appurtenances in accordance with the Plans and the provisions of these specifications.

END OF SECTION





## **SECTION 700 - WASTEWATER SPECIFICATIONS**

### **ITEM 703. CONNECTIONS TO AND WORK ON THE EXISTING WASTEWATER SYSTEM**

#### 703.1 **SCOPE OF WORK**

- A. This specification covers the requirements to maintain flow in existing sewers, handle existing wastewater flow, construct and maintain all temporary connections and diversions and construct the permanent connections to the new system as shown on the Plans and as directed by the Engineer.

#### 703.2 **SUBMITTALS**

- A. None required unless specifically called for in the Plans, details, or requested by the Engineer.

#### 703.3 **GENERAL**

- A. The Contractor shall supply all materials, equipment and labor required for plugging existing wastewater lines, all work on existing manholes (including all work and materials required to reshape existing manhole inverts with concrete and connecting new wastewater lines to existing manholes) and all additional work required.
- B. Should damage of any kind occur that compromises the integrity of the existing wastewater line, manhole, etc., the Contractor shall at his/her own expense, as part of the work under this Section, make repairs to the satisfaction of the Engineer.
- C. The Contractor shall notify the Engineer immediately of any discrepancies in elevations of existing wastewater lines and manholes between those shown on the Plans and those established during construction in order that the Engineer can make the necessary modifications.
- D. All new wastewater pipe for connection shall conform to the pipe specifications in Section 702- POLYVINYL CHLORIDE (PVC) PIPE - WASTEWATER.

#### 703.4 **HANDLING WASTEWATER FLOWS**

- A. The Contractor shall provide all labor, equipment and materials necessary to maintain existing flows, including temporary diversions and all pumping of sewage that may be required to prevent backing up of wastewater lines and shall immediately remove all offensive matter at his/her own expense.
- B. The Contractor shall not be permitted to overflow, bypass, pump or by any other means convey sewage to any stream, or other water course.
- C. All procedures for maintaining flows must meet the approval of the Engineer and the Contractor shall be required to submit to the Engineer, for approval, a detailed written plan of all methods of flow maintenance 10 days in advance of flow interruption.

#### 703.5 **PAYMENT**

- A. No separate payment shall be made for work performed in accordance with this section of the specifications, and the cost thereof shall be included in the proper items of the Proposal and Bid Schedule.

**END OF SECTION**



## **SECTION 700 - WASTEWATER SPECIFICATIONS**

### **ITEM 704. ABANDONING EXISTING MANHOLES (WASTEWATER)**

#### **704.1 SCOPE OF WORK**

- A. This specification covers the requirements to abandon existing manholes as shown on the Plans and as specified herein.

#### **704.2 SUBMITTALS**

- A. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer or the City for approval, technical product literature including backfill material (source, gradation and type), select backfill material (source, gradation, plasticity index and type), flexible base (binding material, additives, source, gradation and type), equipment and all other pertinent data to illustrate conformance to the specification found within.

#### **704.3 REMOVAL OF MANHOLES SHOWN ON THE PLANS WHICH ARE NOT LOCATED IN THE STREET**

- A. Excavate and remove manhole cone, ring, and cover.
- B. Plug all lines entering manhole with concrete.
- C. Backfill with grout or flowable fill to a point 12” above the highest plugged line. Backfill to a point 12” below natural ground surface with compacted native material.
- D. Backfill remaining 12” with suitable topsoil.
- E. Offer manhole ring and cover to Owner for salvage. Remove and dispose of all debris.

#### **704.4 REMOVAL OF MANHOLES SHOWN ON THE PLANS WHICH ARE LOCATED IN THE STREET**

- A. Excavate and remove manhole cone, ring, and cover.
- B. Plug all lines entering manhole with concrete.
- C. Backfill with grout or flowable fill to a point 12” above the highest plugged line. Backfill to a point 12” below existing roadway surface with compacted flexible base.
- D. Backfill remaining 12” with flexible base in accordance with Section 504 – FLEXIBLE BASE.
- E. Offer manhole ring and cover to Owner for salvage. Remove and dispose of all debris.

#### **704.5 PAYMENT**

- A. Payment for abandoning existing manholes shall be paid according to the unit price per each in the proper item of the Proposal and Bid Schedule.

**END OF SECTION**

