



**TABLE OF CONTENTS**

<b><u>Item</u></b>	<b><u>Title</u></b>	<b><u>Page</u></b>
600	Specifications for Underground Construction of Water and Sewer Pipes .....	F-1
601	Specifications for Clearing and Grubbing .....	F-12
605	Specifications for Steel Casing.....	F-13
610	Specifications for Dry Auger Boring .....	F-15
702	Specifications for PVC Gravity Sewer Pipe and Fittings .....	F-17
704	Specifications for Fiberglass Reinforced Plastic Mortar Pipe .....	F-18
705	Specifications for PVC Force Main Sewer Pipe .....	F-19
707	Specifications for Ductile Iron Pipe .....	F-20
708	Specifications for Fiberglass Manholes.....	F-21
709	Specifications for Manhole Stabilization.....	F-25
711	Specifications for Seeding and Sodding .....	F-29
712	Specifications for Trench Safety Systems .....	F-33
719	Specifications for Air Release Valves .....	F-38
801	Specifications for Ductile Iron Pipe and Fittings .....	F-39
803	Specifications for Concrete Steel Cylinder Pipe and Fittings .....	F-41
805	Specifications for Valve Boxes and Risers .....	F-44
806	Specifications for Gate Valves Sizes 42" and Larger .....	F-45
807	Specifications for Butterfly Valves .....	F-48
808	Specifications for Fire Hydrants .....	F-51
809	Specifications for Testing and Sterilization of Completed Lines .....	F-54
810	Specifications for Polyvinyl Chloride (PVC) Pressure Water Pipe .....	F-57
811	Specifications for Resilient Wedge Gate Valves Sizes 4" thru 66" .....	F-59
812	Specifications for Reduced Pressure Principle Backflow Preventers .....	F-61
813	Specifications for Horizontal Directional Drilling .....	F-63
814	Specifications for City of Beaumont Water Utilities Service Agreement for Fire Hydrant Construction Meters .....	F-76
817	Specifications for Cement Stabilized Sand .....	F-80
903	Specifications for Sewer Line Cleaning .....	F-81



---

<u>Item</u>	<u>Title</u>	<u>Page</u>
904	Specifications for Sewer Flow Control .....	F-84
905	Specifications for Television Inspection .....	F-86
01540	Specifications for Diversion Pumping .....	F-88
01578	Specifications for Ground Water and Surface Water .....	F-90
01731	Specifications for Cutting and Patching .....	F-99
02052	Specifications for Trenchless Gravity Sewer Pipe Rehabilitation by Pipe Lining .....	F-102
02221	Specifications for Removing Existing Pavement and Structures .....	F-113
02226	Specifications for Pipe Jacking, Boring, and Tunneling .....	F-115
02317	Specifications for Excavation and Backfill for Utilities .....	F-124
02320	Specifications for Utility Backfill Material .....	F-139
02505	Specifications for High Density Polyethylene (HDPE) Solid and Profile Wall Pipe .....	F-150
02533	Specifications for Acceptance Testing for Sanitary Sewers .....	F-155
02534	Specifications for Sanitary Sewer Service Stubs or Reconnections .....	F-170
02535	Specifications for Field Testing of Large Diameter Slip-Lined Piping Systems .....	F-178
02550	Specifications for Sliplining Sanitary Sewers .....	F-181
02553	Specifications for Point Repairs and Obstruction Removals .....	F-194
02555	Specifications for Manhole Rehabilitation .....	F-202
02558	Specifications for Cleaning and Television Inspection .....	F-211
02611	Specifications for Reinforced Concrete Pipe .....	F-225
02821	Specifications for Chain Link and Wooden Fences and Gates .....	F-228
02951	Specifications for Pavement Repair and Resurfacing .....	F-232
03301	Specifications for Precast Concrete Manholes .....	F-234
04015	Specifications for Plug Abandoned Sewers .....	F-238
04020	Specifications for Pipe Bursting/Crushing .....	F-239



---

**ITEM 600**

**SPECIFICATIONS FOR UNDERGROUND CONSTRUCTION  
OF WATER AND SEWER PIPES**

**600.01 - Description**

Underground construction of water and sewer pipes includes all preparation of site, clearing, grubbing, excavation, street surface removal, boring, tunneling, dewatering, sheeting, bracing, laying and joining of pipe, bedding, backfilling, installation of fittings and manholes, testing, and cleaning up of the site. The work concludes furnishing of all materials, equipment, tools, labor and all other incidentals to complete the construction. Item 600 may not be mistaken for the Street Construction Specifications for the Public Works Department, Engineering Division of the City of Beaumont.

**600.02 - Sequence of Work**

The CONTRACTOR shall make adequate planning and preparation before excavation starts. CONTRACTOR shall notify the Water Utilities Engineer before beginning work. They shall pursue the job in an orderly fashion. The construction shall start with mains and proceed to laterals. All appurtenances shall be constructed as soon as the pipe line they serve is constructed to their location. The construction of appurtenances may be postponed upon approval of the ENGINEER and determination that the circumstances were beyond the control of the CONTRACTOR. A sufficient space as determined by the ENGINEER, shall be provided for proper installation at a later time.

**600.03 - Site of Work**

The OWNER will furnish the site, easements, or any right of way considered necessary by the ENGINEER. If CONTRACTOR needs more working area, they shall make their own arrangements and indemnify the OWNER from any damages or claims.

**600.04 - Protection of the Public**

The CONTRACTOR shall make any provisions necessary to protect the public from inconveniences and dangers caused by the construction. Storage and stringing of the material, equipment and excavation shall be done in a manner to cause minimum obstruction and inconvenience to the traffic and the property owners along or adjacent to the construction site. Fire Hydrants, water meters, water valves, gas valves, manholes, catch basins, and boxes for telephone, signal, and alarms shall not be obstructed or covered.



The CONTRACTOR shall make bridges or other provisions and arrangements approved by the ENGINEER to give access to the public across streams, highways, streets, sidewalks, and driveways. When required CONTRACTOR is to construct temporary bridges. Their responsibility for accidents shall include the roadway approaches and the structures of such crossings. The OWNER reserves the right to remedy any neglect by the contractor about the public conveniences and safety which may come to its attention. After twenty-four hours notice in writing to the CONTRACTOR, except in cases of emergency, when they shall have the right to remedy any neglect without notice, and, in either case, the cost of such work done by the OWNER shall be deducted from monies due or because of the CONTRACTOR.

### **600.05 - Handling of Traffic**

The CONTRACTOR shall make provisions necessary to handle, direct, and divert the traffic. Notify the Public Works Department, Transportation Division of the City of Beaumont of any change in traffic flow at least forty-eight (48) hours in advance.

If diversion of traffic requires construction of a temporary roadway, the CONTRACTOR shall make all arrangements at their own cost and to the approval of the ENGINEER and the Public Works Department, Transportation Division. If a street needs closing, the department shall be informed forty-eight (48) hours before closing, and also after opening street to traffic. Adequate signs to divert the traffic shall be used as directed by the Public Works Department, Transportation Division.

The CONTRACTOR shall make every attempt to save traffic signs and also traffic boxes, cables and lights. If any of these appurtenances need to be removed or moved accidentally, the Public Works Department, Transportation Division shall be informed immediately.

### **600.06 - Barricades, Lights, and Guard (s)**

Where the work is in or adjacent to any street, alley, or public place, the CONTRACTOR, at their own cost and expense, furnish and build such barricades, fences, lights and danger signals; shall provide such guard (s) and shall take such other precautionary measures for the protection of persons or property and of the work necessary. Barricades shall be recently painted in a color that will be visible at night. From sunset to sunrise the CONTRACTOR shall furnish and maintain adequate lights at each barricade. An enough barricades shall be built to keep vehicles from being driven on or into any work under construction. The CONTRACTOR shall furnish guard (s) in sufficient numbers to protect the work.

The CONTRACTOR shall be responsible for all damage to the work because of failure of barricades, signs, lights and guard (s) to protect it, and whenever evidence found of such damage, the ENGINEER may order the damage portion immediately removed and replaced by the CONTRACTOR at the CONTRACTOR'S cost and expense. The CONTRACTOR'S responsibility for the maintenance of barricades, signs and lights, and for providing guard (s), shall not cease until the project is accepted by the OWNER.



Barricades, signs, and handling of traffic shall be in agreement with the Manual on Uniform Traffic Control Devices as adopted by the Texas Highway Department, and as directed by the Public Works Department, Transportation Division of the City of Beaumont, all in agreement with these specifications. A copy of the manual is available for review without charge at the Traffic and Transportation in City Hall.

### **600.07 - Protection of Utilities**

The locations of utilities are not shown on the plans. The CONTRACTOR shall inspect the route of the construction during the bidding period to check the location of such utilities, and possibility of any conflict. Whenever existing utilities present obstructions to grade and alignment of pipes or appurtenances, the CONTRACTOR will notify the ENGINEER, who without delay, will determine whenever existing improvements are to be relocated or grade and alignment of pipe to be changed. When necessary to move services, poles, guy wires, pipe lines, or other obstructions, the CONTRACTOR will make necessary arrangements with owner-operator of utilities. The OWNER will not be liable for damages because of changes made by the owner operator of the utility which hinders progress of work, nor will the OWNER be liable for cost incurred in relocating utilities service poles, services and appurtenances.

The CONTRACTOR shall make any provision necessary to protect all utilities, services, and appurtenances. They shall locate and inform the owner-operator of a utility at least forty-eight (48) hours before progressing to such utility. It is the responsibility of the CONTRACTOR to provide and install all beam span supporting, bracing, shoring, and sheeting necessary to support all utilities crossed at their own expense.

### **600.08 - Protection of Private Property**

The CONTRACTOR shall not enter upon private property for any purpose without having previously obtained permission from the OWNER. The CONTRACTOR shall be responsible for the preservation of, and shall use every precaution to prevent damage to all trees, shrubbery, plants, lawns, fences, culverts, bridges, pavement, driveways, sidewalks, buildings, and service lines in or adjacent to private property. If a private property owner has a complaint, the CONTRACTOR shall take immediate action to satisfy the property owner.

### **600.09 - Preparation of the Site and the Route**

The CONTRACTOR shall make all preparation necessary before excavation starts. The construction site and or the route which the pipe will be laid in shall be cleared and grubbed before pipe laying. All trees, stumps, brush, roots, logs, rubbish and other objectionable material shall be removed and disposed of in a manner approved by the ENGINEER. Burning and or hauling of the material shall be executed in compliance with ordinances of the City of Beaumont, County of Jefferson, or any other governmental body.

If work is proceeding through a utility easement, care shall be taken to clear all the proposed easement as specified above.



CONTRACTOR shall prepare the site furthermore by establishing drainage along the route if necessary, filling up holes, and generally leveling the site and or the route. The purpose is to keep the surface water away from the trench for pipe. It will also benefit the CONTRACTOR since soil conditions will improve and therefore the progress of the pipe laying.

#### **600.10 - Protection of Street and Drainage**

The CONTRACTOR shall make all attempts to keep streets and drainage open. Streets should be kept as clean as possible and mud scraped often as required and dust watered down if asked by the City. Drainage ditches shall be kept open and if filled by the CONTRACTOR, they shall be reopened before the crew leaves the site at the end of a working day.

If in the opinion of the ENGINEER the street needs to be closed, the CONTRACTOR shall inform the Public Works Department, Transportation Division and the residents being affected at least forty-eight (48) hours in advance. Attempts should be made to give temporary access to the residents of the blocking being affected. CONTRACTOR should attempt to minimize the duration of street closing by proper planning of the work and arranging for all the required material, equipment, and personnel. However, since the safety of the public is more important than the inconveniences imposed on, the CONTRACTOR should keep a closed street unpassable to through traffic and not open it until it is safe for through traffic.

If sections of the original pavement or surface are removed by the CONTRACTOR, the trench shall be filled according to the provisions of "ITEM 600.19 and 20". Fill the top layer of the street with limestone temporarily until the street is ready for surface replacement in agreement with "ITEM 600.20 and 21", until the street is ready for final replacement of the surface, CONTRACTOR should keep the street passable for the local residents.

The Street Division of the City of Beaumont makes the final inspection of pavements, streets, shoulders, drainage ditches, and structures related to their department. CONTRACTOR shall correct any problem pointed out by this department.

#### **600.11 - Temporary Sewer and Drainage Connections**

If existing sewers have to be taken up or removed, the CONTRACTOR at his cost and expense, provide and maintain temporary outlets and connections for all private or public drains and sewers. The CONTRACTOR shall also take care of all sewage and drainage which will be received from these drains and sewers; and for that purpose they shall provide and maintain, at their own expense, adequate pumping facilities and temporary outlets or diversions. The CONTRACTOR, at their own expense, shall construct such trough, pipe or other structures necessary, and at all times prepare to dispose of drainage and sewage received from these temporary connections until the permanent connections built and maintained under the contract, except where specified or ordered to be abandoned by the ENGINEER. All water or sewage shall be disposed of satisfactorily so that no nuisance is created and so that the work under construction will be adequately protected. Under no circumstances shall sewage be diverted to a drainage ditch, street, or natural ground.



### **600.12 - Control of Grade and Alignment**

It is the responsibility of the CONTRACTOR to provide centerline stakes and cuts at each stake and to protect such stakes and control the alignment and grade. The CONTRACTOR may use any device such as level, transit or laser beam instrument to control the pipe laying. If the pipe alignment and grade is incorrect, it shall be taken out.

### **600.13 - Trench Excavation**

The ground shall be excavated by the open trench method to the required depth, width, line and grade as given by the ENGINEER. The trench walls shall be vertical to a point not less than 12 inches above the top of the pipe. For all pipes the sides of the trench below the top of the pipe shall be less than 6 inches nor more than 8 inches from the side of the pipe for sizes 12 inches and less, and the pipe outside diameter plus 24 inches maximum trench width for pipe sizes 15 inches and larger. If the trench is excavated below the proper grade, it shall be refilled to grade with selected backfill material and thoroughly rammed without extra compensation, unless the extra excavation was ordered by the ENGINEER. In case of a cave-in and if the trench width is larger than the maximum allowed, selected backfill material shall be placed on sides of the pipe up to the undisturbed wall and compacted.

In sewer construction, use 3" of washed sand for final grading/bedding. In sewer and water construction, bell holes must be excavated before pipe placement.

### **600.14 - Locating Intersecting Pipes**

The CONTRACTOR shall make attempts to locate intersecting lines ahead of pipe laying. They shall locate and excavate in advance service lines, sewers, and water lines which will be tied into the system under construction. Any pipe line or gas line, underground power lines, fiberoptic and telephone cables shall be located with proper notification.

### **600.15 - Sheeting and Bracing**

The CONTRACTOR shall provide sheeting and bracing necessary for the protection of the work and employees. In the event the soil conditions are such that the CONTRACTOR should desire to leave such sheeting in place, they shall secure the permission of the ENGINEER to do so. Any cost of such sheeting and bracing shall be included in the unit price of laying pipe.

### **600.16 - De-watering**

Under no circumstances shall the surface water be allowed to flow in the trench. When ground water exists in the trench, the CONTRACTOR shall make attempts to drain it away from pipe laying area or pump it out of the trench. If quicksand or water sand conditions appear in the trench bottom, the CONTRACTOR shall undercut the trench and replace it with granular material at no extra cost to the OWNER, and with the ENGINEER'S approval. City reserves the right to require the CONTRACTOR to use adequate dewatering and sheeting and bracing if the CONTRACTOR was not installing the pipe properly in unstable soil.



### **600.17 - Pipe Handling**

The CONTRACTOR shall unload, store, and replace pipe according to the specifications of the pipe manufacturer. Care shall be taken not to damage the pipe by impaction or point loading. If using PVC or Truss pipe the pipe shall be kept in the shipping bundle until the day that it will be installed.

### **600.18 - Pipe Placement**

The pipe shall be laid straight to the exact alignment and grade as given by the ENGINEER. No variation from the given alignment and grade will be permitted except to avoid existing underground mains, and then only upon the written permission of the ENGINEER. It is important to locate such mains in advance for possible conflict.

All pipe shall be laid with the spigot end or tongue end downstream entering the bell or groove to full depth. Care shall be taken in placing pipe to prevent any bedding material being dragged into or left in the annular space for sealing of the joints.

The pipe shall be examined for defects, cut to correct lengths, and the interior surface and the bell and spigot thoroughly cleaned of all foreign material. The ENGINEER reserves the right to reject any joint of pipe which has not completely complied with the provisions of these specifications. Any unsatisfactory joint shall be replaced without cost to the OWNER.

### **600.19 - Jointing and Backfilling**

Jointing and backfilling depends on the pipe material. Under each item for a given material, jointing and backfilling provisions are specified.

As soon as jointing is completed, backfilling shall start. The trench shall be absolutely backfilled before the working day ends. Backfill material above the required 6 or 12 inch select backfill depends on the location of the line in relation to type of street or pavement.

(a) Portland Cement Concrete Pavement and Flexible Base Asphalt Surfaces with curb and gutter, the trench shall be filled to the bottom of the pavement with a dry mixture of clean sand and one and one-half (1½) sacks of cement to the cu. yd., thoroughly tamped. This requirement shall apply to both trenches running along, parallel and under the pavement and in trenches crossing the pavement.

(b) Flexible Base Asphalt Surfaces without Curb and Gutter in trench crossing flexible base surfaces with bituminous topping of any type or condition, the trench shall be filled to the bottom of the pavement surface with a dry mixture of clean sand and one and one-half (1½) sacks of cement to the cu. yd. thoroughly tamped. This requirement shall apply in trenches crossing this type of pavement surface; however, in trench running under and parallel to this type of surface the requirement shall be the same as that specified for dirt streets in (c) below.



(c) Dirt Streets - The trench shall be backfilled with selected excavation of loose fine earth by either of two methods of backfill procedure, water tamping or power tamping. In using water tamping, the balance of the trench above the 6" height above the top of pipe shall be filled with the loose fine material in even layers not exceeding eighteen (18") inches in thickness of loose material and immediately flooded to complete saturation and left undisturbed for three (3) days.

The trench shall then be refilled and flooded again using poles to insure penetration of water to the full depth of the trench. This flooding shall continue until there is no further settlement. The top ten (10") inches of the trench shall be backfilled as per standard detail. Power tamping will be permitted only where the trench and backfill material are dry enough to permit satisfactory compaction. Backfill shall be placed in the trench in layers not exceeding twelve (12") inches in thickness.

On completion of the tamping, all excavated material shall be substantially replaced in the trench deducting the space occupied by the pipe and bedding. Compaction in all levels from six (6") inches above the top of the pipe to grade shall be not less than 90% of the Maximum density value as determined by the "Standard Laboratory Method for Compaction and Density of Soil", "AASHTO Designation T-99". The top six (6") inches of the trench shall be backfilled with gravel or insitu materials with no fines as per standard detail. The above procedure for dirt streets shall apply in trenches running in, parallel to and running across the normally maintained portion of the road or street right-of-way.

Whenever the trench is not in a street but in an easement or plant area which is not traveled, the backfill procedure shall be the same as for a dirt street, except for the top six (6") inches, refer to standard detail.

Whenever the trench is within a street right-of-way in which there is concrete or flexible base asphalt pavement but the trench is not in the paved portion of the right-of-way, the procedure shall be the same as for the dirt street, except that the shell in the top six (6") inches of the trench shall be placed only in driveway crossings, roadway shoulders and other areas where there will be light traffic. Where shell is omitted the ground shall be restored to its original condition by the replacement of grass or any other improvement which existed before the construction.

In general, pipe shall be placed in a trench free of clods of dirt and bedded with a bedding material or natural ground free of any large clods to damage the pipe or its position. The material around the pipe up to the spring line shall be packed to 90% density.

### **600.20 - Removal and Replacement of Street Surfaces**

The provisions of this item are same as those of Item 121.15 of the Street Construction Specifications for the Public Works Department, Engineering Division of the City of Beaumont.

This work shall comprise the cutting and replacement of pavement where such is necessary for the installation of pipe lines or appurtenances under the contract. The work shall include the furnishing of all labor, materials, tools and equipment and doing all work of whatever nature including the hauling and disposal of surplus materials necessary for the removal and later replacement of pavement in agreement with the plans and specifications.



Whenever pipe line construction occurs in any street, regardless of type of pavement, the contractor will make every effort to provide ingress and egress to residents living along said streets.

No separate items for pavement for removal and replacement of concrete, asphaltic, shell or gravel, streets shall be listed. The cost of this work shall be included in the unit cost per foot of pipe line.

(a) Concrete Pavement: Concrete pavement shall include streets with a concrete slab, concrete base with topping, and asphaltic pavements with curb and gutter.

The CONTRACTOR shall not use equipment to cut trenches in existing pavements which will strike a heavier blow than is usual with a hand pavement breaker operated from an air compressor. The edges of the cut shall be trimmed to leave a vertical face of sound, unfractured, pavement.

The pavement shall be removed to a distance not less than twelve (12") inches back from a firm bank of the trench excavation.

All concrete for pavement replacement shall meet the requirements for concrete pavements as set out by the OWNER. Replacement of pavement shall be made as per Public Works Department, Engineering Division standard details as shown in the plans.

All replacement pavement shall be finished in a neat and workmanlike manner and protected and cured as its nature may require.

(b) Streets other than Concrete pavement: Street pavements other than concrete and asphaltic pavements with curb and gutter may be removed with the excavation to the extent of the excavation. After backfilling the trench as specified elsewhere herein, the CONTRACTOR shall replace the pavement to its original condition.

(c) Street surfacing: P. C. Concrete or asphaltic pavement, shall be replaced within 72 hours after completion of trench backfilling or be patched with three inches (3") of temporary asphalt and maintained until permanent replacement is made.

### **600.21 - Crossings of Driveways, Sidewalks, and Parking Areas**

In backfilling the trenches which cross under driveways of any type (concrete, bituminous, shell and dirt), and under concrete sidewalks, the procedure shall be the same as that specified in Item 600.19 Paragraph (a) for concrete pavement which specifies a dry mixture of clean sand and one and one-half (1½) sack of cement to cubic yard thoroughly tamped. Such backfill shall also conform to provisions of the Public Works Department, Engineering Division Street Construction Specifications of the City of Beaumont.

The CONTRACTOR shall restore driveways and their culverts to their original condition as soon as possible. They shall inform citizens which will be affected by this work before start of work.



### **600.22 - Highway Crossings**

Crossings of highways shall be done according to the requirements set forth by the Texas Highway Department as explained in the permit. The ENGINEER shall provide the City of Beaumont Water Utilities Department with plan and profile drawings of the proposed construction. The City of Beaumont Water Utilities Department will acquire the permit. It is the responsibility of the CONTRACTOR to familiarize himself with the requirements.

The CONTRACTOR shall notify the maintenance superintendent of the Texas Highway Department at least 48 hours before any work starts. Adequate signs, flares, barricades and flagmen shall be used according to the State Highway Standards. Highway shall be restored to its original condition.

### **600.23 - Railroad Crossings**

Crossings of the railroads shall be done according to the requirements set by the Railroad Company as explained in the permit. The CONTRACTOR and/or ENGINEER will acquire the permit. The completed permit shall be submitted to the City of Beaumont Water Utilities Department prior to construction. It is the responsibility of the CONTRACTOR to familiarize himself with the requirements.

The CONTRACTOR shall notify railroad roadmaster before crossing railroad at least 48 hours before any work starts. CONTRACTOR shall pay all costs connected with the furnishing by the railroad of foreman and/or crews for the supervision of work done by the railroad.

### **600.24 - Drainage Ditch Crossings**

Crossings of drainage ditches and canals shall be done according to the requirements set by the authority in charge of the ditch as explained in the permit. The CONTRACTOR and/or ENGINEER will acquire the permit. The completed permit shall be submitted to the City of Beaumont Water Utilities Department prior to construction. It is the responsibility of the CONTRACTOR to familiarize himself with the requirements.

The CONTRACTOR shall notify the authority in charge before crossing ditch or canal at least 48 hours before any work starts. Adequate protection shall be taken to establish drainage back before the working day ends. The CONTRACTOR shall be responsible for any damages caused by the stoppage of drainage. CONTRACTOR shall restore the ditch or canal to its original shape and density as soon as possible.

### **600.25 - Pipe Line Crossings**

It is the responsibility of the CONTRACTOR to locate all pipe lines to be crossed, contact the owner of the pipe line, and make arrangements for crossing such lines. It is best to locate such lines a few hundred feet ahead of pipe laying operation, in order to make revisions in grade or alignment, if they are necessary and approved by the ENGINEER.



### **600.26 - Excess Excavation**

Excess excavation shall be hauled and placed on properties designated by the OWNER. If OWNER does not have any use for the excess dirt, the CONTRACTOR at his cost is to make arrangements to dispose of the excess excavation in a manner approved by the ENGINEER.

Those portions of excavated fine quality soil may be used in the trench above the 6 or 12 inch select backfill. Such portions may also be used on the construction site if they are spread properly as directed by the ENGINEER.

### **600.27 - Plugging Ends**

Before leaving the work for the night, or at any time, the end of the pipe line shall be securely closed with a water tight plug at the entire cost and expense of the CONTRACTOR.

### **600.28 - Tunneling, Boring, and Casing**

Requirements for tunneling, boring, and casing depends on the permit issuing agency involved. However, the Water Utilities Department of the City of Beaumont should concur with the requirement set.

In general casings shall have a uniform invert to be accepted for maintenance by the City of Beaumont. Furthermore, size of the casing shall be at least 6 inches larger than the outside diameter of the bell of the pipe.

Whenever a water line or sewer line is too shallow and pipe material is not adequate to withstand the traffic load at street crossings, casing or a rigid pipe such as ductile iron shall be used. An asphalt coated corrugated metal pipe may be used as a casing pipe under streets.

### **600.29 - Protective Coating**

All bolts shall receive a protective coating of an asphaltic compound or shall be wrapped with a sand and cement ( 2 sack cement per 1 cubic yard of sand mixture).

### **600.30 - Spacing of Sanitary Sewers and Water Lines**

#### **A. Water Lines**

Water lines shall be laid as per Texas Commission on Environmental Quality Control (TCEQ) regulations that will be determined on a case by case basis because of physical conditions, precautions shall be taken in securing absolute and permanent tightness of water pipe joints. No water pipe joint shall exist within nine feet (9') of the crossover point.

#### **B. Sanitary Sewer Lines**

Sanitary sewer lines shall be laid as per Texas Commission on Environmental Quality Control (TCEQ) regulations that will be determined on a case by case basis. Where this requirement cannot meet physical



conditions, precautions shall be taken in securing absolute and permanent tightness of the sewer line joints.

### **600.31 - Testing and Acceptance**

All water lines shall be flushed, sterilized and pressure tested according to the provisions of Section 809 before acceptance for maintenance by the Water Utilities Department of the City of Beaumont.

### **600.32 - Clean up**

The CONTRACTOR shall remove from site of work, and from public and private property, all temporary structures, rubbish, waste material including all excess excavated materials, and all trees removed. The completed clean up shall not be greater than 1,000 feet behind pipe laying operation, however, this distance shall be reduced in residential areas. Not more than one block can be disrupted for construction. Clean up and testing may be done at the same time but clean up shall not be delayed on the account of testing. Pipe laying operation will be suspended temporarily if completed clean up is farther behind than 1,000 feet.

### **600.33 - Agency Requirements to be Met**

All water and sewer lines installed in City of Beaumont shall meet the requirements of the Texas Commission on Environmental Quality Control (TCEQ).

### **600.34 - Measurement**

Pipe will be measured by the linear foot of pipe complete in place. Such measurements will be made between the ends of the pipe barrel along the center axis as installed. Also consisting of all materials, labor, excavation, backfilling, testing, inspection, and other incidentals necessary to the complete installation.

End Of Section



---

**ITEM 601**

**SPECIFICATIONS FOR CLEARING AND GRUBBING**

**Description**

Clearing and grubbing shall consist of the removal and disposal of trees, stumps, brush, roots, vegetation, logs, rubbish and other objectionable matter.

**Construction Methods**

The entire street or drainage right-of-way and other specified areas shall be cleaned except such trees and brush as may be designated by the Engineer for preservation. Trees and brush designated to be left in place shall be carefully trimmed as directed and shall be protected from scarring, barking or other injuries during construction operations.

When directed by the Engineer, this item shall receive priority and shall be completed throughout the project.

Areas required for water and sanitary sewer construction shall be cleared and grubbed and roots and stumps must be removed to a depth of at least two (2) feet below the existing ground surface. All holes remaining after clearing and grubbing shall be backfilled and tamped as directed by the Engineer.

All cleared and grubbed material shall become the property of the Contractor and shall be disposed of at the Contractor's expense.

**Measurement and Payment**

When specifically included as a Bid Item, Clearing and Grubbing performed as specified herein, will be measured by the acre of surface area as measured on the ground within the limits designated on the plans. All work performed satisfactorily as specified and measured as herein provided shall be paid for at the unit price bid for "Clearing and Grubbing" which price shall be full compensation for furnishing all labor, materials, equipment, tools, supplies and incidentals necessary to perform the work as specified.

When not included as a Bid Item, Clearing and Grubbing will not be paid for directly but will be considered subsidiary to pay items.

End of Section



---

**ITEM 605**

**STEEL CASING**

**605.01 - GENERAL**

This specification shall govern for underground construction using casing pipes in the excavation. The work shall be accomplished in accordance with these specifications and the requirements of Technical Specification Item 600, as they apply.

**605.02 - MATERIALS**

The carrier or casing pipe shall be of the type and strength as specified in these specifications, as follows:

A. Steel Casing Pipe

Steel casing used for underground construction shall be new and unused steel pipe of the size and thickness as shown on the plans and specifications. The exterior of the casing pipe shall have a minimum of 20 mil. DFT of cold tar epoxy (three coats) applied after surface preparation meeting SSPC - SP10-85 to a near-white condition, using an abrasive blast material. During installation operations, care shall be taken to protect the epoxy coating and to repair any damaged areas. The Contractor shall mechanical brush and repaint all welded joints or damaged areas. During the installation operation using a quick cure coal tar epoxy paint and allow the newly painted areas to dry to touch prior to placing the casing pipe into the excavation. The proposed carrier pipe with bell/spigot joints shall have spacers to center the pipe consisting of RACI casing spacers as manufactured by Public Works Marketing, Inc. or prior approved equal. Both ends of the casing shall be sealed water tight after inserting the carrier pipe, with rubber end seals.

B. Exposed Steel Casing Pipe

Steel casing used for creek crossing construction shall be new and unused steel pipe of the size and thickness shown on the plans and in the specifications. The exterior of the casing pipe surface preparation shall be SSPC-SP10 near-white blast cleaned and primed with Tnemec Series 66 Hi-Build Epoxoline consisting of a minimum dry film thickness of 4.0 mils, or an approved equal. Finish coat shall be Tnemec Series 69 Hi-Build Epoxoline II consisting of a minimum dry film thickness of 8.0 mils, or approved equal. The color of the finish coat shall by "Tank White". The proposed carrier pipe with bell/spigot joints shall have spacers to center the pipe consisting of RACI casing spacers as manufactured by Public Works Marketing, Inc. or prior approved equal. Both ends of the casing shall be sealed water tight after inserting the carrier pipe, with rubber end seals.



RICH WITH QUALITY  
**BEAUMONT**  
T • E • X • A • S

**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

**605.03 - MEASUREMENT**

The casing will be measured by the linear foot of casing in placing. Such measurements will be made between the ends of the casing along the center axis as installed.

END OF SECTION



---

**ITEM 610**

**SPECIFICATIONS FOR DRY AUGER BORING**

**610.01 - Description**

This item shall govern for the furnishing and installation of pipe by the methods of jacking, boring or tunneling as shown on the plans and in conformity with this specification.

**610.02 - Materials**

Casings shall be steel pipe, coated on the inside and outside with coal tar epoxy (20 mil minimum thickness). Minimum wall thickness shall be 0.375" for 24" pipe. The diameter (if not specified in plans and specifications) shall be sufficient to allow installation of the carrier pipe (including joints). Any joints in casing shall be welded and coated with manufacturer approved field wrap.

**610.03 - Construction**

The owner will provide all boring and receiving pits necessary for the boring operations. All trench excavation protection shall be constructed in accordance with the provisions of, Part 1926, Subpart P-Excavations, Trenching, and Shoring of the Occupational Safety and Health Administration's Standards and Interpretations.

Where pipe is required to be installed under railroad embankments or under highways, streets, or other facilities by jacking or boring methods, construction shall be made in such a manner that will not interfere with the operation of the railroad, street, highway, or other facility, and shall not weaken or damage any embankment or structure. During construction operations, barricades and lights to safeguard traffic and pedestrians shall be furnished and maintained by the owner until such time as the backfill has been completed and then shall be removed from the site.

Heavy duty jacks suitable for forcing the pipe through the embankment shall be provided. In operating jacks, even pressure shall be applied to all jacks used. A suitable jacking head, usually of timber, and suitable bracing between jacks and jacking head shall be provided so that pressure will be applied to the pipe uniformly around the ring of the pipe. A suitable jacking frame or back stop shall be provided. The pipe to be jacked shall be set on guides, properly braced together, to support the section of the pipe and to direct it in the proper line and grade. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe. In general, embankment material shall be excavated just ahead of the pipe and material removed through the pipe, and the pipe forced through the embankment with jacks, into the space thus provided.

The Contractor shall furnish for the Engineer's approval, a plan showing his proposed method of handling, including the design for the jacking head, jacking support or back stop, arrangement and position of jacks, pipe guides, etc., complete in assembled position. The approval of this plan by the Engineer will not relieve the Contractor from his responsibility to obtain the specified results.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

The excavation for the underside of the pipe, for at least one third of the circumference of the pipe, shall conform to the contour and grade of the pipe. A clearance of not more than 2 inches may be provided for the upper half of the pipe.

This clearance is to be tapered off to zero at the point where the excavation conforms to the contour of the pipe.

The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material, but it shall not exceed 2 feet in any case. The distance shall be decreased on instructions from the Engineer, if the character of the material, being excavated makes it desirable to keep the advance excavation closer to the end of the pipe.

The pipe, preferably, shall be jacked from the low or downstream end. Vertical variation in the final position of the pipe from the grade established by the Engineer will be permitted only to the extent of 1 inch in 50 feet, provided that such variation shall be regular and only in one direction and that the final grade of flow line shall be in the direction indicated on the plans. Lateral variation in the final position of the pipe from the line established by the Engineer will be permitted only to the extent of 1 inch in 10 feet, provided that such variation shall be regular and only in one direction.

If the Contractor desires, he may use a cutting edge of steel plate around the head end of the pipe extending a short distance beyond the end of the pipe with inside angles or lugs to keep the cutting edge from slipping back onto pipe.

When jacking of pipe is once begun, the operation shall be carried on without interruption, insofar as practicable, to prevent the pipe from becoming firmly set in the embankment.

Any pipe damaged in jacking operations shall be removed and replaced by the Contractor at his entire expense.

The pits or trenches excavated to facilitate jacking operations shall be backfilled, immediately after the jacking of the pipe has been completed and the carrier pipe installed.

#### **610.04 - Measurement**

Boring and casing pipe will be measured by the linear foot of pipe complete in place. Such measurement will be made between the ends of the pipe along the flow line as installed.

#### **610.05 - Payment**

The work performed and materials furnished as prescribed by this section, measured as provided under "Measurement" will be paid for at the unit price bid per linear foot for "Boring and Casing Pipe", of the type, size, and class specified on the plans, which price shall be full compensation for furnishing all materials, pipe liner materials required for tunnel operations, for all preparation, hauling and installing of same, and for all labor, tools, equipment, and incidentals necessary to complete the work.

End of Section

---

## **ITEM 702**

### **SPECIFICATIONS FOR PVC GRAVITY SEWER PIPE AND FITTINGS**

#### **702.01 - Special Requirement**

The work includes all PVC (Poly Vinyl Chloride) Gravity Sewer pipe installed at locations and grades shown on plans and consisting of all excavation, backfilling, testing, and the furnishing of all materials, equipment, tools, labor, and incidentals for complete construction of the sewer line.

#### **702.02 – Pipe and Fittings**

All PVC (Poly Vinyl Chloride) sewer pipe and fittings installed under these specifications and intended as a gravity sewer line shall be manufactured to the dimensions and minimum design criteria as set forth in "Type PSM (Poly Vinyl Chloride) (PVC) Sewer Pipe and Fittings", ASTM Designation D-3034, except as herein stated. Pipe shall have a minimum SDR of 26.

Joints used in installing PVC sewer pipe shall be of the bell and spigot confined rubber gasket type with joining in agreement with the manufacturer's recommendations.

Pipe shall be installed in compliance with Item 600 of these specifications, manufacturer's specifications, and ASTM Standard D-2321-72 for "Underground Installation of Flexible Thermoplastic Sewer Pipe" or latest revision thereof.

Pipe shall be kept in the bundle as shipped from the plant until the day it is installed.

A deflection test may be required if deflection is apparent.

#### **702.03 – Inspection and Testing**

Upon request, the CONTRACTOR shall furnish the OWNER with a certified copy of test results showing that pipe supplier's material meets the requirements of this specification and those set forth in ASTM D-3034

The finished gravity sewer line shall pass the test in agreement with the procedure outlined in Item 02533. If any section of line fails to pass the above test, the CONTRACTOR, at his own expense, shall locate and repair all defects and retest until the line passes the prescribed test.

#### **702.04 – Method of Payment**

Payment shall be by linear foot of pipe, complete in place, measured in agreement with Item 600.34 and consisting of all materials, labor, excavation, backfilling, testing, inspection, and other incidentals necessary to complete construction.

End of Section



---

**ITEM 704**

**SPECIFICATIONS FOR FIBERGLASS REINFORCED PLASTIC MORTAR PIPE**

**704.01 - General**

This specification covers machine-made fiberglass reinforced plastic mortar pipe intended for use as a gravity line for domestic wastes to be furnished in nominal 10, 20, or 40 foot lengths.

**704.02 - Pipe**

The fiberglass reinforced plastic mortar sewer pipe, fabricated in a composite laminate consisting of a catalyzed isophthalic polyester resin, glass fibers, and siliceous sand, shall be as manufactured by Johns-Manville, Owens/Corning, or United Technology Center or Equivalent. Pipe shall be designed to withstand trench loads developed with 25 feet of depth. All materials used in manufacture of pipe shall conform to the applicable ASTM Standards. The fiber-glass reinforced plastic mortar sewer pipe shall meet the most current requirements of ASTM Committee D-20.23.11 proposed Standard Specification for R.P.M.P.

**704.03 - Installation**

Fiberglass reinforced plastic mortar sewer pipe shall be installed in agreement with ASTM D-2321, Class I embedment, 70% haunching unless otherwise altered in writing from the pipe manufacturer requiring custom bedding.

**704.04 - Joints**

The joint shall be a bell and spigot with a rubber-ring gasket which compresses to form a water-tight seal when the joint is assembled. The rubber-ring gasket shall be contained in a groove in the bell end of the pipe. The gasket shall conform to ASTM Specification D-1869 except that the nominal hardness durometer will be from A35 to A65.

**704.05 - Fittings**

Fittings shall be factory fabricated tees, ells, and wyes and shall be of the same composite laminate as the pipe. The joining method of the fittings to pipe sections shall be bell and spigot.

**704.06 - Method of Payment**

Payment shall be by linear feet of the line complete in place in agreement with the plans and specifications.

End Of Section



## **ITEM 705**

### **SPECIFICATIONS FOR PVC FORCE MAIN SEWER PIPE**

#### **705.01 - General**

This specification covers PVC (Poly Vinyl Chloride) pipe used as a force main for domestic wastes.

#### **705.02 - Pipe**

PVC force main pipe Class 12454-B shall be designed for use at a minimum hydrostatic working pressure of 160 psi with a minimum standard dimension ratio SDR 26 or Class 150 PVC.

#### **705.03 - Installation**

PVC Force main sewer pipe shall be installed in agreement with ASTM D-2774-69T.

#### **705.04 - Joints**

Joints shall be of the bell and spigot type with confined rubber gasket.

#### **705.05 - Inspections and Testing**

The completed force main line shall pass a hydrostatic test equal to a minimum of 25 pounds per square inch or 1.5 times the manufacturers recommended operating pressure of the pipe for a 2 hour duration.

#### **705.06 - Method of Payment**

Payment shall be by linear feet of the line complete in place in agreement with the plans and specifications.

End Of Section



---

**ITEM 707**

**SPECIFICATIONS FOR DUCTILE IRON PIPE**

**707.01 - General**

This specification covers ductile iron pipe intended for a gravity pipe line to convey domestic wastes.

**707.02 - Pipe and Fittings**

Pipe shall conform to AWWA Class 150 and have a Protecto 401 or equal inside coating of 20mils.

All fittings for cast iron pressure pipe shall be ductile iron designed and manufactured in conformance with AWWA Standard Specifications C110/A21.10-98, or latest revision thereof.

Fittings shall be mechanical joint fittings and shall be furnished complete with glands, gaskets and bolts. All bolts, glands, and gaskets shall be in accordance with AWWA Standard Specification C111/A21.11-95, or latest revision thereof.

All fittings shall be furnished with standard outside coatings consisting of coal tar or asphalt base bituminous materials. Fittings shall be wrapped in Protecto 401 or equal and sealed in conformity with AWWA Standard Specification C104/A21.4-95, or the latest revision thereof.

**707.03 - Installation**

Pipe not installed through a bore shall be installed with bedding equal to that of adjacent pipe material.

**707.04 - Joints**

Joints shall be of the bell and spigot type with confined rubber gasket unless otherwise shown on drawings.

**707.05 - Method of Payment**

Payment for ductile iron pipe shall be included in the lump sum payment for the item of construction in which the pipe occurs.

End Of Section



## **ITEM 708**

### **MANHOLES**

#### **1.00 GENERAL**

##### **1.01 SCOPE**

The work included in this section of the Specifications shall consist of providing fiberglass manholes, cast-iron rims, covers, and stainless steel rainstoppers where indicated on the Plans.

##### **1.02 QUALITY ASSURANCE**

- A. Comply with the latest edition of the following standards:
1. ASTM C270, Type M Mortar.
  2. ASTM D3753, Glass Fiber-Reinforced Polyester Manholes.

##### **1.03 SUBMITTALS**

Submit the following information in accordance with the requirements of Section 01300: Contractor's Submittal.

- A. Record Data  
Submit record data of detailed drawings showing dimensions, materials, thicknesses of materials, manufacturer's installation instructions, accessories, fittings, hardware, anchorages, schedule of components, and other pertinent data.
- B. Certificate of Adequacy of Design.

#### **2.00 PRODUCTS**

##### **2.01 MORTAR**

Comply with Mortar for Unit Masonry, ASTM C270, for Type M mortar. The cement material used in the preparation of the mortar shall be Portland cement, Type I, normal, or Type II, moderate sulfate resistant.

##### **2.02 CAST IRON FRAMES AND COVERS**

Frames and slotted covers shall be furnished and installed in accordance with the details on the Plans and shall be East Jordan Iron Works V-1418-2 with City of Beaumont logo or approved equivalent, unless otherwise shown on the drawings.



### **2.03 FIBERGLASS MANHOLES**

- A. Fiberglass manholes shall conform to all ASTM standards governing plastic laminations and the latest Glass Fiber-Reinforced Polyester Manholes, ASTM Designation D3753, with supplementary details or additions as set forth in these specifications.
- B. The barrel and cone shall each be produced in a continuous manufacturing process which ensures continuous reinforcement and uniform strength and composition. The cone section, if produced separately, shall be affixed to the barrel section at the factory with a reinforced glass-resin joint resulting in a one-piece unit. Field-made joints shall not be acceptable.
- C. The manhole shall be a circular cylinder with a minimum internal diameter of four feet.

The cone of the manhole shall have a bearing surface wide enough to facilitate the placement of concrete adjustment rings. The ring and cover shall not be placed directly on the manhole.

- D. Provide and install concrete grade rings to bring the cast iron frames to grade. Grade rings shall be 2 inches by 8 inches with an inside diameter of 24 inches.
- E. Where PVC piping is connected to manholes, provide and install PVC sleeves with rubber gaskets and an abrasive silica outer coating. Sleeve shall be as manufactured by GPK products, Inc., of Fargo, North Dakota, or approved equivalent. Sleeve shall be firmly grouted into manhole opening in accordance with manufacturer's instructions.
- F. Any manhole shall be rejected for failure to conform with any of the requirements of these specifications.

Any manhole found to be defective or damaged resulting from improper handling or installation shall be removed and replaced at no additional expense to the OWNER. Patching shall not be acceptable.

### **2.04 MANHOLE INSERT**

- A. Manhole inserts shall be furnished and installed at each manhole and shall be a stainless steel Preco Sewer Guard ME C-4 watertight manhole insert or equivalent.
- B. The manhole insert shall be stainless steel and each of its components, the valve bodies, the valve plugs, the valve springs, and the gasket shall be manufactured of plastic, stainless steel, or other corrosion proof material.
- C. Each insert shall contain a gasket manufactured of Grade RE-41 black closed cell neoprene and meet the requirements of ASTM D-1056-73T. The gasket shall have a pressure sensitive adhesive on one side and be placed on the underside of the insert rim by the manufacturer.



- D. Each insert shall have a gas relief valve and a vacuum relief valve each designed to release at a pressure differential equivalent to approximately ½ psi and approximately 2.25 psi, respectively. The valve body shall be manufactured of specially formulated plastic polymers and the valve plug shall be neoprene confined within a stainless steel spring.
- E. The manhole insert shall be manufactured and finished to fit upon the manhole frame rim upon which the manhole cover rests.
- F. The manhole frame shall be cleaned of all dirt/debris before placing the insert upon the rim.
- G. The insert lip with gasket shall be placed in contact with 360 degrees of manhole frame rim to retard water seepage between the insert and the manhole frame.
- H. After the manhole insert has been installed on the manhole frame rim, note that the insert does not come in contact with the cover upon its removal or replacement (flipping).
- I. After installation of the watertight manhole insert, the seal shall be water tested and shall not allow more than 1-gallon of inflow during a period of 24 hours.

### **3.00 EXECUTION**

#### **3.01 INSTALLATION**

- A. Manhole Base:
  - 1. Inverts shall be built of concrete or half-sections of pipe (unless otherwise shown on the Plans) and shall be true and troweled to a smooth, hard finish. The invert depth shall be equal to one-half of the diameter of the largest pipe connected to the manhole, and shall be sloped at 1:1 between the inlet and outlet pipe flowlines. The top of the poured manhole invert outside of the flow channel shall be steeply-sloped to prevent solids deposition.
  - 2. Concrete and reinforcing steel for the manhole base shall be placed in accordance with the details on the Plans and the applicable provisions of these Specifications.
  - 3. Fiberglass manholes shall be installed in accordance with the manufacturer's recommendation and with supplementary details, addition or exception as directed by the OWNER and/or shown on the Plans. A minimum of 8 holes 5/8-inch in diameter shall be drilled around the periphery of the manholes, 2 inches from the bottom for use in securing the manhole to the concrete base.
  - 4. All concrete used in the construction of fiberglass manhole bases shall have a minimum concrete alkalinity of 70 percent calcium carbonate equivalency in the final concrete product. Alkalinity shall be tested in accordance with methodology set forth in Concrete Pipe Handbook, published by the American Concrete Pipe Association, or equivalent industrial standards, with test results provided to the ENGINEER for record data.
- B. Provide an adequate connection where the pipe connects to the manhole such that infiltration and exfiltration are prevented from occurring at the connection. When required,



manhole adaptors shall be used. If the manhole base is concrete and cast-in-place around the pipe, an adapter gasket shall then be installed such that the gasket will serve as a watertight seal (water stop) between the pipe and concrete. If the manhole base has a pipe fabricated integrally with the manhole, then a manufacturer's recommended adaptor shall then be used to connect the pipe to the manhole pipe. If a "boot type" flexible connection is used, a minimum of two stainless steel straps shall then be used to secure the flexible connector to the pipe.

- C. Frames and covers shall be furnished and installed as required and indicated on the Plans.
- D. Use no more than 4 grade rings per manhole. Ring hold down bolts shall pass through rings into the top of the cone.
- E. Where piping is connected to a manhole, CONTRACTOR shall provide a resilient connector in accordance with ASTM C-923 and the specifications and drawings. Where resilient connectors cannot be made at manhole connections, CONTRACTOR shall ensure that the pipe on each side of the manhole does not extend further than six (6) feet from the outside of the manhole wall or base, and the concrete cradle extends to within one (1) foot of the end of the pipe.
- F. Where main sewer (lowest line) passes straight through manhole or degree of deflection of main sewer is less than 5 degrees, and no other line or stub-out is shown entering manhole below centerline of main sewer, lay sewer continuous through manhole. After manhole wall sections have been completed above top of sewer, break out and remove top half of barrel of sewer pipe that was previously laid through manhole. Use barrel of sewer pipe that was previously laid through manhole. Use concrete with 1-inch mortar topping and shape floor.

Where main sewer (lowest line) alignment deflects greater than 5 degrees at manhole or where another sewer or stub-out enters at or below centerline of main sewer, terminate main sewer pipe laying in such a manner that ends of pipe are 2 inches inside of manhole wall.

End of Section



---

**ITEM 709**

**MANHOLE STABILIZATION**

**PART 1-GENERAL**

**1.01 SCOPE**

- A. Stabilization, void filling and sealing of deteriorated, leaking or structurally unsound manholes.

**1.02 MEASUREMENT AND PAYMENT**

- A. Unit Prices

1. Rehabilitated Manholes:

- a. Measurement and manhole stabilization, void fill and sealing (including bench stabilization) is on a vertical foot basis to the nearest tenth of a foot, measured from the bottom of the frame to the top of the bench.
- b. Payment for stabilization , void filling and sealing of manholes or junction boxes other than four foot diameter circular manholes will be on an equivalent rehabilitated shall be converted to an equivalent vertical feet of a four foot diameter manhole by dividing the square feet by 12.57.

- B. Stipulated Price (Lump Sum): If the Contract is a Stipulated Price Contract, payment for work in the Section is included in the total Stipulated Price.

**1.03 PERFORMANCE REQUIREMENTS**

- A. Perform work needed to structurally stabilize manholes, prevent entrance of inflow or groundwater, prevent entrance of soil or debris, and prevent further movement and/or subsidence due to supporting soils.
- B. Manufacturer's Product Support: When requested by the Engineer, provide a representative employed by the manufacturer having technical training in closed cell, hydro-sensitive structural polyurethane available for consultation on site upon 48 hours notice.

**1.04 SUBMITTALS**

1. Submittals: Comply with Section 01300- Submittal Procedures.
2. Product Data: Submit manufacturer's product data, MSDS sheets, and application methods including the URETEK method and the URETEK Deep Injection Method.



3. Technician Qualifications: Contractor shall submit technician qualifications to the Engineer. Technicians must have a minimum of 5 years experience in performing manhole stabilization, void fill, and sealing utilizing closed cell, hydro-insensitive, structural polyurethane and in the application of the URETEK method and patented URETEK Deep Injection method.

### **1.05 PROJECT CONDITIONS**

#### **A. Manholes Containing Mechanical or Electrical Equipment:**

1. Drawings may not show locations of flow monitoring equipment. If a manhole contains any mechanical hardware or electrical flow monitoring equipment, immediately notify the Engineer.
2. Reschedule work in such manholes until equipment has been removed by the further instructions are given.
3. Do not subject manholes with mechanical hardware or electrical equipment to diversion or bypass pumping.
4. Damage to installed equipment, due to Contractor's failure to adhere to this instruction, will be repaired by the City and cost of repairs charged to the Contractor.

#### **B. Field Location of Manholes**

1. Contractor is responsible for locating and uncovering all manholes. If Contractor is unable to locate manholes, Contractor shall notify the Engineer in writing.
2. Manholes may be located within project limits which are not part of the system being rehabilitated. Properly identify manholes before starting work.

## **PART 2-PRODUCTS**

### **2.01 STABILIZATION, VOID FILL, AND SEALING MATERIAL**

- A. The material for stabilizing, void filling and sealing manholes shall be URETEK 486 STAR, a closed cell, hydro-insensitive, high density polyurethane system.
- B. The material shall have a minimum free rise density of 3.0 lbs./cubic ft. with a minimum compressive strength of 38.0 psi
- C. The material shall have a maximum free rise density of 3.2 lbs./cubic ft. with a minimum compressive strength of 42.0 psi.
- D. The polyurethane material shall be hydro-insensitive in the material's component reaction such that the injected product is not significantly compromised by soil moisture or free water in the soil surrounding and/or supporting to the manhole.



## **PART 3-EXECUTION**

### **3.01 PROTECTION**

- A. Provide barricades, warning lights and signs for manhole or cleanout removal excavations. Comply with City Beaumont Special Provisions Section.
- B. Do not allow soil, sand debris, or runoff to enter sewer system.

### **3.02 DIVERSION PUMPING**

- A. Install and operate diversion pumping equipment to maintain sewage flow and to prevent backup or overflow as specified in Section 01540-Diversion Pumping.
- B. In the event of accidental spill or overflow, immediately stop the overflow and take action to clean up and disinfect spillage. Promptly notify the Engineer so that required reporting can be made to the Texas Commission on Environmental Quality and U.S. Environmental Protection Agency.

### **3.03 MANHOLE WALL STABILIZATION, VOID FILL, AND SEALING**

- A. Multiple injection holes (5/8" diameter) shall be drilled thru the wall of the manhole at locations and at spacing as determined by field conditions. Or, Injection tubes (1/2" ) are inserted thru augered holes, or are driven, or are jetted at multiple locations from grade and at depths as determined by field conditions.
- B. URETEK 486 polymer is injected in multiple shots thru the injection holes, allowed to expand, void fill, stabilize and seal the back side of the repair area. Or, URETEK 486 polymer is injected in multiple shots thru the injection tubes, allowed to expand, void fill, stabilize, and seal the back side of the repair area. ( As per all or part of URETEK's patented "Deep Injection" process)
- C. If annular space stabilization and seal, following pipe bursting and/or slip lining is required, injection tubes are placed into the annular space a minimum of three feet. The material is injected and allowed to outcrop and seal the entire annular area.
- D. Outcropped material is removed with hand tools and disposed of by the technician.
- E. The new seal is inspected visually for completeness and repair documentation form is completed by the technician.

### **3.04 MANHOLE BENCH STABILIZATION**

- A. Multiple injection holes (5/8" dia) shall be drilled thru the bench of the manhole and injection tubes placed at multiple depths and at locations/spacing as determined by field conditions.
- B. Per the patented URETEK Deep Injection method, URETEK 486 polymer is injected thur tubes at



multiple depths, allowed to expand, void fill, stabilize and seal the underside side of the bench thus densifying and strengthening the manhole supporting soils.

### **3.05 FIELD QUALITY CONTROL**

- A. Inform the Engineer immediately if materials being used are not producing required results or need modification. The Engineer has the right to stop the use of any material at any time.

### **3.06 INSPECTION**

- A. After manhole stabilization, void fill and sealing, visually inspect manholes in the presence of the Engineer. Check for cleanliness and for elimination of active leaks.

End of Section



**ITEM 711**

**SEEDING AND SODDING**

**SEEDING**

1. **Description.** This item shall govern for preparing ground, providing for sowing of seeds mulching with straw, hay, or cellulose fiber and other management practices along and across such areas as are designated on the plans and in accordance with these specifications.
2. **Materials.** All seed must meet the requirements of the Texas Seed Law including the labeling requirements for showing pure live seed (PLS = purity x germination), name and type of seed. Seed furnished shall be of the previous season's crop and the date of analysis shown on each bag shall be within nine months of the time of use on the project. Each variety of seed shall be furnished and delivered in separate bags or containers. A sample of each variety of seed shall be furnished for analysis and testing when directed by the Engineer. The amount of seed planted per acre shall be of the type specified below.

<u>Common Name</u>	<u>Scientific Name</u>
Bermuda and giant Bermuda grass (Hulled or Unhulled)	Cynodon dactylon
Annual Rye	Lolium multiflorum
German Foxtail Millet	Setaria italica

3. **Planting Season.** Planting dates, seed mixtures and application rates shall conform to the following table:

<b><u>Application Rate</u></b>		
<u>Planting Date</u>	<u>Type(s)</u>	<u>(Lbs. per Acre PLS)</u>
April 1 - September 30	Bermuda and Giant	20
	Bermuda grass (Hulled)	
	Millet	40
October 1 - March 31	Hulled Bermuda	20
	Unhulled Bermuda	20
	Annual Rye grass	40



4. **Fertilizer.** All fertilizers used shall be delivered in bags or containers clearly labeled showing the analysis. The fertilizer is subject to testing in accordance with the Texas Fertilizer Law. A pelleted or granulated fertilizer shall be used with an analysis of 13-13-13- or having the analysis shown on the plans. The figures in the analysis represent the percent of nitrogen, phosphoric acid, and potash nutrients respectively as determined by the methods of the Association of Official Agricultural Chemists.

In the event it is necessary to substitute a fertilizer of a different analysis, it shall be pelleted or granulated fertilizer with a lower concentration, but the total amount of nutrients furnished and applied per acre shall equal or exceed that specified for each nutrient.

Pelleted or granulated fertilizer shall be applied uniformly over the area specified to be fertilized and in the manner directed for the particular item of work. The fertilizer shall be dry and in good physical condition. Fertilizer that is powdered or caked will be rejected. Distribution of fertilizer for the particular item of work shall meet the approval of the Engineer.

Unless otherwise indicated in the plans or specifications, fertilizer shall be applied uniformly at the average rate of 600 pounds per acre for all types of "Seeding."

5. **Sprinkle Irrigation.** Sprinkle Irrigation shall consist of the authorized application of water on those portions of the right-of-way as shown on plans or as directed by the Water Utilities Engineer, and as herein specified.

Water shall be furnished by the Contractor and shall be clean and free of industrial wastes and other substances harmful to the growth of grass.

This work will be done only at such time as approved by the Water Utilities Engineer and in sufficient frequency to allow optimum germination. The Contractor shall furnish and operate approved sprinklers which will insure the distribution of water in a uniform and controllable rate of application.

6. **Straw Mulch.** Straw mulch shall be oat, wheat or rice straw. Hay mulch shall be prairie grass, Bermuda grass or other hay as approved by the engineer. The mulch shall be free of Johnson grass or other noxious weeds and foreign materials. It shall be kept in a dry condition and shall not be molded or rotted.

7. **Cellulose Fiber Mulch.** Cellulose fiber mulch shall be a natural cellulose fiber mulch produced from grinding clean, whole wood chips, or fiber produced from ground newsprint with a labeled ash content not to exceed 7 percent. The mulch shall be designed for use in conventional mechanical planting, hydraulic planting of seed or hydraulic mulching of grass see, either alone or with fertilizers and other additives. The mulch shall be such, that when applied, the material shall form a strong, moisture-retaining mat without the need of an asphalt binder. Application rate for mulch in HYDRO MULCH SEEDING shall be 2000 lbs./acre.



- 
8. **Soil Stabilizer/Tacking Agent.** Soil stabilizer for hydro-mulch seeding shall be of a commercially available type approved by the Engineer and shall be applied at a rate of 40 lbs./acre unless otherwise specified.
9. **Construction Methods.** After the designated areas have been completed to the lines, grades and cross sections shown on the plans, and as provided for in other items of this contract, seeding shall be performed in accordance with the requirements hereinafter described. All areas to be seeded shall be cultivated to a depth of at least four inches (4"), unless otherwise directed by the Engineer. The seedbed shall be cultivated sufficiently to reduce the soil to a state of good tilth when the soil particles on the surface are small enough and lie closely enough together to prevent the seed from being covered too deep for optimum germination. Cultivation of the seedbed will not be required in loose sand where depth of sand is four inches (4") or more.

The cross-section previously established shall be maintained throughout the process of cultivation and any necessary reshaping shall be done prior to any planting of seed.

The following are four methods of seeding which may be specified in the plans:

10. **Straw or Hay Mulch Seeding.** The seed or seed mixture in the quantity specified shall be uniformly distributed over the areas shown on plans or where directed by the Engineer. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. If mechanical equipment is used, all varieties of seed as well as fertilizer may be distributed at the same time, provided that each component is uniformly applied at the specified rate. When seed and fertilizer are to be distributed as a water slurry, the mixture shall be applied to the area to be seeded within 30 minutes after all components are placed in the equipment. Upon completion of planting of seed, straw or hay mulch shall be spread uniformly over the seeded area at the rate of approximately 1½ to 21 tons of hay or 2 to 2½ tons of straw per acre. A mulching machine approved by the Engineer shall be equipped to inject a tacking agent into the straw or hay uniformly as it leaves the equipment at a rate of 0.05 to 0.10 gallon of tacking agent per square yard of mulched area. If the straw or hay and tacking agent are placed by hand, then the rate of application for the tacking agent shall be approximately 0.15 gallon per square yard.
11. **Cellulose Fiber Mulch Seeding.** The seed or seed mixture, in the quantity specified, and fertilizer, shall be uniformly distributed over the areas shown on the plans or where directed. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. If mechanical equipment is used, all varieties of seed as well as fertilizer may be distributed at the same time, provided that each component is uniformly applied at the specified rate. When seed and fertilizer are to be distributed as a water slurry, the mixture shall be applied to the area to be seeded within 30 minutes after all components are placed in the equipment. After planting, the planted area shall be rolled with a corrugated roller of the "Cultipacker" type. All rolling of the slope areas shall be on the contour. Upon completion of planting and cultipacking of the seed, cellulose fiber mulch shall be spread uniformly over the area at the rate of 2000 lbs. per acre given in dry weight of mulch per acre. A mulching machine, approved by the Engineer, shall be equipped to eject the thoroughly wet mulch material at a uniform rate to provide the mulch coverage specified.



12. **Hydro Mulch Seeding.** The seed or seed mixture, in the quantity specified, shall be mixed in an approved mixer/distributor with fertilizer and cellulose fiber mulch at the specified rates. Mixing and distributing shall be in such a manner so that thoroughly wet mulch material will be distributed at a uniform rate to provide the coverages specified. Soil stabilizer/tacking agent shall be added to the mixture at the specified rates.
  
13. **Broadcast Seeding.** The seed or seed mixture in the quantity specified shall be uniformly distributed over the areas shown on plans or where directed by the Engineer. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. If mechanical equipment is used, all varieties of seed as well as fertilizer may be distributed at the same time, provided that each component is uniformly applied at the specified rate. When seed and fertilizer are to be distributed as a water slurry, the mixture shall be applied to the area to be seeded within 30 minutes after all components are placed in the equipment. After planting, the planted area shall be rolled with a corrugated roller of the "Cultipacker" type. All rolling of the slope areas shall be on the contour.
  
14. **Required Coverage.** Germination and establishment of a good stand of Bermuda grass will be required in order to qualify any Seeding as "Acceptable Work." Substantial bare spots and ruts designed by the Engineer will be reseeded and fertilized as required to achieve germination. Isolated bare spots measuring 2 feet in diameter or less will be considered as acceptable work. These requirements will be adhered to assuming normal weather conditions. In the event of abnormal flooding conditions, these requirements will be applied to areas above measured high-water marks.

## **SODDING**

The Contractor shall be responsible for restoration of all disturbed areas. Sod shall consist of St. Augustine grass. Prior to planting the St. Augustine grass, the Contractor shall prepare the disturbed area by removing all building materials such as concrete rubble, wood, bricks, etc. The planting area shall have straight edges, then be rough graded, and covered with top soil or sand. The contractor shall then apply starter fertilizer that is high in phosphate and mix it with the top soil prior to planting the sod. The Contractor shall completely (100% coverage) sod all disturbed areas. Once the sod is in place, the Contractor shall water within 30 minutes of installation and then water daily for approximately two (2) weeks.

End of Section



---

**ITEM 712**

**TRENCH SAFETY SYSTEMS**

**712.01- General**

1. Description:

The Contractor shall comply with the minimum requirements of this specification. Maintenance and inspection of any shoring and related equipment shall be the responsibility of the Contractor. Owner and/or Engineer reserve the right to require the Contractor to remove, repair and/or replace any portions of the shoring system deemed unsafe but the final responsibility for worker's safety remains with the Contractor.

The Contractor shall determine the safety system needed for the project within the minimum requirements of this specification. The Contractor shall submit to the Owner's Engineer a certified submittal from a Registered professional Engineer from the State of Texas that the Contractor's Trench Safety System meets the minimum requirements of this specification, and shall make adjustments as required by the Owner and/or Engineer to meet minimum requirements at Contractor's expense. Approval of a trench safety system by the Owner and/or Engineer shall not relieve the Contractor of his responsibility to provide a safe working place for his employees. The Contractor agrees to hold harmless and defend the Owner and/or Engineer against any claim resulting from failure of the trench system or lack of one.

2. Regulatory Requirements:

A. Conform to applicable Occupational Safety and Health Administration (OSHA) Standards as contained in 29 CFR, Part 1926, Subpart P - Excavations (as may be amended) including OSHA "Proposed Rules: Excavations. Federal Register, Vol. 52, No. 72 Wednesday, April 15, 1987, pages 12325-12339." The sections that are made part of these specifications by reference include Sections 1926.652 and 1926.653.

B. The Contractor's Trench Safety System shall be designed by "a registered professional engineer" or "a qualified person or a qualified engineer," such a person shall be a Professional Engineer registered in the State of Texas.

C. The Contractor's "Engineer" shall develop a specific trench safety system design for the project in general compliance to the requirements set forth by House Bills 662 and 665 of the 70<sup>th</sup> Legislature, and in accordance with Part 1926.652(c)(4) of OSHA "Proposed Rules."

3. Definitions:

A. Angle of Repose: The greatest angle above the horizontal plane at which a material will lie without sliding.



- B. Bank: A mass of soil rising above a digging level.
- C. Braces: The horizontal members of the shoring system whose ends bear against the uprights or stringers.
- D. Excavation: Any man-made cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a trench.
- E. Hard Compact Soil: All earth materials not classified as running or unstable.
- F. Kickouts: Accidental release or failure of a shore or brace.
- G. Sheet Pile: A pile, or sheeting, that form one of a continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.
- H. Sides, Walls, Faces: The vertical or inclined earth surfaces formed as a result of excavation work.
- I. Slope: The angle with the horizontal at which a particular earth material will stand indefinitely without movement.
- J. Stringers Wales The horizontal members of a shoring system whose sides bear against the uprights or earth.
- K. Trench: A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet.
- L. Trench Jack: Screw or hydraulic type jacks used as cross bracing in a trench shoring system.
- M. Trench Shield: A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls or a trench from the ground level to the trench bottom and which can be moved along as work progresses.
- N. Unstable Soil: Earth material, other than running, that because of its nature or the influence of related conditions, cannot be depended upon to remain in place without extra support such as would be furnished by a system of shoring.
- O. Uprights: The vertical members of a shoring system.

## **712.02 - CONSTRUCTION MATERIALS AND MAINTENANCE**



1. Materials used for sheeting, sheet piling, cribbing, bracing, shoring, and underpinning shall be in good, serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions as called for in the latest revision of OSHA Construction Standards, Subpart P, "Table P-2 - Trench Shoring - Minimum Requirements," of which is made a part of these specifications. All materials which are found to be defective in any way shall be immediately removed from the job site. It shall be the responsibility of the Contractor to regularly check all trench safety equipment for soundness and adequacy.
2. Steel trench shields shall be constructed of steel plate sides, welded to a steel framework. All shields shall be construction in order to provide protection equivalent to or greater than sheeting or shoring required for the trench. The Contractor shall provide written certification from the manufacturer's engineer to the Owner's Engineer of adequacy before using any trench shield. Adjustable jacks may be used in order adjust the shield to varying trench widths. An access ladder shall be provided at the midpoint. Pipe or flat steel runners or wheels shall be installed under the side walls for ease of movement of the shield during trenching operations. Substantial lifting eyes and/or rings shall be welded at proper points for moving of the shield. For adaptability to deep and shallow trenches, the shield may be made with top and bottom sections. When the sides of the trench extend above the top of the shield, a reinforced roof with hatches shall be provided. Forced ventilation shall be provided for fully-enclosed shields.
3. All maintenance of the trench safety equipment shall be the sole responsibility of the Contractor.

### **712.03 - IMPLEMENTATION**

Within fifteen (15) days after the Contract is awarded and prior to beginning any construction, the Contractor shall submit a written plan for a Trench Safety System specifically for construction of trench excavation, together with the general safety program required by OSHA standards governing the presence and activities of individuals in and around trench excavations. Failure to submit a Trench Safety System submittals required may result in forfeiture of the bid bond. The Trench Safety System submittal shall be all inclusive of specific requirements required by OSHA and Owner's Engineer.

The Contractor shall provide a trench safety system for all trench excavations which exceed a depth of five feet (5'). The Trench Safety System shall conform to the Occupational Safety and Health Administration (OSHA) standards, latest revision, the same of which is made a part of these specifications, along with the following additions and revisions. The types of trench safety systems currently allowed include shoring, bracing, solid shoring, sloping of the ground, and trench shields. The Contractor may submit an alternative method of trench safety, but may not implement until a sealed submittal by a Registered Professional Engineer from the State of Texas is approved by the Owner's Engineer. Should the Contractor decide to slope the sides of the trench, he shall have the angle of repose of the soil determined by an approved independent soil testing lab. At a minimum, the Contractor's design for sloping of the trench sides shall conform to the last revision of OSHA Construction Standards, Subpart P, "Table P-1 - Approximate Angle of Repose for Sloping of Sides of Excavations," which is made a part of these specifications. Soil core samples taken to a depth of at least the depth of the trench plus four feet shall be taken a minimum of every 700



feet. A minimum of two copies of the results of the lab tests shall be provided to the Engineer. The cost of the tests shall be included in the unit price bid for the trench safety system.

1. Each Contractor shall be responsible and liable for his own Trench Safety System, including self inspections, whether or not a project representative is present on the job site. The Contractor shall install additional safety equipment if requested to do so by the engineer. The Engineer's decision shall be final. The cost of additional trench safety equipment required shall be the responsibility of the contractor.
2. Before beginning any excavation, the Contractor shall make an inspection of the job site. He shall pay special attention to the type of soil or soils in which he will be working, any adjacent roads, highways, railroads, and any previous excavations. All underground installations shall be located, including utility lines, pipelines, etc., before any excavation begins.

The Contractor shall provide a trench safety system in every trench. The trench safety system shall be installed in a true horizontal position, be spaced vertically and shall be secured to prevent sliding, falling, or kickouts. The trench safety system shall be effective to the bottom of the excavation. All trenches shall be provided with an adequate means of exit at all times with spacings of 25 feet or less.

These means of exit shall be anchored in place in order to aid in the event a quick exit is necessary. During trench excavation, the excavated material shall be placed a minimum of two feet (2') away from the edge of the trench.

3. The Contractor shall make an inspection of all trench excavations. He shall check for any evidence of cave-ins, slides, etc. If any change in soil conditions or failure of the trench is found, the Contractor shall remedy such. All water shall be diverted by suitable means to prevent the entrance of same into any excavation. No water shall be allowed to accumulate in any excavation and shall be removed as soon as possible.

#### **712.04 - INDEMNIFICATION**

1. The Contractor shall indemnify and hold harmless the Owner, and the Owner's employees, agent and Engineer, from any and all damages, cost (including without limitation, legal fees, court costs, and investigation costs), judgments, or claims by anyone for injury or death of persons resulting from the collapse or failure of trenches constructed under this contract. These specifications for the trench safety system in no way relieve the Contractor of his responsibilities and liability to ensure the safety of the workers or any other party from the hazards of the construction operations.
2. The Trench safety system plan by the Contractor's Engineer should cover the situations that may be encountered during construction. It should be recognized that information contained in the required Geotechnical report is based on the data obtained from the soil borings and conditions along the line route may differ from those found at the soil boring locations. It is the Contractor's responsibility to detect varying conditions which may be hazardous and take appropriate action.



3. The Contractor is responsible for determining the appropriate trench safety systems necessary for specific locations based on actual subsurface conditions encountered during construction. The Owner and Owner's Engineer shall be held harmless from any claim or liability for injury or loss that results from failure on the part of the Contractor to implement the Trench Safety System plan properly or to make necessary changes to the trench safety systems necessitated by conditions encountered during construction.

#### **712.05 - MEASUREMENT AND PAYMENT**

The specified trench safety system will be measured by the linear foot along the centerline of the pipe, including manholes/inlets, in accordance with the specifications. Payment for the trench safety system, measured by prescribed above, will be made at the unit price bid per linear foot.

Payment shall be full compensation, in accordance with the pay item set in the bid for the trench safety system, including but not limited to all benching, sloping, hauling, shoring, sheeting, excess excavations, dewatering, sheet piling, bracing, trench shields, and all other incidentals necessary to provide the trench safety system as specified in the approved Trench Safety System plan.

End of Section



---

**ITEM 719**

**SPECIFICATIONS FOR AIR RELEASE VALVES**

**719.01 - General**

The Contractor shall furnish all equipment and materials and perform all operations necessary for furnishing and installing sewage air and vacuum or combination air valves and manual air valves complete with all fittings and manholes as shown on the plans and herein specified for a complete automatic system.

**719.02 - Design**

The valve shall have a conical shaped body with a clam lock-flush nozzle as the air opening. Valve body shall be stainless steel 316 and all internal parts shall be corrosion resistant plastic or stainless steel. The valve shall have a working pressure range of 3 to 230 psi. Inlet size shall be determined by the valve manufacturer.

**719.03 - Installation**

The sewage air valve shall be located on the top of the pipe at locations as indicated on the plans.

The sewage air valve shall be connected to the pipe using a tapped pipe saddle. A 2-inch gate valve shall be installed between the pipe saddle and the air/vacuum valve.

**719.04 - Manufacturer**

The sewage air valve shall be ARI Model D-020, or approved equal.

End Of Section



---

**ITEM 801**

**SPECIFICATIONS FOR DUCTILE IRON PIPE & FITTINGS**

**801.01 - General**

These Specifications cover the furnishing and the installing of ductile iron pipe and ductile iron fittings, including taps, connections, and appurtenances as required for a functional system as indicated herein.

(a) All ductile iron pipe furnished under the Specifications shall be manufactured by either of the following processes:

1. Nominal sizes 4-inch through 24-inch centrifugally cast in Metal Molds and Sand Lined Molds in conformity with AWWA Standard Specifications C151/A21.51-96 except as may be herein modified.

(b) All ductile iron pipe furnished under the specifications shall be in agreement with AWWA Standard Specifications C150/A21.50-96 and C151/A21.51-96.

(c) All pipe shall be AWWA Class 150 standard weight and wall thickness for installation in flat-bottom trenches with tamped backfill of four (4) foot cover. Joints shall be flange, mechanical joint, or of the push-on type as specified and furnished in nominal 16 or 18 foot lengths. Rubber gasket joints shall conform with American Standards' Association Specification C111/A21.11-95.

(d) All pipe shall be furnished with standard outside coatings consisting of coal tar. Inside surface of nominal pipe sizes 4-inch through 48-inch shall be Cement Mortar lined to standard thickness and sealed in conformity with AWWA Standard Specifications C104/A21.4-95.

(e) All pipe shall be acceptable, without penalty, to the Texas Fire Insurance Commission for use in Water Works Distribution Systems.

The plans show size, approximate location and arrangement for all piping and responsibility for exact "make-up" rests with the CONTRACTOR.

**801.02 - Fittings**

(a) All fittings shall be short body ductile iron designed and manufactured in conformance with "AWWA Standard Specifications" C110/A21.10-98 revision thereto.

(b) Fittings shall be furnished with the type of joint and end combinations as well as pressure class specified. Mechanical joint fittings shall be furnished complete with glands, gaskets and bolts. All bolts shall be coated according to provisions of Item 600, Section 600.29.



Push-on fittings shall be furnished complete with joint gaskets and lubricant. Flange joint fittings shall be furnished complete with gasket and bolts.

All mechanical joint pipe and fittings shall be supplied with ductile iron T-Head bolts with hexagonal nuts and shall comply with ASTM A536 ANSI-AWWA standard specification C-111/A21.11-95.

(c) All fittings shall be furnished with standard outside coatings consisting of coal tar. Fittings shall be cement mortar lined and sealed in conformity with AWWA Specification C104/A21.4-95.

### **801.03 - Hammer Test**

All pipe shall be inspected for defects and rung with a light hammer to detect possible cracks while suspended and before lowering. Any defective, damaged or unsound pipe shall be rejected.

### **801.04 - Laying Ductile Iron Pipe**

The laying of the pipe and the making of the joints shall be in agreement with AWWA Standard Specification C600-99 or the latest revisions thereof. Pipe shall be "poly" wrapped in agreement with AWWA Specification C105/A21.5-99.

### **801.05 - Concrete Blocking**

Concrete having a compressive strength of not less than 1,500 psi shall be used as a cradle or blocking where shown on the Plans or where directed by the ENGINEER. Bends, crosses with one opening plugged, and all tees shall be blocked with reinforced concrete as a thrust blocking. Blocking shall be placed between solid ground and the fitting to be anchored to the size and shape as shown on the Plans or as directed by the ENGINEER.

### **801.06 - Cutting Pipe**

Plans show size, approximate location and arrangement for piping. Responsibility for furnishing and installing exact lengths of various sized pipes for exact "make-up" rests with the CONTRACTOR.

Pipe cutting for insertion of valves, fittings, or closure pieces shall be done in a neat and workmanlike manner with no damage to pipe.

### **801.07 - Method of Measurement**

All pipe shall be measured by the linear foot along the centerline of pipe completed in place. The length of reducer shall be included with pipe of same size as the larger end of the reducer. It shall be noted that deductions will be made from the pipe measurement for all specials, fittings, valves, and any other appurtenances which appear in the Proposal as a bid item.

End of Section



---

## **ITEM 803**

### **SPECIFICATIONS FOR CONCRETE STEEL CYLINDER PIPE AND FITTINGS**

#### **803.01 - General**

All concrete steel cylinder pipe shall be manufactured in agreement with "AWWA Standards" C301-84 or latest revision for prestressed pipe and C303-87 or latest revision for pretension pipe.

All pipe shall be designated to meet 150 psi working pressure.

Manufacturer shall furnish a sworn statement of compliance in agreement with Paragraph 1-10 of AWWA C301-84 and Paragraph 1-11 of AWWA C303-87 to the Engineer. In addition, the manufacturer shall submit design calculations and tabulated layout schedules.

Concrete steel cylinder pipe is used mainly as a transmission line. It may not be tapped often after installation.

Pipe shall be acceptable, without penalty, to the the "Texas Fire Insurance Commission" for use in Water Works Distribution Systems.

#### **803.02 - Joints**

Joints shall be of steel bell and spigot rings. Rings shall be smooth to prevent cutting of the rubber gasket.

Joints shall be sealed watertight, with ASTM approved and tested rubber gaskets. Gaskets shall be stored in a dry place away from the sun before use. They shall be cleaned and lubricated by an approved lubricant recommended by the pipe manufacturer. If moisture in the trench is too high, an underwater lubricant shall be used to prevent washing of lubricant. If required by the engineer, the contractor shall submit test reports showing results of gasket tests.

After making up a joint, check gasket with a gage to guarantee a tight joint. A burlap wrapper, supplied by a manufacturer, shall be placed around the joint and fastened with required tools. The joint shall be filled with a cement mortar of one part cement to 2 ½ parts sand and enough water mix consistent mortar free of clods. Mortar shall be poured evenly to fill the joint.

Joint shall also be filled with a thick and rich mortar from inside. Joint recess shall be coated with mortar before the joint is made. Afterward, the excess shall be wiped and any gap shall be filled up. In small diameter pipe a swab may be used afterward to wipe joints clean from the inside.

In critical sections and with approval of the engineer joints may be welded together before pouring mortar. Such cases may arise in pipe laying around a bend, under a road or canal, or in tunnel construction.

---

### **803.03 - Specials and Fittings**

Long radius curves may be accomplished by joint deflections and use of maximum 5 degree bevel pipe.

Specials and bends shall be furnished specially fabricated for closures, curves, bends, and other connections to main valves or other pipe. Specials and bends shall be fabricated from steel plate or sheets, lined and coated with cement mortar or steel sheets surrounded by one of or more reinforcing steel cages all encased in concrete. The specials and bends shall be of equal strength to the adjoining pipeline.

All line valves are to be flange and special flange adapters conforming to ASA B-16.1 drilling shall be provided.

### **803.04 - Pipe Laying**

Pipe shall be laid in agreement with provision of the AWWA standards, as shown in AWWA Manual M9 "Installation of Concrete Pipe", and the engineers approval.

Pipe shall be encased as per Manufacturer's recommendation. The trench shall be backfilled right after making a joint.

### **803.05 - Tapping**

Concrete steel cylinder pipe shall not be tapped in the field or while under pressure. If a special case arises, it shall be tapped under supervision of the Water Utilities Department representative, and a factory representative. Tapping procedures of the manufacturer shall be followed.

Tapped outlets shall be manufactured in plant at points shown on the plans. Three inch taps shall be made for air release valves. Flange outlets of 6 inch, 8 inch, and 12 inch shall be manufactured into the side of the pipe at locations shown on the plans. Quarter of an inch taps shall be built at beginning or end sections of a line for chlorination and testing of line or at either side of valves, if required by the engineer.

Manholes or handholes may be required on one side of the line valves depending on construction procedures. All joints shall be wiped from inside.

### **803.06 - Connection of Metallic Pipe**

All lateral connections to cast or ductile iron shall be electrically isolated from the main line by use of insulating type joints or nonmetallic pipe. The flanges shall be coated with cement mortar or an asphaltic compound. No metal section shall be left unprotected.



### **803.07 - Method of Measurement**

All pipe shall be measured by the linear foot along the centerline of the pipe complete in place. Deductions will be made from pipe measurement for all specials, fittings, valves, and any other appurtenances which appear in the proposal as a bid item.

End of Section



**ITEM 805**

**SPECIFICATIONS  
FOR VALVE BOXES AND RISERS**

**VALVE BOX**

Valve box complete with water lid  
24" Min. - 36" Max. Extension  
5¼" Shaft Tyler Pipe #562-S

Valve box complete with water lid  
16" Length  
5¼" Shaft Tyler Pipe #562-S

Valve box complete with water lid  
10" Length  
5¼" Shaft Tyler Pipe #461-S

**RISERS**

6" C-900 pipe for Shaft between Valve box and Valve equipment

End of Section



---

## **ITEM 806**

### **SPECIFICATIONS FOR GATE VALVES SIZES 42" AND LARGER**

#### **806.01 - General Description**

Gate valves shall conform strictly to requirements of American Water Works Association Standard Specifications for Double-Disc Parallel Seat Gate Valves for Ordinary Water Works Service, C500-93, including changes and additions specifically stated in these specifications.

Gate valves shall be of the double-disc, parallel seat design with a two piece beveled wedging system with wedges to apply the pressure in the center of the discs. The wedging device shall consist of an upper and lower wedge so designed to allow the discs to reach the seating position before wedging forces are applied and to release the wedging forces before discs are moved away from seating position. The upper wedge shall be fitted with a heavy bronze or corrosion-resisting stem nut, threaded to accept the valve stem. The wedge's bearing shall be not less than one-third the diameter of the gate or disc and shall be solid, with no links, hooks, nor auxiliary parts to hold parts in place.

#### **806.02 - Test and Operating Procedures**

All gate valve parts shall be designed to withstand safely and without permanent deformation both the stresses resulting from an internal test pressure of 350 psi and the combined stresses resulting from the full internal pressure of 150 psi coincident with moving of the valve gates across their seats in either direction under fully unbalanced service pressure from their fully-closed position to the point of opening.

Further, the valve body and internal parts of all valves shall be so constructed to develop full strength of the valve to the point of failure, in moving the valve gates in either direction across their seats from point of opening to their full-closed position under full service pressure without rupture or permanent deformation of any other part.

The gate valves shall be subject to a 350 psi hydrostatic seat and shell test which shall be applied between the gates. All joints and castings shall be completely water-tight. No casting shall show any suggestion of permanent distortion.

Gates shall be considered water-tight if the seat leakage during hydrostatic seat test is less than one fluid ounce per inch of port diameter per hour per port.

#### **806.03 - Valve Construction**

(a) Valves shall open left with fixed non-rising stem.

(b) Operating nut is to be 2 inches square.

(c) Stem shall be made of bronze with tensile strength of not less than 60,000 psi, a yield strength greater than 30,000 psi, and an elongation of not less than 15 percent.



- (d) All valves to be manufactured with mechanical joints unless otherwise specified.
- (e) Valve stems, stem collars and stem nuts for valves 42 inches and larger shall have stems, stem collars and stem nuts cast or forged from manganese bronze or corrosion resisting material which has a tensile strength of at least 80,000 psi, a yield strength of at least 40,000 psi and an elongation of not less than 15 percent.
- (f) Bronze alloy used for pinned or rolled-in gate faces shall be sufficiently malleable to conform to the dovetail grooves of the disc and shall have a minimum compressive strength, without deformation, or 4,000 psi.
- (g) Bronze alloy used for seat rings and other miscellaneous parts shall have a tensile strength of at least 30,000 psi, a yield strength of at least 14,000 psi, and an elongation of not less than 15 percent.
- (h) Manufacturer shall supply certified reports stating materials used in the gate valves conform to this Specification and latest AWWA C-500 Specification.
- (i) Packing may be conventional stuffing box or "O" ring stuffing box.
- (j) Valves 42 inches in size and larger shall have extended type gears and gear or grease case or cover. Gears are to be either bevel or spur type gears, steel cut teeth embedded in grease.
- (k) Valves forty two inches and larger which are installed horizontally "on the edge", shall be equipped with bronze rollers, bronze tracks and bronze scrapers, or may be designed so that edges of the disc shall act as rollers when moving the gate assembly to and from the parts of the valves on opening and closing.
- (l) Body of valves shall have interior ribbing to provide strength of valve housing.
- (m) Valves 42 inches in size and larger shall be furnished with by-passes according to AWWA C-500 Standard Specifications. By-passes and by-pass valves shall be flange connections and shall be of the same size as for valves covered by this Specification. By-pass and by-pass valve shall be as listed in Table 8 AWWA C500-93.
- (n) Tapping valves shall meet the same specifications as ordinary gate valves of the same size.
- (o) Valves furnished under these Specifications shall be M & H or approved equal.
- (p) All necessary bolts, glands, and gaskets for complete installation of each valve shall be supplied with each valve and shall conform to AWWA Standard Specification C111/A21.11-95. They shall be shipped and stored in such a manner to prevent rusting or damage before installation.



#### **806.04 - Basis of Payment**

Payment for valves in place shall be for size listed in the bid item of the proposal and shall include valve, concrete support, cast iron adjustable valve box and cover and reinforced concrete slab around the valve box including all materials, labor, tools, equipment and supervision necessary to install, sterilize, test and make the valve ready for operation.

End of Section

---

**ITEM 807**

**SPECIFICATIONS FOR BUTTERFLY VALVES**

**807.01 - General**

Butterfly valves shall conform to requirements of American Water Works Association Standard C504-87 or the latest revision thereof. Valves shall be tight closing with rubber seats which are recess mounted and clamped into the valve body.

Valve disc shall rotate 90 degrees from full open to tight shut position.

Valves shall be suitable for installation with shaft in any position.

Valves shall be short body type designed for closing against flow velocity of 16 feet per second at normal working pressure of 150 psi with downstream pressure of zero (0) psi. (Class 150 B)

**807.02 - Construction Details**

(a) Body

Valve body shall be cast iron conforming to ASTM A126, Class B or ASTM A48, Class 40. Ductile iron conforming to ASTM A536, Grade 65-45-12. There shall be two hubs for shaft bearings cast integral with the valve body.

Valve shall have flange ends faced and drilled in agreement with ASA B16.2 standards. Drilled and tapped holes at shaft hubs will be acceptable. Drilled and tapped holes in flanges are acceptable when required.

(b) Main Shaft

Valve shaft shall be of the one piece type. Shafts shall be of 18-8 stainless steel Type 304 secured to the disc by tangentially fitted stainless steel pins (Type 416), and shall be offset from center line to provide eccentric seating action.

(c) Valve Disc

The valve disc or vane shall be solid bronze or cast iron (ASTM A48, Class 40) with attached bronze or stainless steel disc ring. Disc ring shall be offset to clear main shaft at the circumferential seating surface and shall engage the rubber seat to make a double tight shutoff in closed position. Mechanical stops shall be provided to prevent over travel of the disc in both the full open and full closed position.

The disc assembly shall be geometrically arranged with the main shaft so that closure is affected with an eccentric motion to prevent drag across the rubber seat.

(d) Valve Seats

The valve seat shall be of natural or synthetic rubber, and shall conform to the requirements of AWWA Standard C504-87 or the latest revision thereof.

The valve seat shall be a continual ring offset to clear the main shaft and shall seat against the outside diameter of the disc ring.

The seat shall be mounted and clamped in a recess in the body with provision for increasing clamping pressure to force the ring inwardly against the disc ring so as to adjust seat pressures for tight shut-off.

This seat shall be replaceable without disassembly of the main shaft and disc from the valve.

(e) Bearings

Valves shall be fitted with sleeve-type self-lubricating bearings contained in the hubs of the valve body.

Valves shall have an adjustable thrust bearing to hold the disc in the center of the valve seat.

A bearing beyond the stuffing box shall be contained in the operator housing.

(f) Stuffing Box

Stuffing box packing shall be flax. Stuffing boxes shall be such that the packing can be replaced or adjusted without disturbing any part of the valve or operator except the follower gland.

(g) Manual Operators

Manual operators shall be properly sized gear type for 30" and larger. The traveling nut and lever type operators may be used on 24" and smaller valves. The operator shall be equipped with a 2" square nut operating counterclockwise to open valve.

All gears or traveling nut and lever accessories shall be totally enclosed and suitable for buried service. Operators shall conform to the requirements of AWWA Standard C504-87 or the latest revision and shall be equipped with adjustable limit stop devices.

Operator enclosures shall be properly lubricated at the factory.

**807.03 - Amendment**

The herein above specifications are modified to the extent that the following valves will be acceptable under this contract.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

Clow Style 1450 and Style 4500 as manufactured by McWane, Inc., Birmingham, Alabama; BIF Series 650 as manufactured by BIF; Providence, Rhode Island; Dresser "450" Series as manufactured by Dresser Manufacturing Division, Bradford, Pennsylvania; American Darling as manufactured by American Darling Valve and Manufacturing, Birmingham, Alabama; Pratt Valves as manufactured by Henry Pratt Company, Aurora, Illinois.

End of Section

---

**ITEM 808****SPECIFICATIONS FOR FIRE HYDRANTS****808.01 - Special Requirement**

Fire hydrants furnished as part of water system extension or improvements shall be same type and brand as fire hydrants purchased by the City's Water Utilities Department under annual contract.

Terms of the annual contract require the Supply Company to furnish fire hydrants to contractors at a cost no greater than the City's contract price. The annual contract will be renewed each January. Contact the Water Utilities Office at (409) 866-0062 for the type of hydrant being used.

**808.02 - Specification**

Fire hydrants shall conform to requirements and test of AWWA Standard for Dry Barrel Fire Hydrant – C502-94 or latest revision thereof, as they pertain to the design, component materials, construction and manufacture, except as modified or supplemented below:

- Operating nuts on hydrants must be bronze, non-rising, pentagonal in shape, open counterclockwise, and measure 1-1/2" from point to flat.
- Hold-down nut on hydrants must incorporate an integral resilient weather seal and be e-coated epoxy.
- The lubrication chamber must be provided sealed top and bottom with "O" rings and filled with lubricant which shall be food grade grease. The design shall be such that the thrust collar and the threaded operating parts are automatically lubricated each time the hydrant is cycled. There must be not less than two (2) "O" rings separating the lubrications reservoir from the waterway and that portion of the stem contracting these "O" rings shall be sleeved with bronze. An anti-friction device must be in place above the thrust collar to further minimize operating torque.
- The bonnet on each hydrant must be attached to the upper barrel by not less than six (6) bolts and nuts, with an inserted flat rubber gasket as a pressure seal. The bonnet must incorporate a flat surface in the bottom to provide for an integral stop nut attached to the hydrant rod to limit the open travel.
- Hydrants must be "three-way", having two (2) 2-1/2" hose nozzles and one (1) pumper nozzle, measuring 4-1/2" I.D. with 4-491 City of Beaumont threads.
  - Nozzles must attach clockwise into hydrant barrel utilizing a breach-lock design with clockwise rotation into hydrant barrel utilizing "O" ring pressure seals.
  - A suitable nozzle lock must be in place to prevent inadvertent nozzle removal. Lock shall use a ductile iron threaded retainer ring that threads onto the nozzle and mates against the nozzle outlet and is "O" ring sealed.
  - "Traffic model" having upper and lower barrels joined approximately 3-1/2-inches above the ground line by a separated and breakable "swivel" flange providing 360-degree rotation of upper barrel for proper nozzle facing. This flange must employ no less than eight (8) bolts.

- 
- Stem must be two-piece, 1" x 1" square (excluding threaded or machined areas) and must be connected by a breakable stem coupling that is e-coated epoxy near the ground line flange. Screws, pins, bolts, or fasteners used in conjunction with the stem coupling must be stainless steel.
  - Hydrant barrel casting must be ductile iron and e-coat epoxy primed, and painted silver with polyurethane top coat. The inside diameter of the hydrant barrel shall be six and one-eighth inches (6-1/8").
  - Main valves must be compression type closing with the pressure and must not be less than five and one-quarter inch (5-1/4") diameter. Composition of the main valve must be molded rubber of EPDM having a durometer hardness of 95 +/- 5 and must not be less than 1-inch thick. Valve assembly shall consist of three parts: valve top, hydrant valve rubber, valve bottom. Valve top and bottom shall be C550 FBE epoxy and interlock to prevent unthreading of the assembly. The valve assembly shall be locked to the lower rod using a stainless steel clevis pin.
  - Hydrants must be equipped with a spring to give positive shut off to the drain lever with a maximum of three complete turns of the operating nut. Hydrant must have throttling capability without causing damage to the drain mechanism. Hydrant shall employ a stop nut to restrict travel of the stem. Upper and lower plates to be epoxy coated per AWWA C-550. All assembly bolts shall be of the same dimension for ease in repair.
  - Seat ring and drain must be bronze meeting ASTM B-62 and work in conjunction to form an all-bronze drain way. Two (2) internal drains and four (4) external drain openings are required. Seat ring seals must be "O" rings. The 6-inch shoe connection must be specified (flanged, A/C, M.J., etc.) and must be of ductile iron and AWWA C550 fusion bonded epoxy.
  - Each fire hydrant shall have a working pressure rating of 250 PSIG and tested at not less than 500 PSIG.
  - Upon request, supplier must furnish flow data, indicating friction loss in pounds per square inch (PSI) at the flow of 1,000 gallons per minute (GPM) from the pumper nozzle, such friction loss must not exceed 3 PSI.
  - Hydrants shall have a manufacturer's published warranty against defects in material or workmanship for a period of ten (10) years from date of manufacture.
  - The manufacturing facility for the hydrant must have current ISO 9001 certification.
  - The barrel joint shall be designed so that the hydrant shut-off valve will remain closed and reasonably tight against leakage if an impact accident resulting in damage or breaking of the hydrant above or near ground level. The joint shall be provided with a breakable bolt flange or breakable coupling.
  - All necessary bolts, glands, and gaskets for complete installation of each hydrant shall be supplied with each hydrant and shall conform to AWWA Standard Specification C111.72. They shall be shipped and stored in such a manner to prevent rusting or other damage before installation. All bolts installed below ground shall be 304 stainless steel.
  - Hydrants shall be American Flow 5-1/4" B-84-B or pre-approved equal

**808.03 - Installation**

Fire hydrants shall be connected to the main by means of a swivel (anchor) tee, mechanical joint gate valve with valve box, and a variable length Fire Hydrant Gradelok anchoring device.

Where Gradelok cannot be used concrete having a compressive strength of not less than 1,500 psi shall be used, as a cradle or blocking as shown on the plans, or where directed by the ENGINEER. Blocking shall be placed between solid undisturbed ground and the fire hydrant elbow (inlet shoe).

Bury depth is variable, depending on depth of main. Runout pipe to be horizontal. Ground line flange to be set 3" above ground.

**808.04 - Salvage**

Fire Hydrants which have been abandoned and/or replaced shall remain the property of the City. Deliver salvaged items to 1350 Langham Road, Beaumont, Texas.

End of Section



---

**ITEM 809**

**SPECIFICATIONS FOR TESTING AND STERILIZATION OF COMPLETED LINE**

**809.01 - Procedure**

Flushing, checking, chlorinating, sampling and testing of the completed line shall be done in the following sequence:

1. Flush line properly through valve or other opening at dead end. Area of opening should be no less than 1/4 area of pipe being flushed and not less than 2".
2. Chlorinate line. Pressure drop and flow should be away from point of chlorination and should be toward dead end (open) of line, not toward City connection. Chlorination shall be in agreement with AWWA Specification C651-99.
3. Make specified pressure test using City water through a direct connection to pump suction, using water hoses approved for "drinking" water to the standards set by the City of Beaumont and AWWA.
4. Make bacteriological test before and after pressure test.
5. Installation, disinfection, and testing shall meet the requirements of the "Rules and Regulations for Public Water Systems" adopted by the Texas State Department of Health, September 9, 1973.

If a line failure occurs where a joint or portion of a joint of pipe is replaced, that section of line should be isolated by closing adjacent line valves and the open line kept free of foreign matter. Make repairs and use HTH liberally, then flushed out at the nearest hydrant.

In extreme cases of failure, the CONTRACTOR may be required to repeat the entire chlorination procedure.

City personnel only may open and close existing valves.

**809.02 - Pressure Testing**

After pipe is laid and backfilled as specified, all newly laid pipe shall be subject to a hydrostatic pressure equal to 120% of the class of pipe unless otherwise noted on specification of pipe material, but shall not be less than 180 pounds per square inch. Water for testing shall be furnished by the City at the nearest convenient connection approved by the Water Utilities Engineer of the Water Utilities Department. The duration of each pressure test shall be two (2) hours.



### **809.03 - Pressure Test Procedure**

The CONTRACTOR, after back-filling or partial back-filling all newly laid pipe, shall slowly fill the lines with water expelling all air. The CONTRACTOR shall use all available outlets to accomplish this, such as hydrants, air relief valves and taps when specified. Should additional taps be needed to vent air from high points in the line, the same shall be installed by and at the expense of the CONTRACTOR. The CONTRACTOR shall install certified gauges on the line tested at spacing not to exceed 2000 feet and at the end of the test section.

The water under pressure (10 to 50 psi), shall be allowed to stand for not less than 24 hours to allow for absorption before applying a pressure test.

During this period, the bulkheads, valves, and connections shall be examined for leaks.

A test pressure of not less than 180 psi shall be applied to valve or bulkhead sections by a dedicated hydrostatic test pump, 300 psi liquid filled guage, and water meter.

The CONTRACTOR shall furnish, install and operate at their own expense the necessary connections, pumps, meters and gauges in filling the line and making the test. The water necessary to maintain the test pressure shall be measured through a meter or other means satisfactory to the ENGINEER. If using "other means", an authorization letter by the City of Beaumont Water Utilities Engineer is required to be onsite during the test.

### **809.04 - Permissible Leakage**

No pipe installation will be accepted until or unless the leakage in the foregoing test is less than the following values (based on nominal diameters, a 24-hour day, and 150 psi pressure):

- (a) Ductile Iron Pipe: 24 gallons /(inch diameter--mile--day) for 18 foot length joints of pipe, evaluated on a basis of 150 psi.
- (b) Reinforced Concrete Pressure Water Pipe, Steel Cylinder Type, Prestressed or Pretension: 35 gallons/(inch diameter--mile--day).
- (c) Polyvinyl Chloride (PVC) C-900 Pipe: 24 gallons/(inch-- diameter--day).
- (d) For other pressures the ratio of the square roots of pressures shall be used in determining allowable leakages.
- (e) The leakage shall be considered the amount of water entering the pipe line during the test, less the measured leakage through valves or bulkheads.



### **809.05 - Sterilization**

When repairs made to existing mains or when new main extensions are provided, they must be disinfected by the CONTRACTOR using such amount of chlorine or chlorine compounds to fill the repaired or new mains and appurtenances with water containing 50 ppm chlorine. After the water containing this amount of chlorine which is greater than that normally present in drinking water has been in contact with the pipe and appurtenances at least 24 hours, the water shall be replaced with water to be transported normally and samples of water from the new or repaired main submitted to laboratories for bacteriological examination to be sure that the disinfection procedure was effective.

End of Section



---

## **ITEM 810**

### **SPECIFICATIONS FOR POLYVINYL CHLORIDE (PVC) PRESSURE WATER PIPE**

#### **810.01 - General**

(a) Pipe sizes 4 inches through 12 inches shall conform to American Water Works Association Standard C900-97 or the latest revision thereof, for pipe of class 150 with cast iron outside diameter.

(b) Pipe sizes 14 inches through 24 inches shall conform to American Water Works Association Standard C905-97 or the latest revision thereof, for pipe of class 165 with cast iron outside diameter.

(c) Unless contrary to these specifications, the CONTRACTOR shall handle, haul, and store pipe and other materials in agreement with the manufacturers recommendations.

(d) All pipe must be acceptable, without penalty, to the Texas Fire Insurance Department for use in Water Works Distribution Systems.

(e) Gasket shall be glued or held in place with a retainer ring.

#### **810.02 - Manufacturer's Certificate**

The manufacturer shall supply the City of Beaumont an affidavit that the materials supplied for this contract comply with all applicable requirements of AWWA C900-97 or C905-97 standards.

#### **810.03 - Fittings**

(a) All fittings for polyvinyl chloride pressure water pipe shall be gray iron or ductile iron design and manufactured in conformance with AWWA Standard Specifications C110/a21.10-98 revisions thereto.

(b) Fittings shall be furnished with type of joint and end combinations and pressure class specified. Mechanical joint fittings shall be furnished complete with glands, gaskets and bolts. Flange joint fittings shall be in agreement with AWWA Standard Specification C111/A21.11-95.

(c) All fittings shall be furnished with standard outside coatings consisting of coal tar or asphalt base bituminous materials. Fittings shall be cement mortar lined to standard thickness and sealed in conformity with AWWA Standard Specification C104/A21.4-95.

#### **810.04 - Trench**

(a) Minimum width of trench shall be outside diameter of pipe plus twelve (12") inches. Maximum width of trench shall be outside diameter of pipe plus twenty-four (24") inches. Depth of cover shall be three (3') feet over the top of the pipe, unless otherwise authorized by the Water Utilities Engineer. In places where lines cross roadway ditches or drainage ditches in open excavation, the cover shall meet the requirements of the crossing's Owner from top of pipe to flow of ditch.



(b) Preparation of trench bottom. The trench bottom should be constructed to provide a firm, stable, and uniform support for the full length of the pipe. Bell holes should be provided at each joint to permit proper assembly and pipe support. Any part of the trench bottom below grade should be backfilled to grade and should be compacted as required to provide firm pipe support.

#### **810.05 - Laying of PVC Pipe**

(a) Laying of pipe. To prevent damage, proper implements, tools, and equipment shall be used for placement of pipe in the trench. Under no circumstances drop pipe or accessories into the trench. All foreign matter or dirt shall be removed from the pipe interior. Pipe joints should be assembled with care. When pipe laying is not in progress, open ends of installed pipe shall be closed to prevent entrance of trench water, dirt, foreign matter, or small animals into the line.

(b) Pipe embedment. PVC pipe shall be installed with proper bedding providing uniform longitudinal support under the pipe. Backfill material shall be worked under the sides of the pipe to provide satisfactory haunching. Initial backfill material shall be placed to a minimum depth of 12 inches over the top of the pipe. All pipe embedment material shall be selected and placed carefully, avoiding stones (over 1/2 inch in size) and debris.

(c) Final backfill. After placement and compaction of pipe embedment materials, the balance of backfill materials may be machine placed. The material should contain no large stones or rocks, or debris. Proper compaction procedures should be exercised to provide required densities.

#### **810.06 - Concrete Blocking**

Concrete having a compressive strength of not less than 1500 pounds per square inch shall be used as a cradle or blocking as per manufacturer's recommendations. Bends, crosses with one opening plugged, and all tees shall be placed between solid ground and fitting to be anchored to the size and shape as per manufacturer's recommendations. Gate valves shall be anchored as per manufacturer's recommendations.

#### **810.07 - Service Connections**

Make service connections in accordance with AWWA Manual M23 "PVC Pipe - Design and Installation" and the instructions from the Manufacturer. Use a service clamp or saddle to connect 2" and smaller services to PVC pipe sizes 4" - 12". Use a ductile iron Tapped tee to connect 3" service connections.

#### **810.08 - Method of Measurement**

All pipe shall be measured by the linear foot along centerline of the pipe complete in place. The length of reducer shall be included with pipe of the same size as the larger end of the reducer. It shall be noted here that deductions will be made from pipe measurements for all specials, fittings, valves and other appurtenances which appear in the Proposal as a bid item.

End of Section

---

**ITEM 811****SPECIFICATIONS FOR RESILIENT WEDGE GATE VALVES 4" THRU 66"****811.01 – General Description**

Gate valves shall conform strictly to American Water Works Association Standard Specifications requirements for Resilient Wedge Gate Valves for Ordinary Water Works Service C515-01, including changes and additions specifically stated in these specifications. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.

**811.02 – Testing and Operating Procedures**

All gate valve parts shall be designed to withstand safely and without permanent deformation both stresses resulting from an internal test pressure of 500 psi and combined stresses resulting from full internal pressure of 250 psi for valves sized up to and including 66 inches.

Further, the valve body and the internal parts of all valves shall be so constructed to develop full strength of the valve to the point of failure, in moving the valve gates in either direction across their seats from the point of opening to their full-closed position under full service pressure without rupture or permanent deformation of any other part.

The gate valve shall be subjected to a 500 psi hydrostatic seat and shell test which shall be applied between the gates. All joints and castings shall be completely water-tight. No casting shall show any suggestion of permanent distortion.

The resilient wedge mechanism shall provide zero leakage at the rated water working pressure when installed with the line flow in either direction

**811.03 – Valve Construction**

- (a) Valves shall open left with fixed non-rising stem.
- (b) Operating nut is to be 2 inch square.
- (c) For Valve Sizes from 4" thru 24", the Stem shall be made of bronze (ASTM B-763, Alloy 867) with tensile strength of not less than 80,000 psi, a yield strength greater than 32,000 psi, and an elongation of not less than 15 percent. The stem shall not be designed to break above the stuffing box from excess torque.  
For Valve Sizes from 30" to 66", the Stem shall be made of bronze (ASTM B-862) with tensile strength of not less than 90,000 psi, a yield strength greater than 40,000 psi, and an elongation of not less than 18 percent.
- (d) All valves are manufactured with mechanical joints.

(e) The body and bonnet shall be cast from a high-grade ductile iron which conforms to all requirements of ASTM 536-6545-12, or latest revision thereof.

(f) All ferrous surfaces inside and outside shall have a fusion-bonded epoxy coating in accordance with AWWA C-550 or latest revision thereof.

(g) The wedge shall be ductile iron fully encapsulated with EPDM rubber, symmetrical in design and shall seat equally well with flow in either direction. The wedge to stem design shall employ the use of an independent stem nut. An integral stem nut design is not allowed. The independent stem nut shall be inserted into the stem nut slot of the wedge in one direction only and shall be enclosed by three (3) surrounding sides.

(h) Packing shall be double "O" ring construction, with two above and one below the thrust collar except for 24" valves and larger where one above and one below the thrust collar are required. "O" rings set in a cartridge shall not be allowed. Valve stem should have one stainless steel friction washer above and one below the stem collar to provide lower torques.

(i) The manufacturer shall supply certified reports stating the materials used in the gate valve conform to this specification and the latest AWWA C515-01 specification.

#### **811.04 – Basis of Payment**

Payment for valves in place shall be for size listed in bid item of the proposal and shall include the valve, concrete support, cast iron adjustable valve box and cover, reinforced concrete slab around valve box including all materials, labor, tools, equipment, and supervision necessary to install, sterilize, test, and make the valve ready for operation.

End of Section



---

**ITEM 812**

**SPECIFICATIONS FOR**  
**REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTERS**

**812.01 - General Description**

Reduced pressure principle backflow preventers shall be in accordance with AWWA C506 latest revision, ASTM Standards, Texas Water Commission Regulations, and shall be approved by Underwriters Laboratories for fire system installations.

Reduced pressure principle backflow preventers shall be comprised of two (2) Isolation Gate Valves, two (2) check valves and one (1) pressure relief valve. The check valves and pressure relief valve may be constructed as a one-piece unit.

Reduced pressure principle backflow preventers shall be required on all new sprinkler systems, where system can be pressurized, and when an existing sprinkler system is remodeled, such that the sprinkler system riser is modified, or the existing riser does not contain a testable double check valve. Reduced pressure principle backflow preventers shall also be required for all industrial systems where the possibility of contamination is existent.

**812.02 - Construction Details**

(a) Reduced pressure principle backflow preventers shall include an integral sensing system that will automatically open a relief valve whenever the differential pressure between the inlet supply and the reduced pressure zone drops to 2 psi. The relief valve shall remain open until a positive pressure differential of 2 psi is re-established. If pressure upstream of the first check valve drops to atmospheric or below, the relief valve shall remain fully open providing an internal air gap between the first check valve and the water level in the reduced pressure zone. The unit shall also be constructed such that any minor leakage of the second check valve will result in visible flow from the relief valve, even if the first check valve is totally disabled.

(b) Reduced pressure principle backflow preventers shall have all bronze bodies for sizes three (3) inches and smaller and cast iron bodies for sizes four (4) inches and larger. Cast iron bodies shall be coated with a two (2) part thermosetting epoxy coating in accordance with AWWA C550. The reduced pressure backflow preventer shall consist of two (2) independently operated, spring loaded, wye pattern, poppet type check valves designed for installation in a normal horizontal flow attitude. An independent spring loaded relief valve shall be located between the two (2) check valves. Check valve and relief valve springs shall be stainless steel, and all other internal working parts shall be bronze and stainless steel. Check valve and relief valve seats shall be stainless steel or bronze and shall be field replaceable without removing the device from the service line.

(c) Backflow preventers shall be designed for a working pressure of 150 psi and a temperature range of 32 degrees F to 140 degrees F. The backflow preventer shall be manufactured as a complete unit including test cocks, and upstream and downstream isolation gate valves. The test cocks shall be arranged



---

such that the unit can be tested without removing the unit from the line.

(d) Reduced pressure principle backflow preventers shall be manufactured by Hersey Products, Inc. Golden Anderson Valve or an equal approved by the City of Beaumont Water Utilities Department.

### **812.03 - Installation**

Backflow preventers shall be installed at the locations shown on the Drawings.

Backflow preventers shall be installed in accordance with the manufacturer's written installation instructions and as shown on the Standard Details.

Backflow preventers shall be installed in an accessible location for maintenance and testing purposes, which may be inside or outside of enclosed building.

Where placed inside of building, the reduced pressure backflow preventers shall be installed with the provisions for a suitable drain arrangement to drain off discharges from the relief valve, so that discharges are not objectionable. Backflow preventers shall be installed such that they are easily accessible for testing, maintenance and repair. Piping and fitting for the unit, three (3) inches and larger in size, shall have flange joints and shall be properly supported with concrete foundations and adjustable pipe support stands. Support stands shall be approved by the City of Beaumont, Water Utilities Department.

Following installation of the backflow preventer, piping, fittings, and valves, the entire above ground assembly shall be primed and coated. Prior to applying primer and finish coatings all surfaces shall be clean, dry, and free of rust, oil, and grease.

The above ground installation shall be primed with one (1) coat, 1.5 mils DFT per coat, of a rust inhibitive synthetic resin primer or an equal approved by the Engineer.

The installation shall be finish coated with two (2) coats, 1.4 mils DFT each coat, of a straight long oil alkyd resin enamel. The finish coating shall be Koppers Rustarmor 500 or an equal approved by the Engineer.

Additional coating after installation will not be required if backflow preventers are located inside of enclosed building.

### **812.04 - Basis of Payment**

Payment for backflow preventers in place shall be for size listed in the bid item of the proposal and shall include all valves necessary to assemble backflow preventer units, concrete supports, concrete vault and hatch (if specified), including all materials, labor, tools, equipment, and supervision necessary to install, sterilize, test, and make the backflow preventer ready for operation.

End of Section



---

**ITEM 813**

**HORIZONTAL DIRECTIONAL DRILLING**

**PART 1 GENERAL**

**WORK INCLUDED**

- A. Furnish all labor, materials and equipment required to install (Pipe Size) potable water main, reclaimed main and force main pipe using directional drilling method of installation, all in accordance with the requirements of the Contract Documents. The pipe size, type and length shall be as specified herein and as shown on the Drawings. Work shall include and not be limited to proper installation, testing, restoration of underground utilities and environmental protection and restoration.
- B. The directional drill shall be accomplished by first drilling a pilot hole as shown on the approved pilot bore plan, and then enlarging the pilot hole no larger than 1.5 times the outer diameter of the Certa-Lok C900 / RJ coupling to accommodate the pull back of the pipe through the enlarged hole.
- C. Soil borings as required for certain subsurface soil conditions shall be provided by the Directional Drilling Contractor within the scope of this project.
- D. See CONDITIONS OF THE CONTRACT and GENERAL REQUIREMENTS, which contain information and requirements that apply to the Work specified herein and are mandatory for this project. Wherever possible, the PBCWUD Minimum Engineering & Construction Standards (latest edition) shall apply.

**REFERENCE SPECIFICATIONS, CODES AND STANDARDS**  
**CERTAINTED - CERTA-LOK C900 / RESTRAINED JOINT PIPE**

**1.01 SCOPE**

This specification covers thrust-restrained Poly-Vinyl Chloride (PVC) pipe, in nominal sizes 4" –12" with cast iron pipe outside diameters. Pipe is included for use as a pressure-rated water delivery system, reclaimed water system, as well as in sewer force main and fire protection piping applications or as a casing for small diameter pipe.

**1.02 REFERENCE DOCUMENTS**

American Society for Testing Materials (ASTM)

ASTM D1784: Standard for Rigid PVC Compounds and Chlorinated PVC Compounds



---

ASTM D2837: Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials

ASTM D3139: Standard Specification for Joints for Plastic Pipes Using Flexible Elastomeric Seals

ASTM F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

American Water Works Association (AWWA)

AWWA C900: Standard for PVC Pressure Pipe Fabricated Fittings, 4" Through 12", for Water Distribution

National Sanitation Foundation (NSF)

NSF14: Plastic Pipe System Components and Related Materials

NSF61 Drinking Water System Components – Health Effects

Underwriters Laboratories (UL)

Quick burst test

Million cycle test

1000 hour sustained pressure test

Deflection leakage test

Factory Mutual Research (FM)

Underground fire protection approval

### **1.03 REQUIREMENTS**

#### **3.1 GENERAL:**

Products delivered under this specification shall be manufactured only from new water distribution pipe and couplings, conforming to AWWA C900. The restrained joint pipe shall also meet all AWWA C900 short-term pressure test requirements. Pipe, couplings, and all locking splines components used thereon shall be completely non-metallic to eliminate corrosion problems.

#### **3.2 MATERIALS:**

Pipe and couplings shall be made from unplasticized PVC compounds having a minimum cell classification of 12454-B, as defined in ASTM D1784. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4 Degrees F, in accordance with the requirements of ASTM D2837.

#### **3.3 APPROVALS:**



Restrained joint pipe products shall be tested and approved by an independent third-party laboratory for continuous use at rated pressure. Copies of Agency approval reports or product listing shall be provided to the ENGINEER. Products intended for contact with potable water shall be evaluated, tested, and certified for conformance with NSF Standard 61 by an acceptable certifying organization.

### 3.4 DIMENSIONS:

Nominal outside diameters and wall thicknesses of thrust-restrained pipe shall conform to the requirements of AWWA C900. Thrust-restrained pipe shall be furnished in sizes 4", 6", 8", 10", and 12", Class 150 and Class 200. Pipe shall be furnished in standard lengths of 20 feet. Dimensions of the pipe thrust restraint grooves shall be in accordance with manufacturer's specifications.

### 3.5 JOINTS:

The pipe shall be joined using non-metallic couplings, which have been designed as an integral system for maximum reliability and interchangeability. High-strength flexible thermoplastic splines shall be inserted into mated, precision-machined grooves in the pipe and coupling to provide joint restraint with evenly distributed loading.

Couplings shall be designed for use at the rated pressure of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage test requirements of ASTM D3139 or the Owner's requirements whichever is more stringent.

### 3.6 QUALITY CONTROL:

Every pipe and machined coupling shall pass AWWA C900 hydrostatic proof test requirements (4X rated pressure for 5 seconds).

### 3.7 MARKING:

Pipe shall be legibly and permanently marked in ink with the following information.

- Manufacturer and Trade Name
- Nominal Size & DR Rating/Pressure Class
- Hydrostatic Proof Test Pressure
- NSF-61
- Manufacturing Date Code
- AWWA C-900

Pipe and couplings shall bear the mark of the certifying agency(s), which have tested and approved the product for use in fire protection applications.

### 3.8 WORKMANSHIP:

As defined in AWWA C900, pipe and couplings shall be homogeneous throughout and free from voids, cracks, inclusions, and other defects, and shall be as uniform as commercially practicable in color, density, and other physical characteristics.

## **1. SUGGESTED SOURCE OF SUPPLY**

Restrained Joint PVC Pipe shall be the CertainTeed's Certa-Lok C900/RJ System, or approved equal.

### **SUBMITTALS**



1. Data supporting the directional drilling contractor's qualifications and experience.
2. Work plan: Prior to beginning work, the CONTRACTOR must submit to the ENGINEER and the WATER UTILITIES DEPARTMENT a work plan detailing the procedure and schedule to be used to execute the project. The work plan should include a description of all equipment to be used, down-hole tools, a list of personnel and their qualification and experience (including backup personnel in the event that an individual is unavailable), list of subcontractors, a schedule of work activity, a safety plan (including MSDS of any potentially hazardous substances to be used), an environmental protection plan and contingency plans for possible problems. Work plan should be comprehensive, realistic and based on actual working conditions for this particular project. Plan should document the thoughtful planning required to successfully complete the project.
3. Bore plan: Prior to beginning work, the CONTRACTOR must submit to the ENGINEER and the WATER UTILITIES DEPARTMENT a signed and sealed, scaled drawing of the pilot bore plan for review and approval. (Max. Vertical scale 1" = 2' and Max. Horizontal scale 1" = 20'). The plan shall show finished grade, deflection and radiuses of the pilot bore, all existing utilities with minimum vertical and horizontal clearances. The plan shall also address the location of the drill rig setups and for multiple bores, the lengths of each bore based on soil condition, equipment used, topography, etc. The proposed vertical and horizontal clearances between the bored C-900 PVC pipe and any existing/proposed conflicting pipes, conduits or obstructions shall exceed the guidance system accuracy tolerance by a minimum of 100%.
4. Material: Specifications on material to be used shall be submitted to ENGINEER. Material shall include the pipe, fittings and any other item, that is to be an installed component of the project.
5. Equipment: Submit specifications on directional drilling equipment to be used to ensure that the equipment will be adequate to complete the project. Equipment list shall include but not be limited to: drilling rig, mud system, mud motors (if applicable), downhole tools, guidance system, and rig safety systems. Calibration records for guidance equipment shall be included. Specifications for any drilling fluid additives that CONTRACTOR intends to use or might use shall also be submitted.

## **QUALITY ASSURANCE**

- A. All directional drilling operations shall be performed by a qualified directional drilling CONTRACTOR with at least (3) years experience involving work of a similar nature to the work required of this project. The CONTRACTOR must have installed a minimum of 10,000 linear feet of pipe (4-inch diameter or greater) using directional drilling operations. A list of project references is required prior to job commencement.
- B. All work shall be scheduled through the ENGINEER and the Water Utilities Engineer. Notify ENGINEER and OWNER a minimum of three (3) days in advance of the start of work.
- C. All work shall be performed in the presence of the OWNER and ENGINEER.
- D. All applicable permits and applications must be in place prior to start of work.



**PART 2 PRODUCTS**

**POLYVINYL CHLORIDE (PVC) PIPE**

- A. The pipe material to be used shall meet AWWA C900 standards for Polyvinyl Chloride pressure pipe and fittings with a standard dimension ratio SDR17. PVC pipe that is intended for use as a casing for a finished product pipe may have the standard dimension ratio of 17. The pipe shall be designated as Certa-Lok C900/RJ as manufactured by CertainTeed Corporation. All other pipe shall have the written approval of the ENGINEER and the WATER UTILITIES DEPARTMENT and meet all submittal review as an optional approved product.
- B. The pipe shall be joined using a separate PVC coupling, built in sealing gaskets and restraining grooves. The restraining splines shall be square and made from Nylon 101.
- C. Exposed splines shall be cut  $\frac{3}{4}$ " from coupling to reduce soil drag.
- D. Couplings shall be beveled on leading edges to minimize soil friction.
- E. Using Certa-Lok C900/RJ pipe, the CONTRACTOR shall adhere to the pipe manufacturer's most current data regarding tensile load limitations for trenchless application. Generally, the maximum pull-in force shall not exceed the following values.

Size	SDR	Class Pipe	O.D.	Coupling O.D.	Maximum Pull-In Force Tightest Bending	Maximum Pull-In-Force Straight Pull (No Bending)
4"	18	150 psi	4.800"	5.964"	6,700 lbs.	8,200 lbs.
6"	18	150 psi	6.900"	8.366"	9,000 lbs.	12,800 lbs.
8"	18	150 psi	9.050"	10.947"	18,000 lbs.	25,200 lbs.
10"	18	150 psi	11.100"	13.361"	25,600 lbs.	35,200 lbs.
12"	18	150 psi	13.200"	15.836"	26,440 lbs.	41,100 lbs.
4"	14	200 psi	4.800"	5.964"	8,000 lbs.	10,300 lbs.
6"	14	200 psi	6.900"	8.366"	9,300 lbs.	14,700 lbs.
8"	14	200 psi	9.050"	10.947"	18,900 lbs.	28,800 lbs.
10"	14	200 psi	11.100"	13.361"	25,600 lbs.	35,200 lbs.
12"	14	200 psi	13.200"	15.836"	26,440 lbs.	41,100 lbs.

- F. CONTRACTOR shall adhere to the following data regarding radius of curvature for Certa-Lok



C900/RJ pipe used for trenchless application. The confirmation of proposed radius of each bore shall be part of the required submittal prior to work.

Pipe Diameter	Min. Radius of Curvature	Offset per 20' Length	Deflection per 20' Length
4"	125'	19"	10.0 percent
6"	188'	13"	6.7 percent
8"	250'	9"	5.0 percent
10"	313'	7"	4.0 percent
12"	375'	6"	3.3 percent

In any case, the deflection radius shall not exceed 75% of the maximum allowable curvature allowed for standard C-900 PVC pipe.

**DIRECTIONAL DRILLING EQUIPMENT REQUIREMENTS**

- A. General: The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pull back the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the installation, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required), a Magnetic Guidance System (MGS) or "walkover" system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safe condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.
- B. Drilling Rig: The directional drilling machine shall consist of a hydraulically powered system to rotate and push hollow drilling pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. There shall be a system to detect electrical current from the drill string and an audible alarm that automatically sounds when an electrical current is detected.
- C. Drill Head: The drill head shall be steerable by changing its rotation and shall provide necessary cutting surfaces and drilling fluid jets.
- D. Mud Motors (if required): Mud motors shall be of adequate power to turn the required drilling tools.
- E. Drill Pipe: Shall be constructed of high quality 4130 seamless tubing, grade D or better, with



threaded box and pins. Tools joints should be hardened to 32-36 RC.

**GUIDANCE SYSTEM**

- A. General: An electronic “walkover” tracking system or a Magnetic Guidance System (MGS) probe or proven (non-experimental) gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance system shall be capable of tracking at all depths up to fifty feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate and calibrated to manufacturer’s specifications of the vertical depth of the borehole at sensing position at depths up to fifty feet and accurate to 2-feet horizontally.
- B. Components: The CONTRACTOR shall supply all components and materials to install, operate, and maintain the guidance system.
- C. The Magnetic Guidance System (MGS) shall be set up and operated by personnel trained and experienced with the system. The CONTRACTOR shall be aware of any geo-magnetic anomalies and shall consider such influences in the operation of the guidance system.

**DRILLING FLUID (MUD) SYSTEM**

- A. Mixing System: A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water, and appropriate additives. The mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be minimum of 1,000 gallons. Mixing system shall continually agitate the drilling fluid during drilling operations.

Drilling Fluids: Drilling fluid shall be composed of potable water and bentonite clay. Water shall be from a authorized source with a pH of 8.5 – 10. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. No additional material may be used in drilling fluid without prior approval from ENGINEER. The bentonite mixture used shall have the minimum viscosity’s as measured by a March funnel:

Rocky Clay	-	60 seconds
Hard Clay	-	40 seconds
Soft Clay	-	45 seconds
Sandy Clay	-	90 seconds
Stable Sand	-	80 seconds
Loose Sand	-	110 seconds
Wet Sand	-	110 seconds

These viscosities may be varied to best fit the soil conditions encountered, or as determined by the operator.



- B. Delivery System: The drilling fluid pumping system shall have a minimum capacity of 35-500 GPM and be capable of delivering the drilling fluid at a constant minimum pressure of 1200 psi. The delivery system shall have filters in-line to prevent solids from being pumped into drill pipe. Used drilling fluid and drilling fluid spilled during operations shall be contained and conveyed to the drilling fluid recycling system or shall be removed by vacuum trucks or other methods acceptable to ENGINEER and the WATER UTILITIES DEPARTMENT. A berm, minimum of 12-inches high, shall be maintained around drill rigs drilling fluid mixing system, entry and exit pits and drilling fluid recycling system to prevent spills into the surrounding environment. Pumping equipment and/ or vacuum truck(s) of sufficient size shall be in place to convey drilling fluid from containment areas to storage and recycling facilities or disposal.

### **OTHER EQUIPMENT**

- A. Pipe Rollers: Pipe rollers shall be used for pipe assembly during final product pull back.
- B. Restrictions: Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the ENGINEER/OWNER/WATER UTILITIES DEPARTMENT prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated (by ENGINEER/OWNER/WATER UTILITIES DEPARTMENT) without undue delay and shall maintain line and grade within the tolerances prescribed by the particular conditions of the project.

### **PERSONNEL REQUIREMENTS**

- B. All personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety. Each person must have at least two years directional drilling experience.
- C. A competent and experienced supervisor representing the CONTRACTOR and Drilling Subcontractor shall be present at all times during the actual drilling operations. A responsible representative who is thoroughly familiar with the equipment and type of work to be performed must be in direct charge and control of the operation at all times. In all cases, the supervisor must be continually present at the job site during the actual Directional Bore operation. The CONTRACTOR and Subcontractor shall have a sufficient number of competent workers on the job at all times to insure the Directional Bore is made in a timely and satisfactory manner.
- D. Personnel who are unqualified, incompetent or otherwise not suitable for the performance of this project shall be removed from the job site and replaced with suitable personnel.
- E. A professional land surveyor registered in the State of Texas may be required to prepare and certify as-builts as per specifications.

### **PART 3 EXECUTION**



---

## **GENERAL REQUIREMENTS**

- A. The ENGINEER and the WATER UTILITIES DEPARTMENT must be notified a minimum of 3 days in advance of starting work. All necessary permits and approvals must be in place prior to commencement of work. The Directional Bore shall not begin until the ENGINEER is present at the job site and agrees that proper preparations for the operation have been made. The ENGINEER'S approval for beginning the installation shall in no way relieve the CONTRACTOR of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of the ENGINEER to provide inspection personnel at such time as appropriate without causing undue hardship by reason of delay to the CONTRACTOR. A copy of the WATER UTILITIES DEPARTMENT approved construction drawings must be on the job site during construction.
- B. All work under this specification affecting the Texas Department of Transportation (TXDOT) property, right-of-way or facilities shall be carried out to the full satisfaction of the TXDOT authorized representative. The CONTRACTOR shall fully inform himself of all requirements of TXDOT as it pertains to the specific project and shall conduct all his work accordingly.
- C. All equipment used by the CONTRACTOR on Owner's property and right-of-ways may be inspected by the OWNER or the Owner's Representatives and shall not be used if considered unsatisfactory by OWNER or Owner's Representatives.
- D. The CONTRACTOR shall be fully responsible for all damages arising from his failure to comply with all applicable regulations and the requirements of these Specifications.

## **DIRECTIONAL DRILLING OPERATION**

- A. The CONTRACTOR shall provide all material, equipment, and facilities required for directional drilling. Proper alignment and elevation of the borehole shall be consistently maintained throughout the directional drilling operation. The method used to complete the directional drill shall conform to the requirements of all applicable permits. The ENGINEER will supply copies of all permits to the CONTRACTOR.
- B. The entire drill path shall be accurately surveyed by the CONTRACTOR with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If CONTRACTOR is using a magnetic guidance system, drill path shall be surveyed for any surface geo-magnetic variations or anomalies.
- C. CONTRACTOR shall place silt fence between all drilling operations and any drainage, well-fields, wetland, waterway or other area designated for such protection if required by documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. CONTRACTOR shall adhere to all applicable environmental regulations. Fuel may not be stored in bulk containers within 200 feet of any water body or wetland.
- D. Readings shall be recorded after advancement of each successive drill pipe (no more than 10') and



- the readings plotted on a scaled drawing of 1" = 2' vertical and 1" = 20' horizontal. Access to all recorded readings and plan and profile information shall be made available to the ENGINEER, or his representative, and the WATER UTILITIES DEPARTMENT at all times. At no time shall the deflection radius of the drill pipe exceed the deflection limits of the carrier pipe as specified herein.
- E. A complete list of all drilling fluid additives and mixtures to be used in the directional operation will be submitted to the ENGINEER, along with their respective Material Safety Data Sheets. All drilling fluids and loose cuttings shall be contained in pits or holding tanks for recycling or disposal, no fluids shall be allowed to enter any unapproved areas or natural waterways. Upon completion of the directional drill project, the drilling mud and cuttings shall be disposed of by the CONTRACTOR at an approved dumpsite.
- F. The pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over the length of the bore unless previously agreed to by the ENGINEER/OWNER/UTILITY. In the event that pilot does deviate from the bore path more than 5% of depth over the length of the bore, CONTRACTOR will notify ENGINEER/OWNER/WATER UTILITIES DEPARTMENT may require CONTRACTOR to pull-back and re-drill from the location along bore path before the deviation. In the event of a drilling fluid fracture, inadvertent returns, or returns loss during pilot hole drilling operations, CONTRACTOR shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and wait another 30 minutes. If mud fracture or returns loss continues, CONTRACTOR will discuss additional options with the ENGINEER/OWNER/WATER UTILITIES DEPARTMENT and work will then proceed as agreed.
- G. Upon completion of pilot hole phase of the operation, a complete set of "as-built" records shall be submitted in duplicate to the ENGINEER, WATER UTILITIES DEPARTMENT and OWNER. These records shall include copies of the pilot bore path, plan and profile record drawing, as well as directional survey reports as recorded during the drilling operation.
- H. Upon approval of the pilot hole location by the ENGINEER/OWNER/WATER UTILITIES DEPARTMENT, the hole opening or enlarging phase of the installation shall begin. The bore hole diameter shall be increased to accommodate the pullback operation of the required size of carrier pipe. The type of hole opener or back reamer to be utilized in this phase shall be determined by the types of subsurface soil conditions that have been encountered during the pilot hole drilling operation. The CONTRACTOR shall select the proper reamer type with the final hole opening being a maximum of 1.5 times the largest outside diameter pipe system component to be installed in the bore hole.
- I. The open bore hole shall be stabilized by means of bentonite drilling slurry pumped through the inside diameter of the drill rod and through openings in the reamer. The drilling slurry must be in a homogenous / flowable state serving as an agent to carry the loose cuttings to the surface through the annulus of the borehole. The volume of bentonite mud required for each pullback shall be calculated based on soil conditions, largest diameter of the pipe system component, capacity of the bentonite mud pump, and the speed of pullback as recommended by the bentonite drilling fluid manufacturer. The bentonite slurry is to be contained at the exit or entry side of the directional bore in pits or holding tanks. The slurry may be recycled at this time for reuse in the hole opening



---

operation, or shall be hauled by the CONTRACTOR to an approved dumpsite for proper disposal.

- J. The pipe section shall be joined together according to manufacturer's specifications. The gaskets and the ends of pipe must be inspected and cleaned with a wet cloth prior to each joint assembly so they are free of any dirt or sand. The pipe must be free of any chips, scratches, or scrapes. A pulling eye will be attached to the Certa-Lok C900/RJ pulling head on the lead stick of pipe which in turn will be attached to a swivel on the end of the drill pipe. Tracer wire (#8) solid coated copper wire shall be attached to the pulling eye and the crown of PVC pipe with duct tape @ 24" O.C. and a minimum of two full wraps around the pipe. This will allow for a straight, smooth pull of the product pipe as it enters and passes through the borehole toward the drill rig and original entrance hole of the directional bore. The product pipe shall be elevated to the approximate angle of entry and supported by means of a side boom with roller arm, or similar equipment, to allow for the "free stress" situation as the pipe is pulled into the exit hole toward the drill rig. The product pullback phase of the directional operation shall be carried out in a continuous manner until the pipe reaches the original entry side of the bore.

## **PIPE HANDLING**

- A. Care shall be taken during transportation of the pipe such that it will not be cut, kinked or otherwise damaged.
- B. Ropes, fabrics or rubber protected slings and straps shall be used when handling pipes. Chains, cables or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped into rocky or unprepared ground.
- C. Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects that could damage the pipe. Stacking of the Certa-Lok C900 / RJ pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions. Where necessary due to ground conditions the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.
- D. The handling of the assembled pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Slings for handling the pipeline shall not be positioned at pipe joints. Sections of the pipes with cuts and gouges or excessive deformation shall be removed and replaced.

## **TESTING PIPE**

- A. Cleaning and flushing are to be done by the CONTRACTOR in order to obtain a clear and debris free product. Only potable water shall be used for flushing and pressure testing.
- B. Directional drilling pipe shall be tested by CONTRACTOR after pullback. The average pressure shall be maintained at 150 psi for two hours. The test pump and water supply shall be arranged to allow accurate measurements of the water required to maintain the test pressure. Any material showing



---

seepage or the slightest leakage shall be replaced as directed by the OWNER at no additional expense to the OWNER.

- C. The pipe manufacturer's (or ENGINEER'S/OWNER'S/WATER UTILITIES DEPARTMENT, whichever is more stringent) recommendations on pipe stretch allowances, bending radius, tensile strength, allowable test leakage allowance, and magnitude and duration of test pressure shall be observed.
- D. Pipeline shall be tested end to end.
- E. All new service lines connected to the new main and installed with new pipe shall be pressure tested along with the newly installed main.
- F. Pressure testing shall not be required for the drilled pipe if the pipe is intended to be used as a casing for a finished product pipe.

#### **SITE RESTORATION**

- A. Following drilling operations, CONTRACTOR will de-mobilize equipment and restore the work site to the original conditions or better. All excavations will be backfilled and compacted according to the specifications.
- B. Surface restoration shall be completed in accordance with the requirements of the contract, approvals or permits to a condition as good or better than existing prior to construction.

#### **RECORD KEEPING AND AS-BUILTS**

- A. CONTRACTOR shall maintain a daily project log of drilling operations and a guidance system log with a copy given to the ENGINEER/OWNER/WATER UTILITIES DEPARTMENT at completion of project.

The guidance system data shall be recorded per page 10 paragraph G during the actual crossing operation. The CONTRACTOR shall furnish to the ENGINEER/OWNER/WATER UTILITIES DEPARTMENT, "as-built" plan and profile drawings based on these recordings showing the actual location horizontally and vertically of the installation, and all utility facilities found during the installation. The guidance data shall be certified accurate by the CONTRACTOR to the capability of the guidance System.

- B. "As-built" drawings shall be completed and certified by a Texas Registered Professional Surveyor and mapped at CONTRACTORS expense in a form as required by the WATER UTILITIES DEPARTMENT, including signed and sealed plans, mylars, and electronic data files if available.

End of Section



---

**ITEM 814**  
**SERVICE AGREEMENT FOR**  
**FIRE HYDRANT CONSTRUCTION METER**

- I. **Purpose.** The Texas Commission on Environmental Quality (TCEQ) requires cities to take all necessary measures to insure its water supply remains protected. The City of Beaumont Water Utilities Department is responsible for protecting the drinking water supply from contamination or pollution. In order to protect the health of the public, the City Council enacted the *Cross Connection Control and Prevention Ordinance 01- 032* on March 27, 2001. These restrictions are enforced by the Water Utilities Department to insure public health and welfare. The purpose of this Service Agreement with \_\_\_\_\_ (herein "Contractor") is to provide and insure this protection. The Contractor must sign this agreement before the City of Beaumont Water Utilities Department will allow the use of water service through fire hydrant connections. In addition, when service to an existing connection has been suspended or terminated, the Water Utilities Department will not reestablish service unless it has received a signed copy of this Agreement.
- II. **Service Agreement.** The following are the terms of the Service Agreement between the City of Beaumont Water Utilities Department and the Contractor.
- A. Effective immediately, fire hydrant construction meters will be issued to the Contractor on a **job by job basis**. When that particular project is finished, the fire hydrant assembly will be returned to the City of Beaumont Water Utilities Department. **The assembly will not be relocated to another project or site without first notifying Diane Newsome, Project Manager at (409)785-3015.**
- B. The fire hydrant meter and backflow prevention assemblies are required to be in a protective cage (device) and will be supplied by the Water Utilities Department. Initial testing of the backflow prevention assembly will be performed by the City. Periodic testing will be required and the frequency will be determined by the Water Quality Control Manager. This testing is to be done by a certified backflow tester at the contractor's expense **only** if the meter is kept over one year from date of this Agreement. Original Reports are to be sent to:
- Karin Warren, Water Quality Control Manager,  
Water Utilities Department, 1350 Langham Road, Beaumont, TX, 77707
- Fax copy to: Diane Newsome, 409-861-4836
- C. An initial non refundable service fee of \$500.00 and a security deposit of \$2,000.00 (payable by check only to the City of Beaumont), will be required to accompany this Service Agreement and Application Form when the meter assembly is picked up.
- D. Damage protection of the device will be the responsibility of the contractor. Contractors will use a fire hydrant wrench **only** when turning on or off the hydrant. The cost to replace or repair any damaged parts will be taken out of the deposit.
- E. Daily protective storage of the device will be performed by the Contractor. If the device is stolen or removed from the designated job site, *the deposit will not be refunded.*



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

- F. Placement of this device will be located in such a place as to protect the public, pedestrians, vehicles, and construction workers on the site. The city assumes no responsibility for injuries or damages to personnel or equipment.
- G. Any unauthorized tampering with City water utility valves or appurtenances, or any theft of water, will be dealt with according to the penalties set forth in the City Ordinance.
- H. Meters will be read by the Contractor and the reading (and meter location) ***must be called in each 3<sup>rd</sup> Monday of the month*** to: Vicki Connell, Customer Service (409) 866-0023, ext. 6038. **The City expects the contractors to give their full cooperation.**

III. **Enforcement.** If the Contractor fails to comply with the terms of this Service Agreement, the Water Utilities Department shall, as its option, terminate service and enforce any and all penalties set forth in City Ordinance 01-032. Any expenses associated with the enforcement of this Agreement shall be billed to the Contractor.

I. **In connection with this Agreement, the official name and address for notification shall be:**

A. **Contractor:**

Contractor Name					
Owner/Manager (Print)					
Owner/Manager (Signature)				Date	
Mailing Address					
City		State		Zip Code	
Phone		Fax			

B. **City of Beaumont, Water Utilities Department**

\_\_\_\_\_  
**Dr. Hani J. Tohme, P.E., Director**

\_\_\_\_\_  
**Date**

***Payment Information:* (Fees must accompany this Agreement)**

\$500.00 Non-Refundable Service Fee  
Receipt # \_\_\_\_\_

\$2,000.00 Security Deposit Fee  
Receipt # \_\_\_\_\_

***For Office Use:***

Contractor's Account Number: \_\_\_\_\_ Cage No. \_\_\_\_\_

Meter No. \_\_\_\_\_ Backflow Preventer No. \_\_\_\_\_

Location of Fire Hydrant Meter: \_\_\_\_\_



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

**ACCOUNT APPLICATION FOR TEMPORARY FIRE HYDRANT CONSTRUCTION METER**

---

DATE OF APPLICATION: \_\_\_\_\_

***BILLING INFORMATION:***

Company Name: \_\_\_\_\_

Mailing Address: \_\_\_\_\_  
\_\_\_\_\_

City: \_\_\_\_\_ State \_\_\_\_\_ Zip Code: \_\_\_\_\_

Phone: \_\_\_\_\_ Contact Person: \_\_\_\_\_

Guarantor Account Number (if applicable) \_\_\_\_\_ Deposit Amt. \_\_\_\_\_

***LOCAL CONTACT INFORMATION:***

Contact Person: \_\_\_\_\_

Local Phone or Cellular Phone: \_\_\_\_\_  
Office / Home Phone Number Cellular / Pager Number

***SERVICE INFORMATION:***

Installation Location: \_\_\_\_\_

Type of Project: \_\_\_\_\_ Approx. Length: \_\_\_\_\_

Comments: \_\_\_\_\_

***CUSTOMER INSTRUCTIONS:***

1. The meter will not be relocated to another project and/or site without first notifying Diane Newsome, Project Manager at 409.785.3015.
2. If meter is kept over a year, refer to Service Agreement II. B.
3. Damage protection of the device will be the responsibility of the contractor. **Only** a fire hydrant wrench is to be used for turning the hydrant on or off.
4. Daily protective storage of the device will be performed by the Contractor. Any damage or theft to the device will be the responsibility of the Contractor and the deposit of \$2,000.00 will not be refunded.
5. **Meters will be read by the Contractor and the reading (and meter location) must be called in each 3<sup>rd</sup> Monday of the month to: Vicki Connell, Customer Service 409.866.0026, ext. 6038.**

<i>For Office Use:</i> Clerk: _____ Cage # _____ Meter Size: _____ Reading: _____	Meter Type: _____ Backflow Preventer No. _____	Meter No. _____ Account No. _____
---	---	--------------------------------------

Revised: 9-6-2007



### TEMPORARY METER NOTIFICATION

DATE: \_\_\_\_\_

TO WHOM IT MAY CONCERN:

The City of Beaumont Water Utilities Department will be providing a temporary meter to \_\_\_\_\_ at the installation location of \_\_\_\_\_. As stated in the Service Agreement II.A., the Fire Hydrant construction meters will be issued to the Contractor on a job-by-job basis, and must be returned to the City of Beaumont immediately upon completion of that particular project location.

It will be the Contractors responsibility to report meter readings to Vicki Connell, Customer Service at (409) 866-0023, ext. 6038. **These readings must be called in each 3<sup>rd</sup> Monday of the month as stated in the Service Agreement II.H.** It will be the Contractors responsibility to report meter locations to Diane Newsome, Project Manager at (409) 785-3015. Your cooperation in this procedure will be appreciated.

\_\_\_\_\_  
Local Contact Person

\_\_\_\_\_  
Local Contact Number

WATER UTILITIES DEPARTMENT  
ADMINISTRATION



**ITEM 817**

**SPECIFICATIONS  
FOR  
CEMENT STABILIZED SAND**

The following specifications are intended to describe sand cement 1 1/2 sack, and sand cement 2 sack.

1. Soil shall consist of sandy loam material free from vegetation or other objectionable materials.
2. Cement shall be Type 1 of a standard brand of Portland Cement and shall conform to the requirements of ASTM Designation: C150 and Texas Department of Transportation standards..
3. Mixing of materials shall be uniform.
4. Materials are subject to an independent testing laboratory batch design test.

End of Section



---

**ITEM 903**

**SPECIFICATIONS FOR SEWER LINE CLEANING**

**903.01 - Intent**

The intent of sewer line cleaning is to remove foreign materials from the lines and restore the sewer to a minimum of 95% of the original carrying capacity or as required for proper seating of internal pipe joint sealing packers. Since the success of the other phases of work depends a great deal on the cleanliness of the lines, the importance of this phase of the operation is emphasized. It is recognized that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where additional damage would result if cleaning were attempted or continued. Should such conditions be encountered the Contractor will not be required to clean those specific manhole sections. If in the course of normal cleaning operations, damage does result from pre-existing and unforeseen conditions such as broken pipe, the Contractor will not be held responsible.

**903.02 - Cleaning Equipment**

(a) Hydraulically Propelled Equipment: The equipment used shall be of a movable dam type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery to insure removal of grease. If sewer cleaning balls or other equipment which cannot be collapsed is used, special precautions to prevent flooding of the sewers and public or private property shall be taken.

(b) High-Velocity Jet (Hydrocleaning) Equipment: All high velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel.

(c) Mechanically Powered Equipment: Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated to have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To ensure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

**903.03 - Cleaning Precautions**

During sewer cleaning operations. Satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard the flow in the sewer line are used, precautions shall be taken to insure that the water pressure created does not damage or cause flooding of public or private property being served by the sewer. When possible, the flow of sewage in the sewer shall be utilized to provide the



---

necessary pressure for hydraulic cleaning devices.

When additional water from fire hydrants is necessary to avoid delay in normal work procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant.

#### **903.04 - Sewer Cleaning**

The designated sewer manhole sections shall be cleaned using hydraulically propelled, high velocity jet, or mechanically powered equipment. Selection of the equipment used shall be based on the conditions of lines at the time the work commences. The equipment and methods selected shall be satisfactory to the Owner's Representative. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the sewer lines and manholes. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire manhole section, it will be assumed that a major blockage exists and the cleaning effort shall be abandoned.

#### **903.05 - Root Removal**

Roots shall be removed in the designated sections where root intrusion is a problem. Special attention should be used during the cleaning operation to assure almost complete removal of roots from the joints. Any roots which could prevent the seating of the packer or could prevent the proper application of chemical sealants shall be removed. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners. Chemical root treatment may be used at the option of the Contractor.

#### **903.06 - Chemical Root Treatment**

To aid in the removal of roots and at the option of the Contractor, manhole sections that have root intrusion may be treated with an approved herbicide. The application of the herbicide to the roots shall be done in accordance with the manufacturer's recommendations and specifications in such a manner to preclude damage to surrounding vegetation. Any damaged vegetation so designated by the Engineer shall be replaced by the Contractor at no additional cost to the Owner. All safety precautions as recommended by the manufacturer shall be adhered to concerning handling and application of the herbicide.

#### **903.07 - Material Removal**

All sludge, dirt, sand, rocks, grease, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section, which could cause line stoppages, accumulations of sand in wet wells, or damage pumping equipment, shall not be permitted.



---

### **903.08 - Disposal of Materials**

All solids or semisolids resulting from the cleaning operations shall be removed from the site and disposed of at a site designated by the Owner. All materials shall be removed from the site no less often than at the end of each workday. Under NO circumstances will the Contractor be allowed to accumulate debris, etc., on the site of work or beyond the stated time, except in totally enclosed containers and as approved by the Owner.

### **903.09 - Final Acceptance**

Acceptance of sewer line cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of the Owner's Representative. If TV inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to reclean and reinspect the sewer line until the cleaning is shown to be satisfactory. In areas where television inspection is not performed, the Owner's Representative may require the Contractor to pull a double squeegee (with each squeegee the same diameter as the sewer) through each manhole section as evidence of adequate cleaning. If internal sealing is to follow the television inspection, particular attention should be given to the adequacy of the cleaning to insure that proper seating of the sealing packer can be achieved.

### **903.10 - Measurement & Payment**

Sewer line cleaning shall be paid for at the unit price bid per linear foot of each size pipe. Measurement of the actual number of feet cleaned shall be made from the center of the manholes.

End Of Section



---

**ITEM 904**

**SPECIFICATIONS FOR SEWER FLOW CONTROL**

**904.01 - General**

When sewer line depth of flow at the upstream manhole of the manhole section being worked is above the maximum allowable for television inspection, the flow shall be reduced to the level shown below by operation of pump stations, plugging or blocking the flow, or by pumping and bypassing of the flow as determined by the Contractor.

**904.02 - Maximum Sewage Flows**

Depth of flow shall not exceed that shown below for the respective pipe sizes as measured in the manhole when performing television inspection.

Maximum Depth of Flow .....	Television Inspection
6" - 10" Pipe .....	20% of pipe diameter
12" - 24" Pipe .....	25% of pipe diameter
27" & up Pipe .....	30% of pipe diameter

**904.03 - Plugging or Blocking**

A sewer line plug shall be inserted into the line upstream of the section being worked. The plug shall be so designed that all or any portion of the sewage can be released. During TV inspection, flow shall be reduced to within the limits specified above. After the work has been completed, flow shall be restored to normal.

**904.04 - Plugging & Bypassing**

When pumping and bypassing is required the Contractor shall supply the pumps, conduits, and other equipment to divert the flow of sewage around the manhole section in which work is to be performed. The bypass system shall be of sufficient capacity to handle existing flow. The Contractor will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system.

**904.05 - Flow Control Precautions**

When flow in a sewer line is plugged, blocked, or bypassed; sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to insure that sewer flow control operations do not cause flooring or damage to public or private property being served by the sewers involved.



**904.06 - Payment**

Payments for plugging/blocking or bypass pumping of sewer lines for television inspection shall be included in the payment for television inspection.

End Of Section



---

## **ITEM 905**

### **SPECIFICATIONS FOR TELEVISION INSPECTION**

#### **905.01 - General**

After cleaning, the manhole sections shall be visually inspected by means of closed-circuit television. The inspection will be done one section at a time and the flow in the section being inspected will be suitably controlled as specified in Item 904.

#### **905.02 - Video Equipment**

The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, video recorder (VHS) and other components of the video system shall be capable of producing a minimum 500 line resolution color video picture. Such picture shall be of quality satisfactory to the Owner's Representative; and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.

#### **905.03 - Procedure**

The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole. If, again, the camera fails to pass through the entire manhole section, the inspection shall be considered complete and no additional inspection work will be required.

#### **905.04 - Communication**

When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to insure good communications between members of the crew.

#### **905.05 - Measurements**

The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to the Owner's Representative.



---

**905.06 - Documentation Television results as follows:**

(a) Television Inspection Logs:

Printed location records shall be kept by the Contractor and will clearly show location in relation to an adjacent manhole of all points of significance such as locations of building sewers, unusual conditions, roots, storm sewer connections, broken pipe, presence of scale and corrosion, and other discernible features will be recorded and a copy of such records will be supplied to the Owner.

(b) Videotape Recordings:

The purpose of tape recording (VHS) shall be to supply a visual and audio (optional) record of problem areas of the lines that may be replayed. Videotape recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. The Contractor shall have all videotapes readily accessible for review by the Owner during the project. At the completion of the project, prior to final payment, the Contractor shall provide the Owner with either the original videotape(s) or an approved copy of all television inspections.

**905.07 - Measurement & Payment**

Television inspection of the sewer lines shall be paid for at the unit price bid per linear foot of each size pipe. Measurement of the actual number of feet inspected shall be made from the center of the manholes.

No separate payment shall be made for (1) keeping television inspection logs and supplying the Owner with copies of these logs; (2) setting up (or resetting up) equipment for televising, viewing, recording, and communicating; or (3) keeping television videotapes and supplying the Owner with copies of these videotapes.

End Of Section



**ITEM 01540**

**DIVERSION PUMPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Diversion Pumping

**1.02 UNIT PRICES**

- A. No separate payment will be made for installation, operation and maintenance of diversion pumping system. Include the cost of diversion pumping in other related bid items.

**1.03 DEFINITIONS**

- A. Diversion pumping is the installation and operation of bulkheads, plugs, hoses, piping, and pumps to maintain sewage flow and prevent backup and overflow.

**1.04 SUBMITTALS**

- A. Make submittals in conformance with Section 01300 - Contractor Submittals.
- B. Diversion pumping systems bypassing line segments with 42-inch diameter or greater sewers, require submittal (prior to installation) of a Diversion Pumping Plan with sufficient detail to show the location, number and size of pumps, the number, location, size and type of hoses and/or rigid piping, and the location of the downstream discharge. Show any special features where pipes or hose cross roadways, such as temporary trenches, support bridges, etc.

**1.05 SCHEDULING**

- A. If the City is operating or maintaining diversion pumping in the construction area, the Contractor shall coordinate with the Water Utilities Engineer, as necessary.
- B. The Contractor shall cease diversion pumping operations when directed by the Water Utilities Engineer.



## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Design piping, joints, and accessories to withstand at least twice the maximum system pressure or 50psi, whichever is greater.
- B. Pumps shall be self-priming type or submersible electric, in good working order, with a working pressure gauge on the discharge. Pumps shall meet the requirements of the City of Beaumont Noise and Sound Level Regulations.

## **PART 3 EXECUTION**

### **3.01 FIELD QUALITY CONTROL**

- A. During diversion pumping, do not allow sewage to be leaked, dumped, or spilled in or onto any area outside of the existing sanitary sewer system.
- B. In the event of accidental spill or overflow, immediately stop the discharge and take action to clean up and disinfect the spill. Promptly notify the Water Utilities Engineer so that required reporting can be made to the Texas Commission on Environmental Quality (TCEQ) and the Environmental Protection Agency (EPA) by the Water Utilities Engineer.

### **3.02 CLEANING**

- A. When diversion pumping operations are complete, piping shall be drained into the sanitary sewer prior to disassembly.

End of Section



---

**ITEM 01578**

**CONTROL OF GROUND WATER AND SURFACE WATER**

**PART I      GENERAL**

**1.01 SECTION INCLUDES**

- A.     Dewatering, depressurizing, draining, and maintaining trenches, shaft excavations, structural excavations, and foundation beds in a stable condition, and controlling ground water conditions for tunnel excavations.
- B.     Protecting work against surface runoff and rising flood waters.
- C.     Disposing of removed water.

**1.02 METHOD OF PAYMENT**

- A.     No separate payment will be made for control of ground water and surface water. Include the cost to control ground water and surface water in unit price for work requiring such controls.

**1.03 REFERENCES**

- A.     ASTM D 698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49 kg) Rammer and 12-inch (304.8 mm) Drop.
- B.     Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).
- C.     Federal Register 40 CFR (Vol. 55, No. 222) Part 122, EPA Administered Permit Programs (NPDES), Para. 122.26(b)(14) Storm Water Discharge.

**1.04 DEFINITIONS**

- A.     Ground water control includes both dewatering and depressurization of water-bearing soil layers.
  - 1.     Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from slopes or bottoms of excavations, or into tunnels and shafts, and disposing of removed water. The intent of dewatering is to increase stability of tunnel excavations and excavated slopes; prevent dislocation of material from slopes or bottoms of excavations; reduce lateral loads on sheeting and bracing; improve excavating and hauling characteristics of excavated material; prevent failure



or heaving of the bottom of excavations; and to provide suitable conditions for placement of backfill materials and construction of structures and other installations.

2. Depressurization includes reduction in piezometric pressure within strata not controlled by dewatering alone, as required to prevent failure or heaving of excavation bottom or instability of tunnel excavations.
- B. Excavation drainage includes keeping excavations free of surface and seepage water.
  - C. Surface drainage includes use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps with discharge lines as required to protect the work from any source of surface water.
  - D. Equipment and instrumentation for monitoring and control of ground water control system includes piezometers and monitoring wells, and devices, such as flow meters, for observing and recording flow rates.

#### **1.05 PERFORMANCE REQUIREMENTS**

- A. Conduct subsurface investigations to identify groundwater conditions and to provide parameters for design, installation, and operation of groundwater control systems.
- B. Design a ground water control system, compatible with requirements of Federal Regulations 29 CFR Part 1926 and Item 712 - Trench Safety Systems, to produce the following results:
  1. Effectively reduce the hydrostatic pressure affecting:
    - (a) Excavations.
    - (b) Tunnel excavation, face stability or seepage into tunnels.
  2. Develop a substantially dry and stable subgrade for subsequent construction operations.
  3. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities, and other work.
  4. Prevent the loss of fines, seepage, boils, quick condition, or softening of the foundation strata.
  5. Maintain stability of sides and bottom of excavations.
- C. Provide ground water control systems may include single-stage or multiple-stage well point systems, ejector and ejector-type systems, deep wells, or combinations of these equipment types.
- D. Provide drainage of seepage water and surface water, as well as water from any other



source entering the excavation. Excavation drainage may include placement of drainage materials, such as crushed stone and filter fabric, together with sump pumping.

- E. Provide ditches, berms, pumps and other methods necessary to divert and drain surface water from excavation and other work areas.
- F. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.
- G. Assume sole responsibility for ground water control systems and for any loss or damage resulting from partial or complete failure of protective measures and any settlement or resultant damage caused by the ground water control operations. Modify ground water control systems or operations if they cause or threaten to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells, or affect potentially contaminated areas. Repair damage caused by ground water control systems or resulting from failure of the system to protect property as required.
- H. Provide an adequate number of piezometers installed at the proper locations and depths as required to provide meaningful observations of the conditions affecting the excavation, adjacent structures, and water wells.
- I. Provide environmental monitoring wells installed at the proper locations and depths as required to provide adequate observations of hydrostatic conditions and possible contaminant transport from contamination sources into the work area or into the ground water control system.
- J. Decommission piezometers and monitoring wells installed during design phase studies and left for Contractors monitoring and use.

#### **1.06 SUBMITTALS**

- A. Submittals shall conform to requirements of Section 01300 - Contractor Submittals.
- B. Submit a Ground Water and Surface Water Control Plan for review by the Water Utilities Engineer prior to start of any field work. The Plan shall be signed by a Professional Engineer registered in the State of Texas. Submit a plan to include the following:
  - 1. Results of subsurface investigation and description of the extent and characteristics of water bearing layers subject to ground water control.
  - 2. Names of equipment suppliers and installation subcontractors.
  - 3. A description of proposed ground water control systems indicating arrangement, location, depth and capacities of system components, installation details and criteria, and operation and maintenance procedures.
  - 4. A description of proposed monitoring and control system indicating depths and



locations of piezometers and monitoring wells, monitoring installation details and criteria, type of equipment and instrumentation with pertinent data and characteristics.

5. A description of proposed filters including types, sizes, capacities and manufacturer's application recommendations.
  6. Design calculations demonstrating adequacy of proposed systems for intended applications. Define potential area of influence of ground water control operation near contaminated areas.
  7. Operating requirements, including piezometric control elevations for dewatering and depressurization.
  8. Excavation drainage methods including typical drainage layers, sump pump application and other necessary means.
  9. Surface water control and drainage installations.
  10. Proposed methods and locations for disposing of removed water.
- C. Submit the following records upon completed initial installation:
1. Installation and development reports for well points, eductors, and deep wells.
  2. Installation reports and baseline readings for piezometers and monitoring wells.
  3. Baseline analytical test data of water from monitoring wells.
  4. Initial flow rates.
- D. Submit the following records on a weekly basis during operations:
1. Records of flow rates and piezometric elevations obtained during monitoring of dewatering and depressurization. Refer to Paragraph 3.02, Requirements for eductor, well points, or deep wells.
  2. Maintenance records for ground water control installations, piezometers, and monitoring wells.
- E. Submit the following records at the end of work. Decommissioning (abandonment) reports



for monitoring wells and piezometers installed by others during the design phase and left for Contractor's monitoring and use.

### **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Comply with requirements of agencies having jurisdiction.
- B. Comply with Texas Natural Commission on Environmental Quality regulations and Texas Water Well Drillers Association for development, drilling, and abandonment of wells used in dewatering system.
- C. Obtain permit from EPA under the National Pollutant Discharge Elimination System (NPDES), for storm water discharge from construction sites.
- D. Obtain all necessary permits from agencies with control over the use of groundwater and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Because the review and permitting process may be lengthy, take early action to pursue and submit for the required approvals.
- E. Monitor ground water discharge for contamination while performing pumping in the vicinity of potentially contaminated sites.

## **PART 2 PRODUCTS**

### **2.01 EQUIPMENT AND MATERIALS**

- A. Equipment and materials are at the option of Contractor as necessary to achieve desired results for dewatering. Selected equipment and materials are subject to review of the Water Utilities Engineer through submittals required in Paragraph 1.06, Submittals.
- B. Eductors, well points, or deep wells, where used must be furnished, installed and operated by an experienced contractor regularly engaged in ground water control system design, installation, and operation.
- C. All equipment must be in good repair and operating order.
- D. Sufficient standby equipment and materials shall be kept available to ensure continuous operation, where required.

## **PART 3 EXECUTION**



### **3.01 GROUND WATER CONTROL**

- A. Perform a subsurface investigation by borings as necessary to identify water bearing layers, piezometric pressures, and soil parameters for design and installation of ground water control systems. Perform pump tests, if necessary to determine the draw down characteristics of the water bearing layers. The results shall be presented in the Ground Water and Surface Water Control Plan (See Paragraph 1.06,B).
- B. Provide labor, material, equipment, techniques and methods to lower, control and handle ground water in a manner compatible with construction methods and site conditions. Monitor effectiveness of the installed system and its effect on adjacent property.
- C. Install, operate, and maintain ground water control systems in accordance with the Ground Water and Surface Water Control Plan. Notify the Water Utilities Engineer in writing of any changes made to accommodate field conditions and changes to the Work. Provide revised drawings and calculations with such notification.
- D. Provide for continuous system operation, including nights, weekends, and holidays. Arrange for appropriate backup if electrical power is primary energy source for dewatering system.
- E. Monitor operations to verify that the system lowers ground water piezometric levels at a rate required to maintain a dry excavation resulting in a stable subgrade for prosecution of subsequent operations.
- F. Where hydrostatic pressures in confined water bearing layers exist below excavation, depressurize those zones to eliminate risk of uplift or other instability of excavation or installed works. Allowable piezometric elevations shall be designed in the Ground Water and Surface Water Control Plan.
- G. Remove ground water control installations.
  - 1. Remove pumping system components and piping when ground water control is no longer required.
  - 2. Remove piezometers, including piezometers installed during the design phase investigations and left for Contractor's use, upon completion of testing, in accordance with Section 02533 - Acceptance Testing of Sanitary Sewers.
  - 3. Remove monitoring wells when directed by the Water Utilities Engineer.
  - 4. Grout abandoned well and piezometer holes. Fill piping that is not removed with cement-bentonite grout or cement-sand grout.

- H. During backfilling, dewatering may be reduced to maintain water level a minimum of 5 feet below prevailing level of backfill. However, do not allow that water level to result in uplift pressures in excess of 80 percent of downward pressure produced by weight of structure or backfill in place. Do not allow water levels to rise into cement stabilized sand until at least 48 hours after placement.
- I. Provide a uniform diameter for each pipe drain run constructed for dewatering. Remove pipe drain when it has served its purpose. If removal of pipe is impractical, provide grout connections at 50-foot intervals and fill pipe with cement-bentonite grout or cement-sand grout when pipe is removed from service.
- J. Extent of construction ground water control for structures with a permanent perforated underground drainage system may be reduced, such as for units designed to withstand hydrostatic uplift pressure. Provide a means of draining the affected portion of underground system, including standby equipment. Maintain drainage system during operations and remove it when no longer required.
- K. Remove system upon completion of construction or when dewatering and control of surface or ground water is no longer required.
- L. Compact backfill to not less than 95 percent of the maximum dry density in accordance with ASTM D 698.

### **3.02 REQUIREMENTS FOR EDUCTOR, WELL POINTS, OR DEEP WELLS**

- A. For aboveground piping in ground water control system, include a 12-inch minimum length of clear, transparent piping between every eductor well or well point and discharge header so that discharge from each installation can be visually monitored.
- B. Installation sufficient piezometers or monitoring wells to show that all trench or shaft excavations in water bearing materials are predrained prior to excavation. Provide separate piezometers for monitoring of dewatering and for monitoring of depressurization. Install piezometers and monitoring wells for tunneling as appropriate for Contractor's selected method of work.
- C. Install piezometers or monitoring wells not less than one week in advance of beginning the associated excavation.
- D. Dewatering may be omitted for portions of underdrains or other excavations, but only where auger borings and piezometers or monitoring wells show that soil is predrained by an existing system such that the criteria of the ground water control plan are satisfied.
- E. Replace installations that produce noticeable amounts of sediments after development.
- F. Provide additional ground water control installations, or change the methods, in the event that the installations according to the ground water control plan does not provide



satisfactory results based on the performance criteria defined by the plan and by the specification. Submit a revised plan according to Paragraph 1.06B.

### **3.03 EXCAVATION DRAINAGE**

- A. Contractor may use excavation drainage methods if necessary to achieve well drained conditions. The excavation drainage may consist of a layer of crushed stone and filter fabric, and sump pumping in combination with sufficient wells for ground water control to maintain stable excavation and backfill conditions.

### **3.04 MAINTENANCE AND OBSERVATION**

- A. Conduct daily maintenance and observation of piezometers or monitoring wells while the ground water control installations or excavation drainage are operating in an area or seepage into tunnel is occurring. Keep system in good condition.
- B. Replace damaged and destroyed piezometers or monitoring wells with new piezometers or wells as necessary to meet observation schedule.
- C. Cut off piezometers or monitoring wells in excavation areas where piping is exposed, only as necessary to perform observation as excavation proceeds. Continue to maintain and make observations, as specified.
- D. Remove and grout piezometers inside or outside the excavation area when ground water control operations are complete. Remove and grout monitoring wells when directed by the Water Utilities Engineer.

### **3.05 MONITORING AND RECORDING**

- A. Monitor and record average flow rate of operation for each deep well, or for each wellpoint or eductor header used in dewatering system. Also monitor and record water level and ground water recovery. These records shall be obtained daily until steady conditions are achieved, and twice weekly thereafter.
- B. Observe and record elevation of water level daily as long as ground water control system is in operation, and weekly thereafter until the Work is completed or piezometers or wells are removed, except when the Water Utilities Engineer determines that more frequent monitoring and recording are required. Comply with the Water Utilities Engineer's direction for increased monitoring and recording and take measures as necessary to ensure effective dewatering for intended purpose.

### **3.06 SURFACE WATER CONTROL**



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

- A. Intercept surface water and divert it away from excavations through use of dikes, ditches, curb walls, pipes, sumps or other approved means. The requirement includes temporary works required to protect adjoining properties from surface drainage caused by construction operations.
  
- B. Divert surface water and seepage water into sumps and pump it into drainage channels or storm drains, when approved by agencies having jurisdiction. Provide settling basins when required by such agencies.

End of Section



---

**ITEM 01731**

**SPECIFICATION FOR CUTTING AND PATCHING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Cutting, patching and fitting of the Work or Work under construction and to existing facilities and to accommodate the coordination installation or connection of Work with existing facilities, or to uncover work for access, inspection or testing and related submittals

**1.02 CUTTING AND PATCHING**

- A. Perform activities to avoid interference with facility operations and the Work of others in accordance with Section 1100 - General Conditions.
- B. Execute cutting and patching, including excavation, backfill and fitting to:
1. Remove and replace defective Work or Work not conforming to the Drawings and Specifications.
  2. Take samples of installed Work as required for testing.
  3. Remove construction required to provide for specified alteration or addition to existing work.
  4. Uncover Work to provide for inspection or reinspection of covered Work by the Water Utilities Engineer or regulatory agencies having jurisdiction.
  5. Connect any Work that was not accomplished in the proper sequence to completed Work.
  6. Remove or relocate existing utilities and pipes which obstruct Work to which connections must be made.
  7. Make connections or alterations to existing or new facilities.
  8. Provide openings, channels, chases and flues, if any, and do cutting, patching and finishing.
- C. Restore existing work to a state equal to or better than that prior to cutting and patching. Restore new Work to standards of these Specifications.



- D. Support, anchor, attach, match, trim and seal materials to the Work of others. Unless otherwise specified, furnish and install sleeves, inserts, hangers, required for the execution of the Work.
- E. Provide shoring, bracing and support as required to maintain structural integrity and protect adjacent Work from damage during cutting and patching. Before cutting beams or other structural member, anchors, lintels or other supports, request written instruction from the Water Utilities Engineer. Follow such instructions, as applicable.

### **1.03 SUBMITTALS**

- A. Submit written notice to the Water Utilities Engineer requesting consent to proceed prior to cutting which may affect structural integrity or design function, City operations, or work of another contractor.
- B. Include the following in submittal:
  - 1. Identification of project
  - 2. Description of affected Work.
  - 3. Necessity for cutting
  - 4. Effect on other work and on structural integrity.
  - 5. Include description of proposed Work:
    - a. Scope of cutting and patching.
    - b. Contractor, subcontractor or trade to execute Work.
    - c. Products proposed to be used.
    - d. Extent of refinishing.
    - e. Schedule of operations.
  - 6. Alternatives to cutting and patching, if any.
- C. Should conditions of Work or schedule indicate change of materials or methods, submit a written recommendation to the Water Utilities Engineer including:
  - 1. Conditions indicating change.
  - 2. Recommendations for alternative materials or methods.



3. Submittals as required for substitutions.
- D. Submit written notice to the Water Utilities Engineer designating time Work will be uncovered for observation. Do not begin cutting or patching operations until authorized by the Water Utilities Engineer.

#### **1.04 CONNECTIONS TO EXISTING FACILITIES**

- A. Perform construction necessary to complete connections and tie-ins to existing facilities. Keep all existing facilities in continuous operation unless otherwise specifically permitted in these Specifications or approved by the Water Utilities Engineer.
- B. Coordinate with the Water Utilities Engineer, interruption of service requiring connection into existing facilities. Bypassing of wastewater or sludge to waterways is not permitted. Provide temporary pumping facilities to handle wastewater, if necessary. Use temporary bulkheads (e.g., inflatable plugs) to minimize disruption. Provide temporary power supply and piping to facilitate construction where necessary.
- C. Submit a detailed schedule of proposed connections, including shut-downs and tie-ins. Include in the submittal the proposed time and date as well as the anticipated duration of the Work. Submit the detailed schedule coordinated with the construction schedule.
1. Provide specific time and date information to the Water Utilities Engineer 48 hours in advance of proposed Work.
- D. Procedures and Operations:
1. The Contractor shall operate existing pumps, valves and gates required for sequencing procedures under the supervision of the Water Utilities Engineer. Do not operate any valve, gate or other item of equipment without the knowledge of the Water Utilities Engineer.
  2. Insofar as possible, equipment shall be tested and in operating condition before final tie-ins are made to connect equipment to the existing facility.
  3. Carefully coordinate Work and schedules. Provide written notice to the Water Utilities Engineer at least 48 hours before shutdowns or bypasses are required.

**PART 2 PRODUCTS - Not Used**

**PART 3 EXECUTION - Not Used**

End of Section



---

**ITEM 02052**

**SPECIFICATION FOR  
TRENCHLESS GRAVITY SEWER PIPE REHABILITATION  
BY PIPE LINING**

**PART I GENERAL**

**1.01 DESCRIPTION**

The work performed under this section shall include all labor material, tools, equipment and incidentals necessary to provide for the complete rehabilitation of deteriorated gravity sewer lines, junction boxes and manholes using cured in place pipe (CIPP) methods. This method utilizes the installation of a continuous liner which is initially smaller in size than the inside diameter of the host pipe, then heated, pressurized and cooled so that it conforms to the shape of the existing pipe. Additional systems or processes used shall be submitted to the ENGINEER for approval.

**1.02 SUBMITTALS**

- A. The CONTRACTOR and MANUFACTURER shall review the TV Inspection Video (Base Bid) and visit the site prior to preparation of submittals.
- B. The CONTRACTOR shall furnish for the ENGINEER's approval a plan showing the proposed method of lining, including shop drawings, catalogue data and MANUFACTURER's technical data of the proposed liner and installation equipment and techniques.
- C. The CONTRACTOR shall submit to the ENGINEER, MANUFACTURER's certifications that the proposed materials, methods, details and systems proposed will comply with the MANUFACTURER's specifications.
- D. The CONTRACTOR shall submit to the ENGINEER for review, MANUFACTURER's detailed design calculations for both the internal and external-loading parameters specified in Section 1.04. The design shall follow the requirements specified in Section 1.04 and shall clearly identify the physical properties used for design. The bid design shall provide for Type II or Type III conditions in accordance with ASTM 5813. Submittal design shall provide for actual conditions based on the TV Video Inspection.
- E. The CONTRACTOR shall submit to the ENGINEER, copies of certification of workmen's training for installing the proposed liner.
- F. Review of the plan and other submittals by the ENGINEER will not relieve the CONTRACTOR from his responsibility to obtain the specified results.



### **1.03 QUALITY ASSURANCE**

- A. Referenced Standards:
1. ASTM F1216: Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
  2. ASTM F1743: Practice for Rehabilitation of Existing Pipelines and conduits by Pulled-in-Place Thermosetting Resin Pipe (CIPP).
  3. ASTM F5813: Standard Specification for Cure-in-Place Thermosetting Resin Sewer Piping Systems.
  4. ASTM F2019: Practice fo Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe.
- B. The MANUFACTURER of the product shall demonstrate that the product is commercially proven by documenting to the satisfaction of the OWNER that a minimum of 250,000 linear feet of product has been successfully installed in wastewater collection systems in the U.S.
- C. The installer of the product shall be certified by the MANUFACTURER as a licensed installer of the proposed liner and shall document to the satisfaction of the OWNER at least5 three (3) years active experience in the commercial installation of the proposed liner and shall document that at least 30,000 linear feet of the product has been successfully installed.

### **1.04 DESIGN PARAMETERS**

- A. The following design requirements must be met by the CONTRACTOR for the proposed method of construction:
1. The rehabilitation of the siphon shall be performed without the need for excavation, demolition of existing structures and be able to reestablish user lateral services without excavation and minimize the disruptions to neighboring homes and traffic. Excavation shall be permitted, but only as required and allowed by the ENGINEER.
  2. The rehabilitated siphon shall have a significant reduction of infiltration.
  3. The submitted pipe lining method shall have sufficient structural strength to support all dad loads, live loads, and ground water loads imposed with the assumption that the existing pipe cannot share any loading or contribute to structural integrity of the liner.
  4. The liner shall provide the least possible thickness or decrease in pipe diameter to meet the strength and other design requirements of this section.



- B. The parameter shown in Table 1 shall be used in the design of the proposed lining system:

**TABLE 1  
 Design Parameters**

Safety Factor	2.0
Long term flexural modulus retention factor	50%
Ovality <sup>1</sup>	2%
Groundwater depth	½ pipe depth
Soil depth	refer to plans
Soil density	120 pcf
Live load	AASHTO H-20
Soil Modulus	1,000psi

<sup>1</sup> Or as determined in inspection video tapes: 2% is assumed when the host pipe measurements have not been verified.

$$\text{Ovality \%} = 100 \times (\text{Mean Dia} - \text{Minimum Dia}) / \text{Mean Dia}.$$

### **1.05 REFERENCED DOCUMENTS**

The following specifications and documents are made a part of this Section by reference and shall be the latest edition and revision thereof:

- A. For cured in place pipe liner:

ASTM Standard: F 1216

ASTM Standard: D 5813

ASTM Standard: D 790

Test Report: "Long Term Structural Behavior of Pipeline Rehabilitation Systems," by Trenchless Technology Center at Louisiana Tech University.

### **1.06 WARRANTY**

Provide a MANUFACTURER warranty for five (5) years against failure of the CIPP liner.

- A. The MANUFACTURER shall repair or replace the liner failures resulting from faulty materials, improper surface preparation, or installation procedures.  
 B. All costs required to complete the repairs shall be warranted.

## **PART 2 - MATERIALS**



## **2.01 CURED IN PLACE PIPE (CIPP)**

### **A. Tube**

1. The sewn Tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F 1216, Section 5.1 or ASTM F1743, Section 5.2.1. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections.
2. The wet out Tube shall have a relatively uniform thickness that when compressed at installation pressures will equal or exceed the calculated minimum design thickness.
3. The Tube shall be manufactured to a size that when installed will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during inversion. Overlapped layers of felt in longitudinal seams that cause lumps in the final product shall not be utilized.
4. The outside layer of the Tube shall be coated with an impermeable, flexible membrane that will contain the resin and all the resin impregnation (wet out) procedure to be monitored.
5. The Tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the Tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.
6. The wall color of the interior pipe surface of CIPP after installation shall be relatively light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
7. Seams in the Tube shall be stronger than the non-seamed felt material.
8. The Tube shall be marked for distance at regular intervals along its entire length, not to exceed 5 ft. Such markings shall include the MANUFACTURER's name or identifying symbol. The tubes must be manufactured in the USA.

### **B. Resin**

1. The resin system shall be a corrosion resistant polyester, vinyl ester, or epoxy system including all required catalysts, initiators or hardeners that when cured within the tub create a composite that satisfies the requirements of ASTM F1216 and ASTM F1743, the physical properties herein, and those which are to be utilized in the design of the CIPP for this project. The resin shall produce a CIPP that will



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

comply with the structural and chemical resistance requirements of this specification.

2. CIPP Structural Requirements

1. The CIPP shall be designed as per ASTM 5813 and ASTM F1216, Appendix X.1. The CIPP design shall assume no bonding to the original pipe wall.
2. The CONTRACTOR must have performed long-term testing for flexural creep of the CIPP pipe material installed by his company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. This is a performance test of the materials (Tube and Resin) and general workmanship of the installation and curing. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. Retention values exceeding 50% of the short-term test results shall not be applied unless substantiated by qualified third party test data to the ENGINEER's satisfaction. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.
3. The Enhancement Factor 'K' to be used in 'Partially Deteriorated' Design conditions shall be assigned a value of 7. Application of Enhancement (K) Factors in excess of 7 shall be substantiated through independent test data to the satisfaction of the ENGINEER.
4. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If the layers separate during field sample testing, new samples will be required to be obtained from the installed pipe. Any recurrence may cause rejection of work.
5. The cured pipe material (CIPP) shall conform to the structural properties, as listed in Table 2.

**TABLE 2**



**Minimum CIPP Physical Properties**

<u>Property</u>	<u>Test Method</u>	<u>Cured Polyester Composite</u>	
		<u>Min. per ASTM F1216</u>	<u>Enhanced Resin</u>
Modulus of Elasticity	ASTM D790	250,000 psi	400,000 psi
Flexural Stress	ASTM D790	4,500 psi	4,500 psi

6. The required structural CIPP wall thickness shall be based as a minimum, on the physical properties in 2.1.3 (e) and in accordance with the design equations in appendix XI, Design Considerations of ASTM F1216.
7. Refer to the MANUFACTURER's dimension ratio table for specific pipe section requirements, based on the pipe condition, depth, ovality, etc. as computed for the conditions shown, using ASTM F1216, design equations.
8. Any layers of the tube that are not saturated with resin prior to insertion into the existing pipe shall not be included in the structural CIPP wall thickness computation.

**D. CIPP Testing Requirements**

1. Test Requirements - Cured-in-Place liner materials shall be tested by one MANUFACTURER in accordance with ASTM 1216 and 5813. Should the standards conflict, the more restrictive shall apply.
2. Chemical Resistance - The CIPP shall meet the chemical resistance requirements of ASTM F1216, Appendix X2. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction. It is required that CIPP samples with and without plastic coating meet these chemical-testing requirements.
3. Hydraulic Capacity - Overall, the hydraulic cross-section shall be maintained as large as possible. The CIPP shall have a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.
4. CIPP Field Samples - When requested by the ENGINEER, the CONTRACTOR shall submit test results from field installations in the USA of the same resin system and tube materials as proposed fro the actual installation. These test results must verify that the CIPP physical properties specified in Section 2.1.3(e) have been achieved in previous field applications.

**2.02 CURED IN PLACE MANHOLE AND JUNCTION BOX**



- 
- A. Fabric/Resin
1. Sewn liner sock shall meet the requirements and standards identified in Section 2.01 pertaining to CIPP.
  2. The liner sock shall be sized based on field measurements of the structures taken by CONTRACTOR.
- B. CIPP Structural Requirements
1. The CIPP shall be designed as per ASTM 5813 and ASTM F1216, Appendix X.1. The CIPP design shall assume no bonding to the original pipe wall.
  2. The CONTRACTOR must have performed long-term testing for flexural creep of the CIPP pipe material installed by his Company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. This is a performance test of the materials (Tube and Resin) and general workmanship of the installation and curing. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. Retention values exceeding 50% of the short-term test results shall not be applied unless substantiated by qualified third party test data to the ENGINEER's satisfaction. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.
  3. The enhancement factor 'K' to be used in 'Partially Deteriorated' Design conditions shall be assigned a value of 7. Application of Enhancement (K) Factors in excess of 7 shall be substantiated through independent test data to the satisfaction of the ENGINEER.
  4. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If the layers separate during field sample testing, new samples will be required to be obtained from the installed pipe. Any reoccurrence may cause rejection of the work.
  5. The cured pipe material (CIPP) shall conform to the structural properties, as listed in Table 3.

**TABLE 3**  
**Minimum CIPP Physical Properties**



<u>Property</u>	<u>Test Method</u>	<u>Cured Polyester Composite</u>	
		<u>Min. per ASTM F1216</u>	<u>Enhanced Resin</u>
Modulus of Elasticity	ASTM D790	250,000 psi	400,000 psi
Flexural Stress	ASTM D790	4,500 psi	4,500 psi

6. The required structural CIPP wall thickness shall be based as a minimum, on the physical properties in 2.1.3 (e) and in accordance with the design equations in Appendix XI, Design Considerations of ASTM F1216.
7. Refer to the MANUFACTURER's dimension ratio table for specific pipe section requirements, based on the pipe condition, depth, ovality, etc. as computed for the conditions shown, using ASTM F1216, design equations.
8. Any layer of the tube that are not saturated with resin prior to insertion into the existing pipe shall not be included in the structural CIPP wall thickness computation.
9. Provide sufficient strength to support all external hydraulic, soil, and live loads based on the actual condition of structure following cleaning and TV Video Inspection.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

The pipe rehabilitation method approved under this specification include the following: Cured In Place Sewer Rehabilitation System: Insituform® or Poly-Triplex®

Other methods proposed under this contract must be submitted to the ENGINEER for consideration. The CONTRACTOR shall base a bid on or subsequently proceed with materials/labor acquisition for an alternative method without the written consent of the ENGINEER.

#### **3.02 DELIVERY, STORAGE, AND HANDLING**

- A. Guidelines of transport, handling, and storage of all pipe lining materials as recommended by the MANUFACTURER shall be adhered to by the CONTRACTOR.
- B. If new pipe or structure liner becomes damaged before or during installation, it shall be repaired as recommended by the MANUFACTURER or replaced as required by the

---

ENGINEER at the CONTRACTOR's expense, before proceeding further.

- C. Delivery, storage and handling of all other associated materials shall be per MANUFACTURER's guidelines to prevent damage.

### **3.03 PREPARATION**

A. Bypassing Sewage:

1. The CONTRACTOR shall bypass the sewage around the section or sections of sewer to be rehabilitated and video taped. The bypass shall be made by plugging the existing upstream manhole and pumping the sewage into a downstream manhole or adjacent system or by another method if approved by the ENGINEER. The pump and bypass lines shall be of adequate capacity and size to handle the flow without sewage backup occurring to facilities connected to the sewer. The CONTRACTOR shall have a standby pump available equal in capacity to the largest in service pump. All bypass pumping shall be subsidiary of the CIPP lining; no separate payment shall be made for pumping. Provisions shall be made at driveways and street crossings to permit safe vehicular travel without interrupting flow in the bypass system. **Under no circumstances will the CONTRACTOR be permitted to discharge sewage into trenches.**
2. The CONTRACTOR shall be responsible for continuity of sanitary sewer service to each facility connected to the section of sewer during the execution of the work. If sewage backup occurs and enters a building, the CONTRACTOR shall be responsible for clean-up, repair, property damage cost and claims.

B. Inspection of Siphon:

Inspection of the siphon (Base Bid) shall be performed by experienced personnel trained in locating breaks, obstacles and service connections using close circuit television (CCTV) inspection techniques. The siphon interior shall be carefully inspected to determine the location of any conditions that may prevent proper installation of the liner. These shall be noted and corrected. A video (DVD) and suitable written log for each line section shall be furnished to the OWNER and MANUFACTURER. The CIPP MANUFACTURER shall review the video provided and furnish written certification of the actual applicability of the proposed process to the actual condition of the siphon and acknowledgment of the warranty required herein.

C. Line Obstructions:

If pre-installation (CCTV) inspection reveals an obstruction in the existing sewer (heavy solids, dropped joints, protruding service taps or collapsed pipe) which will prevent completion of the pipe lining process, and cannot be removed by conventional sewer equipment, then an obstruction removal should be considered to be made by the CONTRACTOR, with the approval of the ENGINEER.



---

### **3.04 LINER INSTALLATION**

- A. A cable shall be strung through the existing pipe to be rehabilitated and attached to the liner through an existing manhole or access point. The liner shall be pulled through the existing manhole and through the existing pipe by this cable. Care shall be taken not to damage the pipe liner during the installation. Appropriate sleeves and rollers shall be used to protect the liner.
- B. When the pre-formed pipe liner is in place, it shall be prepared for forming to the interior of the host pipe using MANUFACTURER's approved equipment and methods. Temperature and pressure measuring instruments shall be attached to the pre-formed pipe liner at both ends.
- C. Areas of active infiltration visible to field personnel or present in the Television Video Inspection shall be repaired to MANUFACTURER's standards prior to installation.
- D. Liner Forming
  - 1. Through the use of heat (ex: steam) and pressure (ex: air or water pressure), the pipe liner shall be formed to the existing pipe wall. The CONTRACTOR shall explicitly follow MANUFACTURER's procedures for completing this process.
- E. Cool-Down
  - 1. The CONTRACTOR shall cool the reformed pipe in accordance with the approved MANUFACTURER recommendation.
  - 2. Gradual transition shall be made from the heating to cooling process. Cooling shall be done without pressure interruption and with water or air as recommended by the MANUFACTURER. As cooling progresses, the pressure shall be gradually increased to maximum recommended by the MANUFACTURER. The final pressure level shall be maintained for a period of another 15 to 30 minutes or longer if determined by the ENGINEER.
  - 3. Temperatures and pressures shall be monitored and recorded throughout the installation process to ensure that each phase of the process is achieved at the approved MANUFACTURER's recommended temperature and pressure levels.
- F. Finish
  - 1. The finished lining shall be continuous over the entire length of an Insertion run and be as free as commercially practicable from visual defects such as foreign inclusions, pinholes, and delamination. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.
  - 2. Any defects, which will or could affect the integrity or strength of the linings, shall

---

be repaired at the CONTRACTOR's expense, in a manner approved by the OWNER and ENGINEER.

3. The pipe liner shall be neatly trimmed at both upstream and downstream manholes to prevent snagging of debris.
4. The beginning and end of the new pipe liner shall be sealed to the rehabilitated pipeline. The sealing material shall provide a watertight seal.

G. Field Testing:

1. Low Pressure air Test of Rehabilitated Pipe: After a manhole-to-manhole (lined structure to lined structure) section has been lined and prior to any service lines being connected, the pipe shall be plugged at each manhole with pneumatic plugs. The design of the plugs shall be such taht they will hold against the test pressure without requiring external blocking or bracing. One of the plugs shall have three air hose connections; one for the inflation of the plug, one for reading the air pressure in the sealed line, and one for introducing air into the sealed line. All testing shall be in accordance with Item 02533 - Acceptance Testing for Sanitary Sewers.

H. Pre and Post-Construction Television Inspection

1. Upon completion, and before acceptance of the work, the CONTRACTOR will reinspect the rehabilitated pipeline by the use of CCTV cameras and shall submit two (2) copies of the pre-installation and post-installation video tapes on DVD of the rehabilitated pipeline to the ENGINEER for approval/acceptance of the work.

End of Section



---

**ITEM 02221**

**REMOVING EXISTING PAVEMENTS AND STRUCTURES**

**Part I General**

**1.01 SECTION INCLUDES**

- A. Removing concrete paving, asphaltic concrete pavement, and base courses.
- B. Removing concrete curbs, concrete curbs and gutters, sidewalks and driveways.
- C. Removing pipe culverts and sewers.
- D. Removing existing inlets and manholes.
- E. Removing miscellaneous structures of concrete or masonry.

**1.02 MEASUREMENT AND PAYMENT**

- A. Unit Prices.
  - 1. No separate payment will be made for removing existing pavement or structures under this Section. Include cost in unit price for different bid items.

**1.03 REGULATORY REQUIREMENTS**

- A. Conform to applicable codes for disposal of debris.
- B. Coordinate removal work with utility companies.

**PART 2 PRODUCTS - Not Used**

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Obtain advance approval from Water Utilities Engineer for dimensions and limits of removal work.
- B. Identify known utilities below grade. Stake and flag locations.

**3.02 PROTECTION**

- A. Protect the following from damage or displacement.



1. Adjacent public and private property.
2. Trees, plants, and other landscape features designated to remain.
3. Utilities designated to remain.
4. Pavement and utility structures designated to remain.
5. Bench marks, monuments, and existing structures designated to remain.

### **3.03 REMOVALS**

- A. Remove pavements and structures by methods that will not damage underground utilities. Do not use a drop hammer near existing underground utilities.
- B. Minimize amount of earth loaded during removal operations.
- C. Where existing pavement is to remain, make straight saw cuts in existing pavement to provide clean breaks prior to removal. Do not break concrete pavement or base with drop hammer unless concrete or base has been saw cut to a minimum depth of 2 inches.
- D. Where street and driveway saw cut locations coincide or fall within 3 feet of existing construction or expansion joints, break out to existing joint.
- E. Remove sidewalks and curbs to nearest existing dummy, expansion, or construction joint.
- F. Where existing end of pipe culvert or end of sewer is to remain, install an 8-inch-thick masonry plug in pipe end prior to backfill.

### **3.04 BACKFILL**

- A. Backfill of removal areas shall be in accordance with requirements of Item 2317 - Specifications for Excavation and Backfill For Utilities.

### **3.05 DISPOSAL**

- A. Manhole frames and covers, will remain City property, and shall be delivered to 1350 Langham Road, Beaumont, Texas.
- B. Methods of the removal of site debris resulting from work under this section shall be approved by the Water Utilities Engineer.

End of Section



---

**ITEM 02226**

**PIPE JACKING, BORING, AND TUNNELING**

**1.00 GENERAL**

**1.01 WORK INCLUDED**

- A. All labor, materials and equipment required to furnish and install pipelines under highways, railroads, or streets by jacking, boring, or tunneling.
- B. The CONTRACTOR shall conform to the requirements of the Texas Department of Transportation, railroad company, county, or city construction specifications. All work necessary to meet these requirements shall be considered incidental to the installation of the pipeline in the rights-of-way.
- C. Pipeline crossings of railroad tracks will be encased using welded steel casing pipe as specified herein and also in accordance with all railroad specifications while in the right-of-way. No tunnel liner plates shall be used within railroad right-of-way.

**1.02 SUBMITTALS**

- A. Record Data: Submit for record purposes only detailed drawings, data, and design calculations for encasement pipe, tunnel liner plate, fasteners, coatings and miscellaneous fittings in conformance with the Contract Documents.
- B. Certificate: Submit certificates of compliance with referenced standards for all products specified in Part 2.
- C. Calculations by a licensed professional engineer in the State of Texas must be submitted verifying the suitability of the material to sustain installation and service loads.

**1.03 DEFINITIONS**

- A. Carrier pipe shall mean the pipeline placed inside the encasement pipe. The carrier pipe conveys potable or nonpotable water and shall have the same inside diameter and be installed on the same grade and at the same alignment as shown on the plans.
- B. Encasement (casing) pipe shall mean any pipe, tunnel liner plates, tunnel pipes, similar material, etc., used to protect the excavation through the embankment from collapsing and used to contain the carrier pipe. The encasement pipe is placed in the excavation and the carrier pipe is placed inside the encasement pipe.



## **2.00 PRODUCTS**

### **2.01 TUNNEL LINER PLATES**

#### **A. Material**

1. Plates. The plates shall be fabricated from steel sheets conforming to the requirements of Steel, Carbon (0.15 minimum, percent) Hot-Rolled Sheet and Strap, Commercial Quality, ASTM Designation A569. In addition, the flat plates shall have the following minimum mechanical properties before cold forming.

Tensile strength = 42,000 psi  
Yield strength = 28,000 psi  
Elongation, 2 inch (51 mm) = 30 percent

2. Bolts and Nuts. Bolts used with lapped seam type (2 flange) liner plates shall be not less than 5/8-inch (15 mm) diameter. Bolts shall conform to Quenched and Tempered Steel Bolts and Studs, ASTM Designation A449 for plate thickness equal or greater than 0.209 inch (5 mm) and to Carbon Steel Externally Threaded Standard Fasteners, ASTM Designation A307 for plate thickness less than 0.209 inch (5 mm). The nuts shall conform to ASTM Designation A307.

- B. Fabrication. The plates shall be new and unused prior to fabrication. All plates shall be punched for bolting on both longitudinal and circumferential seams or joints and shall be so fabricated as to permit complete erection from the inside of the tunnel. All plates shall be uniform in fabrication and those intended for one size tunnel shall be interchangeable.

- C. Grout Holes. One half of the total number of the top plates shall be equipped with 2-inch (50-mm) diameter grout holes to facilitate grouting above and around the tunnel liner conduit. All grout holes shall be equipped with screw type galvanized plugs for final watertight closure of the grout holes.

- D. Galvanizing. After the plates are formed to shape and after all holes are punched, the plates shall be galvanized on all surfaces by the hot-dip process. A coating of prime western spelter, or equal, shall be applied at the rate of not less than 3 ounces per square foot of finished plate or 1-1/2 ounce each side. Spelter coating shall be of a first-class commercial quality free from injurious defects such as blisters, flux and uncoated spots. All nuts and bolts shall be galvanized or sherardized.

- E. Bituminous Coating. The plates shall be given a bituminous coating (inside and outside) meeting in all respects the American Railway Engineering Association specifications for bituminous protected corrugated metal pipe.

- F. Rejection. Structures on which the spelter coating has been bruised or broken either in the

shop or in shipping, or which shows defective workmanship, shall be rejected. The requirement applies not only to the individual plates but to the shipment on any contract as a whole. Among others, the following defects are specified as constituting poor workmanship, and the presence of any or all of them in any individual culvert plate or in general in any shipment shall constitute sufficient cause for rejection:

1. Uneven laps,
2. Elliptical shaping,
3. Variation from a straight centerline,
4. Ragged edges,
5. Unevenly lined or spaced bolt holes,
6. Illegible brands,
7. Bruised, scaled or broken spelter coating, or
8. Dents or bends in the metal itself.

G. Section Properties. Section properties shall conform to those specified in Section 16, Steel Tunnel Liner Plates, of the AASHTO Standard Specifications for Highway Bridges.

H. Design. Tunnel liner plates shall be designed in accordance with Section 16, Division 16.3 ADesign of Steel Tunnel Liner Plates@ of the AASHTO Standards.

## **2.02 PIPELINE ENCASEMENT**

A. Casing Pipe:

1. Material: A-36 steel.
2. Exterior and interior coating: Coal tar epoxy in accordance with AWWA C210.
3. Nominal diameter: Minimum 12 inches larger than OD of carrier pipe, unless otherwise indicated on the plans.
4. Wall thickness: Sufficient to support loads. Minimum wall thickness of casing pipe is as follows:

Maximum Carrier Pipe (Inches)	Casing Size (Inches)	Minimum Wall Thickness (Inches)
4	16	.281
8	21	.375
10	24	.375
16	30	.469
21	36	.531
30	42	.625
36	48	.688
40	54	.781
54	72	1.000

5. Minimum yield stress: 36,000 psi



6. Type of joint: Welded in conformance with AWWA C206
  7. Method of installation: Boring or jacking
- B. Casing pipe shall be located as required by the specifications and as shown on the Drawings.

### **3.00 EXECUTION**

#### **3.01 INSTALLATION**

- A. General:
1. When jacking, boring or tunneling casing pipe from a point starting below the ground surface, suitable pits or trenches shall be excavated for the purpose of conducting these operations and for placing end joints of the pipe.
  2. Such pits and trenches shall be sheathed securely and braced in a manner satisfactory to prevent earth caving. Open excavations shall be adequately barricaded for safety of personnel and/or livestock in the area.
  3. The pits and trenches shall be backfilled after these construction operations are completed and excess excavated material shall be disposed of as specified.
    - a. Pipes installed under railroad tracks or under highways, streets, or other facilities by these construction methods shall conform to the following:
      - 1) All work shall be performed during daylight hours.
      - 2) Construction shall be done in such a manner that will not interfere with the operation of the transportation facilities.
      - 3) During construction operations, barricades and lights to safeguard traffic and pedestrians shall be furnished and maintained until backfilling has been completed.
      - 4) Construction shall not weaken or damage any embankment or structure.
      - 5) The railroad shall be notified and requested to furnish a flagman whenever tunneling is being performed closer than 40 feet from the center line of the railroad track. The CONTRACTOR shall reimburse the railroad for the flagman's services.
      - 6) Temporary bulkheads shall be in the tunnel liner plate before and



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

- during the passage of trains and when work ceases for the day.
- 7) Construction must comply with all requirements and specifications of any railroad company, State highway Department, city or county incidental to the pipeline installation within respective right-of-ways.
  - 8) All backfilling of open excavations within these right-of-ways shall be compacted to 95 percent of the maximum dry density, Standard Proctor, as defined by ASTM D698.
4. The pipe shall be installed starting from the lower end.
  5. Lateral and vertical variation in the field position of the pipe from the line and grade shall be permitted to the extent of 1 inch in 100 feet, provided that such variation shall be regular and only in one direction and that the final grade of flow line shall be in the direction indicated on the plans.
  6. Any pipe damaged as a result of the construction operations shall be removed and replaced by the CONTRACTOR at no additional cost. Variations in plan, profile and manhole locations suggested by Contractor shall be submitted in writing to the Water Utilities Engineer and must be approved prior to construction.
  7. Dewatering:
    - a. All water used or encountered during construction by boring, jacking or tunneling by the CONTRACTOR is the responsibility of the CONTRACTOR and measures shall be provided by the CONTRACTOR in such a manner that the water will not damage public or private property or create a nuisance or health menace.
    - b. The CONTRACTOR shall provide and operate pumps, pipes and equipment to keep all excavations and accesses free from water until the pipeline is installed and backfilling has been completed.
    - c. The CONTRACTOR shall provide all power and facilities necessary to operate the pumps and equipment.
    - d. Water, if odorless and stable, may be discharged into an existing storm drain, channel, or street gutter in a manner approved by the OWNER.
    - e. When required, a means of desilting the water before discharging shall be provided.
  8. Shoring in areas of railroad crossings shall be done in accordance with this Project Manual and in accordance with American Railway Engineering Association (AREA) Manual Volume 1, Chapter 8, Part 20, and the Burlington Northern Santa Fe Railway



Company. The more conservative approach shall govern.

9. The design of the trench safety system for all pipe jacking, boring and tunneling operations is the CONTRACTOR's sole responsibility. The CONTRACTOR shall engage a Professional Engineer registered in the State of Texas to prepare the trench safety system design. Prior to beginning any construction activities in the vicinity of a railroad crossing, trench safety system designs prepared for railroad crossings shall be submitted to the OWNER for forwarding to the railroad for the railroad owner's review and approval. Same applies for highway crossings.

**B. Jacking:**

1. Heavy-duty jacks suitable for forcing the casing pipe through the embankment shall be provided.
2. Even pressure shall be applied to all jacks used.
3. A suitable jacking head and suitable bracing between jacks and jacking head shall be provided so that pressure will be applied to the pipe uniformly around the ring of the pipe.
4. Pipe guides shall be properly braced together and positioned to support the pipe section being jacked and to direct the pipe in the proper line and grade.
5. Excavation for the undersides of the pipe shall conform to the contour and grade of the pipe for at least one third of the pipe circumference.
6. A clearance of not more than 2 inches may be provided for the upper half of the pipe and shall be tapered to zero at the point where the elevation conforms to the contour of the pipe as shown on the Drawings.
7. Excavation shall not exceed 2 feet beyond the end of the pipe.
8. The CONTRACTOR may use a steel plate cutting edge extending a short distance beyond the head end of the pipe with inside angles and lugs.
9. Once jacking has begun, the operation shall be carried on without interruption, insofar as practicable, to prevent the pipe from being firmly set in the embankment.
10. All voids created by over cutting shall be filled by pressure grouting the entire length of the casing pipe and per grout specifications.

**C. Boring:**

1. Holes are to be bored mechanically and shall be accomplished using a pilot hole.
2. A 2-inch pilot hole shall be bored the entire length of the crossing and shall be

---

checked for line and grade on both sides of the embankment.

3. The pilot hole shall serve as the centerline of the larger diameter hole to be bored.
4. Use of water or other fluids in connection with boring operations shall be permitted only to lubricate cuttings.
5. Jetting shall not be permitted.
6. Gel-forming colloidal drilling fluid consisting of at least 10 percent high grade carefully processed bentonite may be used in unconsolidated soil formations to:
  - a. Consolidate cuttings.
  - b. Seal the bore hole walls.
  - c. Provide lubrication for subsequent removal of cuttings.
  - d. Provide immediate lubrication for installing the pipe.
7. All voids created because of any over cutting shall be filled by pressure grouting the entire length of the pipe boring installation, per grout specifications.

**D. Tunneling:**

1. Tunneling shall be used where soil characteristics or size of the proposed pipe would require such a method of construction or where tunneling is called for on the Drawings.
2. Work pits shall be located where shown on the Drawings. Where no such locations are given, the CONTRACTOR shall have the operation of determining such locations subject to approval by the OWNER.
3. In general, access shafts or portals will not be permitted within rights-of-way.
4. All materials encountered in the tunnel within the width and height shall be excavated as necessary to install tunnel supports, place pipe, make joints, and properly place backfill to fill all void space around the pipe to complete the pipe installation in tunneling.
5. Clearances shown on the tunnel details on the Drawings are minimum and no encroachment within the dimensions shown will be permitted.
6. The Spring line clearances shown shall be increased by 3 inches for any tunnel to be constructed on a curve with a centerline radius of less than 300 feet.
7. All drilling shall be performed in such a manner as to avoid undue shattering or loosening of material.



- 
8. The CONTRACTOR shall remove all material which is likely to fall or appears dangerous to workmen or the work. That such removal may enlarge the excavation beyond the required limits shall not relieve the CONTRACTOR from the necessity of performing such work, and the CONTRACTOR will not be entitled to any additional compensation by reason of such tunnel enlargement.
  9. Excavation for tunnel shall be held to the minimum diameter required for installation for the liner plate and not more than 18 inches from the end of the tunnel liner plate.
  10. Blasting shall not be allowed.
  11. All 1-inch plates for the full length of a specified tunnel shall be of one type only and shall be assembled in accordance with the manufacturer's
- E. Grouting:
1. To fill all voids created because of over cutting, the outside diameter of the tunnel liner plate shall be pressure grouted after installation is completed, per grout specifications. instructions.
- F. Carrier Pipe Installation:
1. Install carrier pipe to grade and securely block in place to prevent movement as shown on the Plans.
  2. After the carrier pipe has been installed as detailed on the Drawing, the ends of the tunnel/casing shall be installed. The void space between the carrier pipe and casing shall not be filled.
  3. All voids created between the outside of the casing pipe and undisturbed soil shall be pressure grouted after installation of the casing pipe, per grout specifications.
- G. Tolerances:
1. Conduits shall be placed to line and grade and the CONTRACTOR shall correct any deviation.
  2. Unless otherwise noted on the Drawings, the CONTRACTOR will be permitted a tolerance from exact grade alignment of 1 inch per 100 linear feet, or portion thereof, for vertical and horizontal. The variation shall be regular and only in one direction and the final grade of flow line shall be in the direction indicated on the drawings.
  3. The CONTRACTOR shall inform the OWNER of any horizontal or vertical variations for their approval. The OWNER will approve or reject the pipe position and the CONTRACTOR shall make appropriate modifications to the pipe alignment and



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

grades, if necessary, at the CONTRACTOR's sole expense.

4. As-built record data of crossings shall be completed by a surveyor licensed in the State of Texas. An electronic data format approved by the Water Utilities Engineer shall be submitted to the City.

End of Section



---

**ITEM 02317**

**SPECIFICATIONS FOR EXCAVATION AND BACKFILL FOR UTILITIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

Excavation, trenching, foundation, embedment, and backfill for installation of utilities, including manholes and other pipeline structures.

**1.02 MEASUREMENT AND PAYMENT**

Unit Prices.

No additional payment will be made for trench excavation, embedment and backfill under this Section. Include cost in the unit price for installed underground piping, sewer, conduit, or duct work.

No separate or additional payment will be made for surface water control, ground water control, or for excavation drainage. Include in the unit price for the installed piping, sewer, conduit, or bed work.

**1.03 DEFINITIONS**

**Pipe Foundation:** Suitable and stable native soils that are exposed at the trench subgrade after excavation to depth of bottom of the bedding as shown on the Drawings, or foundation backfill material placed and compacted in over-excavations.

**Pipe Bedding:** The portion of trench backfill that extends vertically from top of foundation up to a level line at bottom of pipe, and horizontally from one trench sidewall to opposite sidewall.

**Haunching:** The material placed on either side of pipe from top of bedding up to springline of pipe and horizontally from one trench sidewall to opposite sidewall.

**Initial Backfill:** The portion of trench backfill that extends vertically from springline of pipe (top of haunching) up to a level line 12 inches above top of pipe, and horizontally from one trench sidewall to opposite sidewall.

**Pipe Embedment:** The portion of trench backfill that consists of bedding, haunching and initial backfill.

**Trench Zone:** The portion of trench backfill that extends vertically from top of pipe embedment up to pavement subgrade or up to final grade when not beneath pavement.



Unsuitable Material: Unsuitable soil materials are the following:

Materials that are classified as ML, CL-ML, MH, PT, OH, and OL according to ASTM D 248.

Materials that cannot be compacted to required density due to either gradation, plasticity, or moisture content.

Materials that contain large clods, aggregates, stones greater than 4 inches in any dimension, debris, vegetation, waste or any other deleterious materials.

Materials that are contaminated with hydrocarbons or other chemical contaminants.

Suitable Material: Suitable soil materials are those meeting specification requirements. Unsuitable soils meeting specification requirements for suitable soils after treatment with lime or cement are considered suitable, unless otherwise indicated.

Backfill: Suitable material meeting specified quality requirements, placed and compacted under controlled conditions.

Ground Water Control Systems: Installations external to trench, such as well points, eductors, or deep wells. Ground water control includes dewatering to lower ground water, intercepting seepage which would otherwise emerge from side or bottom of trench excavation, and depressurization to prevent failure or heaving of excavation bottom. Refer to Section 01578 - Control of Ground Water and Surface Water.

Surface Water Control: Diversion and drainage of surface water runoff and rain water away from trench excavation. Rain water and surface water accidentally entering trench shall be controlled and removed as a part of excavation drainage.

Excavation Drainage: Removal of surface and seepage water in trench by sump pumping and using a drainage layer, as defined in ASTM D 2321, placed on the foundation beneath pipe bedding or thickened bedding layer of Class I material.

Trench Conditions are defined with regard to the stability of trench bottom and trench walls of pipe embedment zone. Maintain trench conditions that provide for effective placement and compaction of embedment material directly on or against undisturbed soils or foundation backfill, except where structural trench support is necessary.

Dry Stable Trench: Stable and substantially dry trench conditions exist in pipe embedment zone as a result of typically dry soils or achieved by ground water control (dewatering or depressurization) for trenches extending below ground water level.

Stable Trench with Seepage: Stable trench in which ground water seepage is controlled by excavation drainage.

Stable Trench with Seepage in Clayey Soils: Excavation drainage is provided in lieu of or to



supplement ground water control systems to control seepage and provide stable trench subgrade in predominately clayey soils prior to bedding placement.

**Stable Wet Trench Sandy Soils:** Excavation drainage is provided in the embedment zone in combination with ground water control in predominately sandy or silty soils.

**Unstable Trench:** Unstable trench conditions exist in the pipe embedment zone if ground water inflow or high water content causes soil disturbances, such as sloughing, sliding, boiling, heaving or loss of density.

**Subtrench:** Subtrench is a special case of benched excavation. Subtrench excavation below trench shields or shoring installations may be used to allow placement and compaction of foundation or embedment materials directly against undisturbed soils. Depth of a subtrench depends upon trench stability and safety as determined by the Contractor.

**Trench Dam:** A placement of low permeability material in pipe embedment zone or foundation to prohibit ground water flow along the trench.

**Over-Excavation and Backfill:** Excavation of subgrade soils with unsatisfactory bearing capacity or composed of otherwise unsuitable materials below top of foundation as shown on Drawings, and backfilled with foundation backfill material.

**Foundation Backfill Materials:** Natural soil or manufactured aggregate of controlled gradation, and geotextile filter fabrics as required, to control drainage and material separation. Foundation backfill material is placed and compacted as backfill to provide stable support for bedding. Foundation backfill materials may include concrete seal slabs.

**Trench Safety Systems** include both protective systems and shoring systems as defined in Item 712 - Trench Safety Systems.

**Trench Shield (Trench Box):** A portable worker safety structure moved along the trench as work proceeds, used as a protective system and designed to withstand forces imposed on it by cave-in, thereby protecting persons within the trench. Trench shields may be stacked if so designed or placed in a series depending on depth and length of excavation to be protected.

**Shoring System:** A structure that supports sides of an excavation to maintain stable soil conditions and prevent cave-ins, or to prevent movement of the ground affecting adjacent installations or improvements.

**Special Shoring:** A shoring system meeting special shoring as specified in Paragraph 1.08, Special Shoring Design Requirements, for locations identified on the Drawings.

## **1.04 REFERENCES**



ASTM C 12 - Standard Practice for Installing Vitrified Clay Pipe Lines.

ASTM D 558 - Test Methods for Moisture-Density Relations of Soil Cement Mixtures.

ASTM D 698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures U 5.5-lb (2.49-kg) Rammer and 12-in., (304.8-mm) Drop.

ASTM D 156 - Test Method for Density in Place by the Sand-Cone Method.

ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

ASTM D 2478 - Classification of Soils for Engineering Purposes.

ASTM D 2922 - Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

ASTM D 3017 - Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

ASTM D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

TxDOT Tex-101-E - Preparation of Soil and Flexible Base Materials for Testing.

TxDOT Tex-110-E - Determination of Particle Size Analysis of Soils.

Federal Regulations, 29 CFR Part 1926, Standard-Excavation, Occupational Safety and Health Administration (OSHA).

## **1.05 SCHEDULING**

Schedule work so that pipe embedment can be completed on the same day that acceptable foundation been achieved for each section of pipe installation, manhole, or other structures.

## **1.06 SUBMITTALS**

Conform to Section 01300 - Contractor Submittals.

Submit a written description for information only of the planned typical method of excavation, backfill placement and compaction, including:

Sequence of work and coordination of activities.



Selected trench widths.

Procedures for foundation and embedment placement, and compaction.

Procedure for use of trench boxes and other premanufactured systems while assuring specified compaction against undisturbed soil.

Procedure for installation of Special Shoring at locations identified on the Drawings.

Submit a ground and surface water control plan in accordance with requirements in this Item and Item 01578 - Control of Ground Water and Surface Water.

Submit backfill material sources and product quality information in accordance with requirements of Item 02320 - Utility Backfill Materials.

Submit a trench excavation safety program in accordance with requirements of Item 712 - Trench Safety System. Include designs for special shoring meeting the requirements defined in Paragraph 1.08, Special Shoring Design Requirements.

Submit record of location of utilities as installed, referenced to survey control points. Include locations of utilities encountered or rerouted. Give stations, horizontal dimensions, elevations, inverts, and gradients.

### **1.07 TESTS**

Testing and analysis of backfill materials for soil classification and compaction during construction will be performed by an independent laboratory provided by the City.

Perform backfill material source qualification testing in accordance with requirements of Item 02320 - Utility Backfill Materials.

### **1.08 SPECIAL SHORING DESIGN REQUIREMENTS**

Have special designed or selected by the Contractor's Professional Engineer to provide support for the sides of the excavations, including soils and hydrostatic ground water pressures as applicable, and to prevent ground movements affecting adjacent installations or improvements such as structures, pavements and utilities. Special shoring may be a premanufactured system selected by the Contractor's Professional Engineer to meet the project site requirements based on the manufacturer's standard design.

## **PART 2 PRODUCTS**



## **2.01 EQUIPMENT**

Perform excavation with hydraulic excavator or other equipment suitable for achieving the requirements of this Section.

Use only hand-operated tamping equipment until a minimum cover of 12 inches is obtained over pipe, conduits, and ducts. Do not use heavy compacting equipment until adequate cover is attained to prevent damage to pipes, conduits, or ducts.

Use trench shields or other protective systems or shoring systems which are designed and operated to achieve placement and compaction of backfill directly against undisturbed native soil.

Use special shoring systems where required which may consist of braced sheeting, braced soldier piles and lagging, slide rail systems, meeting requirements as specified in Paragraph 1.09, Shoring Design Requirements.

## **2.02 MATERIAL CLASSIFICATIONS**

Embedment and Trench Zone Backfill Materials: Conform to classifications and product descriptions of Item 02320 - Utility Backfill Materials.

Concrete Backfill: Conform to requirements for Class B concrete.

Concrete for Trench Dams: Concrete backfill or 3 sack premixed (bag) concrete.

Timber Shoring Left in Place: Untreated oak.

## **PART 3 EXECUTION**

### **3.01 STANDARD PRACTICE**

Install flexible pipe, including "semi-rigid" pipe, to conform to standard practice described in ASTM D 2321, and as described in this Section. Where an apparent conflict occurs between the standard practice and the requirements of this Section, this Section governs.

Install rigid pipe to conform with standard practice described in ASTM C 12, and as described in this Section. Where an apparent conflict occurs between the standard practice and the requirements of this Section, this Section governs.

### **3.02 PREPARATION**

Establish traffic control to conform with requirements of the Special Provisions Section. Maintain barricades and warning lights for streets and intersections affected by the Work, and is considered



hazardous to traffic movements.

Perform work to conform with applicable safety standards and regulations. Employ a trench safety system as specified in Item 712 - Trench Safety Systems.

Immediately notify the agency or company owning any existing utility line which is damaged, broken, or disturbed. Obtain approval from the Water Utilities Engineer and agency for any repairs or relocations, either temporary or permanent.

Remove existing pavements and structures, including sidewalks and driveways, to conform with requirements of Item 02221 - Removing Existing Pavements and Structures, as applicable.

Install and operate necessary dewatering and surface water control measures to conform with Item 01578 - Control of Ground Water and Surface Water.

Maintain permanent benchmarks, monumentation, and other reference points. Unless otherwise directed in writing, replace those which are damaged or destroyed.

### **3.03 PROTECTION**

Protect trees, shrubs, lawns, existing structures, and other permanent objects outside of grading limits and within the grading limits as designated on the Drawings.

Protect and support above-grade and below-grade utilities which are to remain.

Restore damaged permanent facilities to pre-construction conditions unless replacement or abandonment of facilities are indicated on the Drawings.

Take measures to minimize erosion of trenches. Do not allow water to pond in trenches. Where slides, washouts, settlements, or areas with loss of density or pavement failures or potholes occur, repair, recompact, and pave those areas at no additional cost to City.

### **3.04 EXCAVATION**

Except as otherwise specified or shown on the Drawings, install underground utilities in open cut trenches with vertical sides.

Perform excavation work so that pipe, conduit, and ducts can be installed to depths and alignments shown on the Drawings. Avoid disturbing surrounding ground and existing facilities and improvements.

Determine trench excavation widths using the following schedule as related to pipe outside diameter (O.D.). Maximum trench width shall be the minimum trench width plus 24 inches.

Nominal

Minimum Trench



<u>Pipe Size, Inches</u>	<u>Width, Inches</u>
Less than 18	O.D. + 18
18 to 30	O.D. + 24
Greater than 30	O.D. + 36

Use sufficient trench width or benches above the embedment zone for installation of well point headers or manifolds and pumps where depth of trench makes it uneconomical or impractical to pump from the surface elevation. Provide sufficient space between shoring cross braces to permit equipment operations and handling of forms, pipe, embedment and backfill, and other materials.

Upon discovery of unknown utilities, badly deteriorated utilities not designated for removal, or concealed conditions, discontinue work at that location. Notify the Water Utilities Engineer and obtain instructions before proceeding.

**Shoring of Trench Walls.**

Install Special Shoring in advance of trench excavation or simultaneously with the trench excavation, so that the soils within the full height of the trench excavation walls will remain laterally supported at all times.

For all types of shoring, support trench walls in the pipe embedment zone throughout the installation. Provide trench wall supports sufficiently tight to prevent washing the trench wall soil out from behind the trench wall support.

Unless otherwise directed by the Water Utilities Engineer, leave sheeting driven into or below the pipe embedment zone in place to preclude loss of support of foundation and embedment materials. Leave rangers, walers, and braces in place as long as required to support sheeting, which has been cut off, and the trench wall in the vicinity of the pipe zone.

Employ special methods for maintaining the integrity of embedment or foundation material. Before moving supports, place and compact embedment to sufficient depths to provide protection of pipe and stability of trench walls. As supports are moved, finish placing and compacting embedment.

If sheeting or other shoring is used below top of the pipe embedment zone, do not disturb pipe foundation and embedment materials by subsequent removal. Maximum thickness of removable sheeting extending into the embedment zone shall be the equivalent of a 1-inch-thick steel plate. Fill voids left on removal of supports with compacted backfill material.

**Use of Trench Shields.** When a trench shield (trench box) is used as a worker safety device, the following requirements apply:

Make trench excavations of sufficient width to allow shield to be lifted or pulled freely,



without damage to the trench sidewalls.

Move trench shields so that pipe, and backfill materials, after placement and compaction, are not damaged nor disturbed, nor the degree of compaction reduced.

When required, place spread, and compact pipe foundation and bedding materials beneath the shield. For backfill above bedding, lift the shield as each layer of backfill is placed and spread. Place and compact backfill materials against undisturbed trench walls and foundation.

Maintain trench shield in position to allow sampling and testing to be performed in a safe manner.

### **3.05 HANDLING EXCAVATED MATERIALS**

Use only excavated materials which are suitable as defined in this Section and conforming with Item 02320 - Utility Backfill Materials. Place material suitable for backfilling in stockpiles at a distance from the trench to prevent slides or cave-ins.

When required, provide additional backfill material conforming with requirements of Item 02320 - Utility Backfill Materials

Do not place stockpiles of excess excavated materials on streets and adjacent properties. Protect excess stockpiles for use on site.

### **3.06 GROUND WATER CONTROL**

Implement ground water control according to Item 01578 - Control of Ground Water and Surface Water. Provide a stable trench to allow installation in accordance with the Specifications.

### **3.07 TRENCH FOUNDATION**

Excavate bottom of trench to uniform grade to achieve stable trench conditions and satisfactory compaction of foundation or bedding materials.

Place trench dams in Class I foundations in line segments longer than 100 feet between manholes, and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

### **3.08 PIPE EMBEDMENT, PLACEMENT AND COMPACTION**



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

Immediately prior to placement of embedment materials, the bottoms and sidewalls of trenches shall be free of loose, sloughing, caving, or otherwise unsuitable soil.

Place embedment including bedding, haunching, and initial backfill as shown on Drawings.

For pipe installation, manually spread embedment materials around the pipe to provide uniform bearing and side support when compacted. Do not allow materials to free-fall from heights greater than 24 inches above the top of the pipe. Perform placement and compaction directly against the undisturbed soils in the trench sidewalls, or against sheeting which is to remain in place.

Do not place trench shields or shoring within height of the embedment zone unless means to maintain the density of compacted embedment material are used. If moveable supports are used in embedment zone, lift the supports incrementally to allow placement and compaction of the material against undisturbed soil.

Place geotextile to prevent particle migration from the in-situ soil into open-graded (Class I) embedment materials or drainage layers.

Do not damage coatings or wrappings of pipes during backfilling and compacting operations. When embedding coated or wrapped pipes, do not use crushed stone or other sharp, angular aggregates.

Place haunching material manually around the pipe and compact it to provide uniform bearing and side support. If necessary, hold small diameter or lightweight pipe in place during compaction of haunch areas and placement beside the pipe with sand bags or other suitable means.

Place electrical conduit, if used, directly on foundation without bedding.

Shovel in-place and compact embedment material using pneumatic tampers in restricted areas, and vibratory-plate compactors or engine-powered jumping jacks in unrestricted areas. Compact each lift before proceeding with placement of next lift. Water tamping is not allowed.

For water lines construction embedment, use bank run sand, concrete sand, gem sand, pea gravel, or crushed limestone as specified in Item 02320 - Utility Backfill Material. For water lines adhere to the following subparagraph numbers 1 and 2; for utility installation other than water, adhere to numbers 3 and 4 below.

**Class I, II, III Embedment Materials:**



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

Maximum 6 inches compacted lift thickness.

Compact to achieve a minimum of 95 percent of maximum dry density as determined according to ASTM D 698.

Moisture content to be within -3 percent to +5 percent of optimum as determined according to ASTM D 698, unless otherwise approved by Water Utilities Engineer.

**Cement Stabilized Sand:**

Maximum 6 inches compacted thickness.

Compact to achieve a minimum of 95 percent of maximum dry density as determined according to ASTM D 698.

Moisture content to be on dry side of optimum as determined according to ASTM D 698 but sufficient for effective hydration.

**Class I embedment materials.**

Maximum 6 inches compacted lift thickness.

Systematic compaction by at least two passes of vibrating equipment. Increase compaction effort as necessary to effectively embed the pipe to meet the deflection test criteria.

Moisture content as determined by Contractor for effective compaction without softening the soil of trench bottom, foundation or trench walls.

**Class II embedment and cement stabilized sand.**

Maximum 6 inches compacted thickness.

Compaction by methods determined by Contractor to achieve a minimum of 95 percent the maximum dry density as determined according to ASTM D 698 for Class II material and according to ASTM D 558 for cement stabilized materials.

Moisture content of Class II materials within 3 percent of optimum as determined according to ASTM D 698. Moisture content of cement stabilized sands on the dry side of optimum as determined according to ASTM D 558

but sufficient for effective hydration.

Place trench dams in Class I embedment in line segments longer than 100 feet between manholes, and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

### **3.09 TRENCH ZONE BACKFILL PLACEMENT AND COMPACTION**

Place backfill for pipe or conduits and restore surface as soon as practicable. Leave only the minimum length of trench open as necessary for construction.

Where damage to completed pipe installation work is likely to result from withdrawal of sheeting, leave the sheeting in place. Cut off sheeting 1.5 feet or more above the crown of the pipe. Remove trench supports within 5 feet from the ground surface.

For sewer pipes, use backfill materials described here as determined by trench limits. As trench zone backfill in paved areas for streets and to one foot back of curbs and pavements, use cement stabilized sand for pipe for nominal sizes less than 36 inches. Uniformly backfill trenches partially within limits one foot from streets and curbs according to the paved area criteria. Use select backfill within one foot below pavement subgrade for rigid pavement. For asphalt concrete, use flexible base material within one foot below pavement subgrade.

For water lines, backfill in trench zone, including auger pits, with bank run sand, select fill, or random backfill material as specified in Item 02320 - Utility Backfill materials.

When shown in Drawings, a random backfill of suitable material may be used in trench zone for trench excavations outside pavements.

Place trench zone backfill in lifts and compact by methods selected by the Contractor. Fully compact each lift before placement of the next lift.

Bank run sand.

Maximum 9 inches compacted lift thickness.

Compaction by vibratory equipment to a minimum of 95 percent of the maximum dry density determined according to ASTM D 698.

Moisture content within 3 percent of optimum determined according to ASTM D 698.

Cement-stabilized sand.

Maximum lift thickness determined by Contractor to achieve uniform



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

placement and required compaction, but not exceeding 24 inches.

Compaction by Vibratory equipment to a minimum of 95 percent of the maximum dry density determined according to ASTM D 558.

Moisture content on the dry side of optimum determined according to ASTM D 558 but sufficient for cement hydration.

Select fill.

Maximum 6 inches compacted thickness.

Compaction by equipment providing tamping or kneading impact to a minimum of 95 percent of the maximum dry density determined according to ASTM D 698.

Moisture content within 2 percent of optimum determined according to ASTM D 698.

For trench excavations outside pavements, a random backfill of suitable material may be used in the trench zone.

Flat clays (CH) may be used as trench zone backfill outside paved areas at the Contractor's option. If the required density is not achieved, the Contractor, at his option and at no additional cost to the City, may use lime stabilization to achieve compaction requirements or use a different suitable material.

Maximum 9 inch compacted lift thickness for clayey soils and maximum 12-inch lift thickness for granular soils.

Compact to a minimum of 90 percent of the maximum dry density determined according to ASTM D 698.

Moisture content as necessary to achieve density.

For electrical conduits, remove form work used for construction of conduits before placing trench zone backfill.

### **3.10 MANHOLES, JUNCTION BOXES, AND OTHER PIPELINE STRUCTURES**

Meet the requirements of adjoining utility installations for backfill of pipeline structures, as shown on the Drawings.

### **3.11 FIELD QUALITY CONTROL**

Test for material source qualifications as defined in Item 02320 - Utility Backfill Materials.



Provide excavation and trench safety systems at locations and to depths required for testing and retesting during construction at no additional cost to City.

Tests will be performed on a minimum of three different samples of each material type for plasticity characteristics, in accordance with ASTM D 4318, and for gradation characteristics, in accordance with Tex-101-E and Tex-110-E. Additional classification tests will be performed whenever there is a noticeable change in material gradation or plasticity.

At least three tests for moisture-density relationships will be performed initially for backfill materials in accordance with ASTM D 698, and for cement-stabilized sand in accordance with ASTM 558. Additional moisture-density relationship tests will be performed whenever there is a noticeable change in material gradation or plasticity.

In-place density tests of compacted pipe foundation, embedment and trench zone backfill soil materials will be performed according to ASTM D 1556, or ASTM D 2922 and ASTM D 3017, and at the following frequencies and conditions.

A minimum of one test for every 20 cubic yards of compacted embedment and for every 50 cubic yards of compacted trench zone backfill material.

A minimum of three density tests for each full shift to Work.

Density tests will be distributed among the placement areas. Placement areas are: foundation, bedding, haunching, initial backfill and trench zone.

The number of tests will be increased if inspection determines that soil type or moisture content are not uniform or if compacting effort is variable and not considered sufficient to attain uniform density, as specified.

Density tests may be performed at various depths below the fill surface by pit excavation. Material in previously placed lifts may therefore be subject to acceptance/rejection.

Two verification tests will be performed adjacent to in-place tests showing density less than the acceptance criteria. Placement will be rejected unless both verification tests show acceptable results.

Recompacted placement will be retested at the same frequency as the first test series, including verification tests.

Recondition, recompacted, and retest at Contractor's expense if tests indicate Work does not meet specified compaction requirements. For hardened soil cement with nonconforming density, core and test for compressive strength at Contractor's expense.



Acceptability of crushed rock compaction will be determined by inspection.

### **3.12 DISPOSAL OF EXCESS MATERIAL**

Disposal of excess materials shall be at the Contractor's cost and in areas approved by the owner.

End of Section



---

**ITEM 02320**

**SPECIFICATIONS FOR UTILITY BACKFILL MATERIAL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

Material Classifications.

Utility Backfill Materials:

- Concrete sand
- Gem sand
- Pea gravel
- Crushed stone
- Crushed concrete
- Back run sand
- Select backfill
- Random backfill

Material Handling and Quality Control Requirements.

**1.02 MEASUREMENT AND PAYMENT**

Unit Prices.

No payment will be made for backfill material under this Section. Include payment in unit price for applicable utility installation.

Payment for backfill material, when included as a separate pay item, is on a cubic yard basis for material placed and compacted within theoretical trench width limits and thickness of material according to Drawings.

**1.03 DEFINITIONS**

Unsuitable Material: Unsuitable soil materials are the following:

Materials that are classified as ML, CL-ML, MH, PT, OH, and OL according to ASTM D 2487.

Materials that cannot be compacted to the required density due to either gradation, plasticity, or moisture content.

Materials that contain large clods, aggregates, and stones greater than 4 inches in any dimension; debris, vegetation, and waste; or any other deleterious materials



Materials that are contaminated with hydrocarbons or other chemical contaminants.

Materials that do not satisfy the installed utilities manufacturers recommendations.

Suitable Material: Suitable soil materials are the following:

Those meeting specification requirements and manufacturers recommendations.

Unsuitable soils meeting specification requirements for suitable soils after treatment with lime or cement.

**Foundation Backfill Materials:** Natural soil or manufactured aggregate meeting Class I requirements and geotextile filter fabrics as required, to control drainage and material separation. Foundation backfill material is placed and compacted as backfill where needed to provide stable support for the structure foundation base. Foundation backfill materials may include concrete fill and seal slabs.

**Foundation Base:** Crushed stone aggregate with filter fabric as required, cement stabilized sand, or concrete seal slab., The foundation base provides a smooth, level working surface for the construction of the concrete foundation.

**Backfill Material:** Classified soil material meeting specified quality requirements for the designated application as embedment or trench zone backfill.

**Embedment Material:** Soil material placed under controlled conditions within the embedment zone extending vertically upward from top of foundation to an elevation 12 inches above top of pipe, and including pipe bedding, haunching, and initial backfill.

**Trench Zone Backfill:** Classified soil material meeting specified quality requirements and placed under controlled conditions in the trench zone from the top of embedment zone to base course in paved areas or to the surface grading material in unpaved areas.

**Foundation:** Either suitable soil of the trench bottom, or material placed as backfill of over-excavation for removal and replacement of unsuitable or otherwise unstable soils.

**Source:** A source selected by the Contractor supply of embedment or trench zone backfill material. A selected source may be the project excavation, off-site borrow pits, commercial borrow pits, or sand and aggregate production or manufacturing plants.

Refer to Item 02317 - Excavation and Backfill for Utilities for other definitions regarding utility installation by trench construction.



#### **1.04 REFERENCES**

ASTM C 33 - Specification for Concrete Aggregate.

ASTM C 40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.

ASTM C 123 - Test Method for Lightweight Pieces in Aggregate.

ASTM C 131 - Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

ASTM C 136 - Test Method for Sieve Analysis of Fine and Coarse Aggregates.

ASTM C 142 - Test Method for Clay Lumps and Friable Particles in Aggregates.

ASTM D 1140 - Test Method for Amount of Materials in Soils Finer Than No. 200 Sieve.

ASTM D 2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).

ASTM D 2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

ASTM D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

ASTM D 4643 - Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.

TxDOT Tex-101-E - Preparation of Soil and Flexible Base Materials for Testing.

TxDOT Tex-104-E - Test Method for Determination of Liquid Limit of Soils (Part 1).

TxDOT Tex-106-E - Test Method - Methods of Calculating Plasticity Index of Soils.

TxDOT Tex-110-E - Determination of Particle Size Analysis of Soils.

#### **1.05 SUBMITTALS**

Conform to requirements of Section 01300 - Contractor Submittals.

Submit a description of source, material classification and product description, production method, and application of backfill materials.

Submit test results for samples of off-site backfill materials to comply with Paragraph 2.03, Materials testing.



Before stockpiling materials, submit a copy of temporary easement or approval from landowner for stockpiling backfill material on private property.

For each delivery of material, provide a delivery ticket which includes source location.

## **1.06 TESTS**

Perform tests of sources for backfill material in accordance with Paragraph 2.03B.

Verification tests of backfill materials may be performed by the City and in accordance with Paragraph 3.02.

Random fill obtained from the project excavation as source is exempt from pre-qualification requirements by Contractor but must be inspected by City testing lab at Contractors expense for unacceptable materials based on ASTM D 2488.

## **PART 2 PRODUCTS**

### **2.01 MATERIAL CLASSIFICATIONS**

Materials for backfill shall be classified for the purpose of quality control in accordance with the Unified Soil Classification Symbols as defined in ASTM D 2487. Material use and application is defined in utility installation specifications and Drawings either by class, as described in Paragraph 2.01B, or by product descriptions, as given in Paragraph 2.02. Class Designations Based on Laboratory Testing:

Class I: Well-graded gravels and sands, gravel-sand mixtures, crushed well-graded rock, little or no fines (FW, SW):

Plasticity index: nonplastic.

Gradation:  $D_{60}/D_{10}$  - greater than 4 percent; amount passing No. 200 sieve - less than or equal to 5 percent.

Class II: Poorly graded gravels and sands, silty gravels and sands, little to moderate fines:

Plasticity index: nonplastic to 4.

Gradations:

Gradation (GP, SP): amount passing No. 200 sieve-less than 5 percent.

Gradation (GM, SM): amount passing No. 200 sieve - between 12 percent and 50 percent.

Borderline gradations with dual classifications (e.g., SP-SM): amount passing No. 200 sieve - between 5 percent and 12 percent.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

Class III: Clayey gravels and sands, poorly graded mixtures of gravel, sand, silt, and clay (GC, SC, and dual classifications, E.G., SP-SC):

Plasticity index: greater than 7

Gradation: amount passing No. 200 sieve - between 12 percent and 50 percent.

Class IVA: Lean clays (CL)

Plasticity Indexes:

Plasticity index: greater than 7, and above A line.

Borderline plasticity with dual classifications (CL-ML): PI between 4 and 7.

Liquid limit: less than 50.

Gradation: amount passing No. 200 sieve - greater than 50 percent.

Inorganic.

Class IVB: Fat clays (CH)

Plasticity index: above A line.

Liquid limit: 50 or greater.

Gradation: amount passing No. 200 sieve - greater than 50 percent.

Inorganic.

Use soils with dual class designation according to STM D 2487, and which are not defined above, according to the more restrictive class.

## **2.02 PRODUCT DESCRIPTIONS**

Soils classified as silt (ML), elastic silt (MH), organic clay and organic silt (OL, OH), and organic matter (PT) are not acceptable as backfill materials. These soils may be used for site grading and restoration in unimproved areas as approved by the Water Utilities Engineer. Soils in Class IVB, fat clay (CH) may be used as backfill materials where allowed by the applicable backfill installation specification. Refer to Section 02317 - Excavation and Backfill for Utilities.

Provide backfill material that is free of stones greater than 6 inches, free of roots, waste, debris, trash, organic material, no-soil matter, hydrocarbon or other contamination,



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

conforming to the following limits for deleterious materials:

Clay lumps: Less than 0.5 percent for Class I, and less than 2.0 percent for Class II, when tested in accordance with ASTM C 142.

Lightweight pieces: Less than 5 percent when tested in accordance with ASTM C 123.

Organic impurities: No color darker than standard color when tested in accordance with ASTM C 40.

Manufactured materials, such as crushed concrete, may be substituted for natural soil or rock products where indicated in the product specification, and approved by the Water Utilities Engineer, provided that the physical property criteria are determined to be satisfactory by testing.

Bank Run Sand: Durable bank run sand classified as SP, SW, or SM by the Unified Soil Classification System (ASTM D 2487) meeting the following requirements:

Less than 15 percent passing the number 200 sieve when tested in accordance with ASTM D 1140. The amount of clay lumps or balls not exceeding 2 percent.

Materials passing the number 40 sieve shall meet the following requirements when tested in accordance with ASTM D 4318:

Liquid limit: not exceeding 25 percent.

Plasticity index: not exceeding 7.

Concrete Sand: Natural sand, manufactured sand, or a combination of natural and manufactured sand conforming to the requirements of ASTM C 33 and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
-------	-----------------



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

3/8"	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

Gem Sand: Sand conforming to the requirements of ASTM C 33 for course aggregates specified for number 8 size and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
3/8"	95 to 100
No. 4	60 to 80
No. 8	15 to 40

Pea Gravel: Durable particles composed of small, smooth, rounded stones or pebbles and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
1/2"	100
3/8"	85 to 100
No. 4	10 to 30
No. 8	0 to 10
No. 16	0 to 5

Crushed Aggregates: Crushed aggregates consist of durable particles obtained from an approved source and meeting the following requirements:

Materials of one product delivered for the same construction activity from a single source.

Non-plastic fines.

Los Angeles abrasion test wear not exceeding 45 percent when tested in accordance



with ASTM C 131.

Crushed aggregate shall have a minimum of 90 percent of the particles retained on the No. 4 sieve with 2 or more crushed faces as determined by Test Method Tex-460-A, Part I.

Crushed stone: Produced from oversized plant processed stone or gravel sized by crushing to predominantly angular particles from a naturally for embedment where crushed stone is shown on the applicable utility embedment drawing details.

Crushed Concrete: Crushed concrete is an acceptable substitute for crushed stone as utility backfill. Gradation and quality control test requirements are the same as crushed stone. Provide crushed concrete produced from normal weight concrete of uniform quality; containing particles of aggregate and cement material, free from other substances such as asphalt, reinforcing steel fragments, soil, waste gypsum (calcium sulfate), or debris.

Gradations, as determined in accordance with Tex-110-E.

Sieve	Percent Passing by Weight for Pipe Embedment by Ranges of Nominal Pipes Sizes		
	>15"	15" - 8"	<8"
1"	95-100	100	-
3/4"	60-90	90-100	100
1/2"	25-60	-	90-100
3/8"	-	20-55	40-70
No. 4	0-5	0-10	0-15
No. 8	-	0-5	0-5

Select Backfill: Class III clayey gravel or sand or Class IV lean clay with a plasticity index between 7 and 20 or clayey soils treated with lime.

Random Backfill: Any suitable soil or mixture of soils within Classes I, II, III and IV; or fat clay (CH) where allowed by the applicable backfill installation specification. Refer to Item 02317 - Excavation and Backfill for Utilities.

Cement Stabilized Sand: Conform to requirements of Item 817 - Cement Stabilized Sand.

## **2.03 MATERIAL TESTING**



Ensure that material selected, produced and delivered to the project meets applicable specifications and is of sufficient uniform properties to allow practical construction and quality control.

Source or Supplier Qualification. Perform Testing, or obtain representative tests by suppliers, for selection of material sources and products. Provide test results for a minimum of three samples for each source and material type. Tests samples of processed materials from current production representing material to be delivered. Tests shall verify that the materials meet the specification requirements and/or manufacturer recommendations. Repeat qualification test procedures each time the source characteristic changes or there is a planned change in source location or supplier. Qualification tests shall include, as applicable:

Gradation. Complete sieve analyses shall be reported regardless of the specified control sieves. The range of sieves shall be from the largest particle through the No. 200 sieve.

Plasticity of material passing the No. 40 sieve.

Los Angeles abrasion wear of material retained on the No. 4 sieve.

Clay lumps.

Lightweight pieces.

Organic impurities.

Production Testing. Provide reports to the Water Utilities Engineer from an independent testing laboratory that backfill materials to be placed in the Work meet applicable specification requirements.

Assist the Water Utilities Engineer in obtaining material samples for verification testing at the source or at the production plant.

## **PART 3 EXECUTION**

### **3.01 SOURCES**

Use of material encountered in the trench excavations is acceptable, provided applicable specification requirements are satisfied. If excavation material is not acceptable, provide materials from other approved source.

Identify off-site sources for backfill materials at least 14 days ahead of intended use so that the Water Utilities Engineer may obtain samples for verification testing.



Obtain approval for each material source by the Water Utilities Engineer before delivery is started. If sources previously approved do not produce uniform and satisfactory products, furnish materials from other approved sources. Materials may be subjected to inspection or additional verification testing after delivery. Materials which do not meet the requirements of the specifications will be rejected. Do not use material which, after approval, has become unsuitable for use due to segregation, mixing with other materials, or by contamination. Once change to a different material will be credited by the City through a change order.

Bank run sand, select backfill, and random backfill, if available in the project excavation, may be obtained by selective excavation and acceptance testing. Obtain additional quantities of these materials and other materials required to complete the work from off-site sources.

The City does not represent or guarantee that any soil found in the excavation work will be suitable and acceptable as backfill material.

### **3.02 MATERIAL HANDLING**

When backfill material is obtained from either a commercial or non-commercial borrow pit, open the pit to expose the vertical faces of the various strata for identification and selection of approved material to be used. Excavate the selected material by vertical cuts extending through the exposed strata to achieve uniformity in the product.

Establish temporary stockpile locations for practical material handling and control, and verification testing by the Water Utilities Engineer in advance of final placement. Obtain approval from landowner for storage of backfill material on adjacent private property.

When stockpiling backfill material near the project site, use appropriate covers to eliminate blowing of materials into adjacent areas and prevent runoff containing sediments from entering the drainage system.

Place stockpiles in layers to avoid segregation of processed materials. Load material by making successive vertical cuts through entire depth of stockpile.

### **3.03 FIELD QUALITY CONTROL**

Quality Control



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

The Water Utilities Engineer may sample and test backfill at:

Sources including borrow pits, production plants and Contractor's designated off-site stockpiles.

On-site stockpiles.

Materials placed in the Work.

The Water Utilities Engineer may resample material at any stage of work or location if changes in characteristics are apparent.

Production Verification Testing: The City's testing laboratory will provide verification testing on backfill materials, as directed by the Water Utilities Engineer. Samples may be taken at the source or at the production plant, as applicable.

End of Section



---

**ITEM 02505**

**SPECIFICATIONS FOR HIGH DENSITY POLYETHYLENE (HDPE)**  
**SOLID AND PROFILE WALL PIPE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. High Density Polyethylene (HDPE) pipe for gravity sewers and drains, including fittings.
- B. HDPE pipe for sanitary sewer force mains, including fittings.

**1.02 MEASUREMENT AND PAYMENT**

- A. Unit Prices
  - 1. No separate payment will be made for HDPE pipe under this Section. Include cost in unit prices for work as specified in the bid items or in the following sections.
    - a. Item 02550 - Sliplining Sanitary Sewers

**1.03 REFERENCES**

- A. ASTM D 618 - Practice for Conditioning Plastics and Electrical Insulating Materials for testing.
- B. ASTM D 1248 - Specification for Polyethylene Plastics Molding and Extrusion Materials.
- C. ASTM D 2657 - Standard Practice for Heat - Joining Polyolefin Pipe and Fittings.
- D. ASTM D 3212 - Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- E. ASTM D 3350 - Specification for Polyethylene Plastic Pipe and Fittings Materials.
- F. ASTM F 477 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- G. ASTM F 714 - Specifications for Polyethylene Plastic (PE) Pipe (SDR-PR) Based on Outside Diameter.
- H. ASTM F 894 - Specification for Polyethylene Plastic (PE) Large-diameter Profile Wall Sewer and Drain Pipe.



**1.04 SUBMITTALS**

- A. Conform to requirements of Section 01300 - Contractor Submittals.
- B. Submit shop drawings showing design of pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fittings, flanges, and special details.

**1.05 QUALITY CONTROL**

- A. Provide the manufacturer's certificate of conformance to the Specifications.

**PART 2 PRODUCTS**

**2.01 APPROVED AND PRE-APPROVED PRODUCTS**

- A. Provide HDPE pipe as follows:

Wall Construction	Manufacturer	Product Options	ASTM Designation	Pipe Stiffness (Min)	Diameter Range (inches)
Solid Wall	Drisco 1000 Drisco 8600 Quail Price Poly Pipe Plexco	Approved	F714	115 psi	8 to 10
				46 psi	12 to 48
Profile Wall	Spirolite	Pre-approved	F894	46 psi	18-120

- B. Solid wall pipe shall be produced with plain end construction for heat-joining (butt fusion) conforming to ASTM D 2657. Utilize controlled temperatures and pressures for joining to produce a fused leak-free joint.
- C. Furnish profile-wall gravity sewer pipe with bell-and-spigot end construction conforming to ASTM D 3212. Joining will be accomplished with an elastomeric gasket in accordance with the manufacturer's recommendations. Use integral bell-and-spigot gasketed joint designed so that when assembled, the elastomeric gasket, contained in a machined groove on the pipe spigot, is compressed radially in the pipe bell to form a positive seal. Also have joint designed to avoid displacement of the gasket when installed in accordance with the manufacturer's recommendations.
- D. For solid wall pipe for sanitary sewer force mains, provide pipe with a minimum working pressure rating of 150 psi, and with an inside diameter equal to or greater than the nominal pipe size indicated on the Drawings.
- E. HDPE pipe is not approved in applications requiring augering of sewer pipe.



**2.02 MATERIALS**

- A. Pipe Fittings: High density, high molecular weight polyethylene pipe material meeting the requirements of Type III, Class C, Category 5, Grade P34, as defined in ASTM D 1248. Material meeting the requirements of cell classification of 345434D or E (inner wall of light color) in accordance with ASTM D3350 are also suitable for making pipe products under these specifications.
- B. Other Pipe Materials: Materials other than those specified in Paragraph 2.02A, Pipe and Fittings, may be used as part of the profile construction, e.g., as a core tube to support the shape of the profile during processing, provided that these materials are compatible with the base polyethylene material and are completely encapsulated in the finished product and in no way compromise the performance of the pipe products in the intended use. Examples of suitable material include polyethylene and polypropylene.

C. Gaskets.

- 1. Use gaskets meeting requirement of ASTM F 477. Use gasket molded into a circular form or extruded to the proper section and then spliced into circular form. When no contaminant is identified, use gaskets of a properly cured, high-grade elastomeric compound. The basic polymer shall be natural rubber, synthetic elastomer, or a blend of both.
- 2. Pipes to be installed in potentially contaminated areas, especially where free product is found near the elevation of the proposed sewer, shall have the following gasket materials for the noted contaminants:

Contaminant	Gasket Material Required
Petroleum (diesel, gasoline)	Nitrile Rubber
Other Contaminants	As recommended by the pipe manufacturer

- D. Lubricant. Use a lubricant for assembly of gasketed joints which has no detrimental effect on the gasket or on the pipe, in accordance with manufacturer's recommendations.

**2.03 WORKMANSHIP**

- A. Furnish pipe and fittings that are homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. Provide pipe as uniform as commercially practical in color, opacity, density, and other physical properties.

**2.04 INSPECTIONS**

- A. The Water Utilities Engineer reserves the right to inspect pipes or witness pipe manufacturing. Such inspection shall in no way relieve the manufacturer of the



responsibilities to provide product that comply with the applicable standards and these Specifications.

- B. **Manufacturer's Notification:** Should the Water Utilities Engineer wish to witness the manufacture of specific pipes, the manufacturer shall provide the Water Utilities Engineer with adequate advance notice of when and where the production of those specific pipes will take place.
- C. **Failure to Inspect.** Approval of the products or tests is not implied by the Water Utilities Engineer's decision not to inspect the manufacturing, testing, or finished pipes.

## **2.05 TESTING METHODS**

- A. **Conditioning.** Conditioning of samples prior to and during tests are subject to approval by Water Utilities Engineer. When referee tests are required, condition the specimens in accordance with Procedure A in ASTM D 618 at 73.4 degrees F plus or minus 3.6 degrees F and 50 percent relative humidity plus or minus 5 percent relative humidity for not less than 40 hours prior to test. Conduct tests under the same conditions of temperature and humidity unless otherwise specified.
- B. **Flattening.** Flattening three specimens of pipe, prepared in accordance with Paragraph 2.05A, in a suitable press until the internal diameter has been reduced to 40 percent of the original inside diameter of the pipe. The rate of loading shall be uniform and at 2-inches per minute. The test specimens, when examined under normal light and with the unaided eye, shall show no evidence of splitting, cracking, breaking, or separation of the pipe walls or bracing profiles.
- C. **Joint Tightness.** Test for joint tightness in accordance with ASTM D 3212, except replace the shear load transfer bars and supports with 6-inch-wide support blocks that can be either flat or contoured to conform to the pipe's outer contour.
- D. **Purpose of Tests.** The flattening and the joint tightness tests are not intended to be routine quality control test, but rather to qualify pipe to specified level of performance.

## **2.06 MARKING**

- A. Mark each standard and random length of pipe in compliance with these Specifications with the following information:
  - A. Pipe size
  - B. Pipe class
  - C. Production code
  - D. Material designation



## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Conform to requirements of the following Items:
1. Item 600 - Specifications for Underground Construction of Water and Sewer Pipes
  2. Item 02550 - Sliplining Sanitary Sewers
  3. Item 04020 - Pipe Bursting/Crushing Sanitary Sewers
- B. Install pipe in accordance with the manufacturer's recommended installation procedures.

End of Section



---

**ITEM 02533**

**ACCEPTANCE TESTING FOR SANITARY SEWERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Acceptance testing of sanitary sewers including:
  - 1. Visual inspection of sewer pipes
  - 2. Mandrel testing for flexible sewer pipes.
  - 3. Leakage testing of sewer pipes.
  - 4. Leakage testing of manholes.
  - 5. Smoke testing of point repairs.
  
- B. All tests listed in this Section are not necessarily required on this Project. Required tests are named in other Sections which refer to this Section for testing criteria and procedures.

**1.02 MEASUREMENT AND PAYMENT**

- A. Unit Prices.

No payment will be made for acceptance testing under this Section. Include payment in unit price for work requiring acceptance testing.
  
- B. Stipulated Price (Lump Sum). If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

**1.03 REFERENCES**

- A. ASTM C 828 - Standard Test Method for Low Pressure Air Test of Vitrified Clay Pipe Lines.
  
- B. ASTM C 924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
  
- C. ASTM D 3034 - Standard Specification for Type PSM Polyethylene (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  
- D. ASTM F 794 - Specification for Polyvinyl Chloride Large-Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
  
- E. ASTM F 1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air.
  
- F. 30 TAC 317.2 - Design Criteria for Sewage Systems.



- G. Uni-Bell UNI-B-3 Polyvinyl Chloride (PVC) Pressure Pipe (Complying with AWWA C 900).

#### **1.04 PERFORMANCE REQUIREMENTS**

- A. Gravity flow sanitary sewers are required to have a straight alignment and uniform grade between manholes.
- B. Flexible pipe, including "semi-rigid" pipe, is required to show no more than 5 percent deflection. Test pipe no sooner than 30 days after backfilling of a line segment but prior to final acceptance using a standard mandrel to verify that installed pipe is within specified deflection tolerances.
- C. Maximum allowable leakage for Infiltration or Exfiltration
1. The total exfiltration, as determined by a hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of 2 feet above the crown of the pipe at the upstream manhole or 2 feet above the groundwater elevation, whichever is greater.
  2. When pipes are installed more than 2 feet below the groundwater level, an infiltration test shall be used in lieu of the exfiltration test. The total infiltration shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours. Groundwater elevation must be at least 2 feet above the crown of the pipe at the upstream manhole.
  3. Refer to Table 02533-1, Water Test Allowable Leakage, at the end of the Section, for measuring leakage in sewers. Perform leakage testing to verify that leakage criteria are met.
- D. Perform air testing in accordance with requirements of this Section and the Texas Commission on Environmental Quality (TCEQ) requirements. Refer to Table 02533-2, Time Allowed For Pressure Loss From 3.5 psig to 2.5 psig, Table 02533-3, Minimum Testing Times for Low Pressure Air Test, and Table 02533-4, Vacuum Test Time Table, at the end of this Section.

#### **1.05 SUBMITTALS**

- A. Conform to requirements of Section 1300 - Contractor Submittals.
- B. Test Plan: Before testing begins and in adequate time to obtain approval through the submittal process, prepare and submit a test plan for approval by Water Utilities Engineer. Include testing procedures, methods, equipment, and tentative schedule. Obtain advance written approval for deviations from the Drawings and Specifications.
- C. Test Reports: Submit test reports for each test on each segment of sanitary sewer.



---

**1.06 GRAVITY SANITARY SEWER QUALITY ASSURANCE**

- A. Repair, correct, and retest manholes or sections of pipe which fail to meet specified requirements when tested.
- B. Provide testing reports and post-installation video tape of television inspection as directed by Water Utilities Engineer.
- C. Upon completion of tape reviews by Water Utilities Engineer, Contractor will be notified regarding final acceptance of the sewer segment.

**1.07 SEQUENCING AND SCHEDULING**

- A. Perform testing as work progresses. Schedule testing so that no more than 1000 linear feet of installed sewer remains untested at any one time.
- B. Coordinate testing schedules with Water Utilities Engineer. Perform testing under observation of Water Utilities Engineer.

**PART 2 PRODUCTS****2.01 DEFLECTION MANDREL**

- A. Mandrel Sizing. The rigid mandrel shall have an outside diameter (O.D.) equal to 95 percent of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe, dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.
- B. Mandrel Design. The rigid mandrel shall be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number. The barrel section of the mandrel shall have a length of at least 75 percent of the inside diameter of the pipe. The rigid mandrel shall not have adjustable or collapsible legs which would allow a reduction in mandrel diameter during testing. A proving ring shall be provided and used for modifying each size mandrel.
- C. Proving Ring. Furnish a "proving ring" with each mandrel. Fabricate the ring of 1/2-inch-thick, 3-inch-wide bar steel to a diameter 0.02 inches larger than approved mandrel diameter.
- D. Mandrel Dimensions (5 percent allowance). Average inside diameter and minimum mandrel diameter are specified in Table 02533-5, Pipe vs. Mandrel Diameter, at the end of this Section. Mandrels for higher strength, thicker wall pipe or other pipe not listed in the table may be used when approved by the Water Utilities Engineer.



## **2.02 EXFILTRATION TEST**

- A. Water Meter: Obtain a transient water meter from the City for use when water for testing will be taken from the City system. Conform to City requirements for water meter use.
- B. Test Equipment:
  - 1. Pipe plugs.
  - 2. Pipe risers where the manhole cone is less than 2 feet above highest point in pipe or service lead.

## **2.03 INFILTRATION TEST**

- A. Test Equipment:
  - 1. Calibrated 90 degree V-notch weir.
  - 2. Pipe plugs.

## **2.04 LOW PRESSURE AIR TEST**

- A. Minimum Requirement for Equipment:
  - 1. Control panel.
  - 2. Low-pressure air supply connected to control panel.
  - 3. Pneumatic plugs: Acceptable size for diameter of pipe to be tested; capable of withstanding internal test pressure without leaking or requiring external bracing.
  - 4. Air hoses from control panel to:
    - a. Air supply.
    - b. Pneumatic plugs.
    - c. Sealed line for pressuring.
    - d. Sealed line for monitoring internal pressure.
- B. Testing Pneumatic Plugs: Place a pneumatic plug in each end of a length of pipe on the ground. Pressurize plugs to 25 psig; then pressurize sealed pipe to 5 psig. Plugs are acceptable if they remain in place against the test pressure without external aids.

## **2.05 GROUND WATER DETERMINATION**

- A. Equipment: Pipe probe or small diameter casing for ground water elevation determination.

## **2.06 SMOKE TESTING**



A. Equipment:

1. Pneumatic plugs.
2. Smoke generator as supplied by Superior Signal Company, or an approved equal.
3. Blowers producing 2500 scfm minimum.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Provide labor, equipment, tools, test plugs, risers, air compressor, air hose, pressure meters, pipe probe, calibrated weirs, or any other device necessary for proper testing and inspection.
- B. The selection of test methods and pressures for gravity sanitary sewers shall be determined based on ground water elevation. Determine ground water elevation using equipment and procedures conforming to Item 01578 - Control of Ground Water and Surface Water.

### **3.02 VISUAL INSPECTION OF GRAVITY SANITARY SEWERS**

- A. Check pipe alignment visually by flashing a light between structures. Verify if alignment is true and no pipes are misplaced. In case of misalignment or damaged pipe, remove and re-lay or replace pipe segment.

### **3.03 MANDREL TESTING FOR GRAVITY SANITARY SEWERS**

- A. Perform deflection testing on flexible and semi-rigid pipe to confirm pipe has no more than 5 percent deflection. Mandrel testing shall conform to ASTM D 3034. Perform testing no sooner than 30 days after backfilling of line segment, but prior to final acceptance testing of the line segment.
- B. Pull the approved mandrel by hand through sewer sections. Replace any section of sewer not passing the mandrel. Mandrel testing is not required for stubs.
- C. Retest repaired or replaced sewer sections.

### **3.04 LEAKAGE TESTING FOR GRAVITY SANITARY SEWERS**

A. Test Options:

1. Test gravity sanitary sewer pipes for leakage by either exfiltration or infiltration methods, as appropriate, or with low pressure air testing.
2. Test new or rehabilitated sanitary sewer manholes with water or low pressure air. Manholes tested with low pressure air shall undergo a physical inspection prior to



testing.

3. Leakage testing shall be performed after backfilling of a line segment, and prior to tie-in of service connections.
4. If no installed piezometer is within 500 feet of the sewer segment, Contractor shall provide a temporary piezometer for this purpose.

**B. Compensating for Ground Water Pressure:**

1. Where ground water exists, install a pipe nipple at the same time sewer line is placed. Use a 1/2-inch capped pipe nipple approximately 10 inches long. Make the installation through manhole wall on top of the sewer line where line enters manhole.
2. Immediately before performing line acceptance test, remove cap, clear pipe nipple with air pressure, and connect a clear plastic tube to nipple. Support tube vertically and allow water to rise in the tube. After water stops rising, measure height in feet of water over invert of the pipe. Divide this height by 2.3 feet/psi to determine the ground water pressure to be used in line testing.

**C. Exfiltration test:**

1. Determine ground water elevation.
2. Plug sewer in downstream manhole.
3. Plug incoming pipes in upstream manhole.
4. Install riser pipe in outgoing pipe of upstream manhole if highest point in service lead (house service) is less than 2 feet below bottom of manhole cone.
5. Fill sewer pipe and manhole or pipe riser, if used, with water to a point 2-1/2 feet above highest point in sewer pipe, house lead, or ground water table, whichever is highest.
6. Allow water to stabilize for one to two hours. Take water level reading to determine drop of water surface, in inches, over a one-hour period, and calculate water loss (1 inch of water in 4 feet diameter manhole equals 8.22 gallons) or measure the quantity of water required to keep water at same level. Loss shall not exceed that calculated from allowable leakage according to Table 02533-1 at the end of this Section.

**D. Infiltration test: Ground water elevation must be not less than 2.0 feet above highest point of sewer pipe or service lead (house service).**



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

1. Determine ground water elevation.
  2. Plug incoming pipes in upstream manhole.
  3. Insert calibrated 90 degree V-notch weir in pipe on downstream manhole.
  4. Allow water to rise and flow over weir until it stabilizes.
  5. Take five readings of accumulated volume over a period of 2 hours and use average for infiltration. The average must not exceed that calculated for 2 hours from allowable leakage according to the Table 02533-1 at the end of this Section.
- E. Low Air Pressure Test: When using this test conform to ASTM C 828, ASTM C 924, or ASTM F 1417, as applicable, with holding time not less than that listed in Table 02533-2.
1. Air testing for sections of pipe shall be limited to lines less than 36-inch average inside diameter.
  2. Lines 36-inch average inside diameter and larger shall be tested at each joint. The minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch during a joint test shall be 10 seconds, regardless of pipe size.
  3. For pipe sections less than 36-inch average inside diameter:
    - a. Determine ground water level.
    - b. Plug both ends of pipe. For concrete pipe, flood pipe and allow 2 hours to saturate concrete. Then drain and plug concrete pipe.
    - c. After a manhole-to-manhole section of sanitary sewer main has been sliplined and prior to any service lines being connected to new liner, plug liner at each manhole with pneumatic plugs.
    - d. Pressurize pipe to 4.0 psig. Increase pressure 1.0 psi for each 2.3 feet of ground water over highest point in system. Allow pressure to stabilize for 2 to 4 minutes. Adjust pressure to start at 3.5 psig (plus adjustment for ground water table). See Table 02533-2 at the end of this Section.
    - e. To determine air loss, measure the time interval for pressure to drop to 2.5 psig. The time must exceed that listed in the Table 02533-2 at the end of this Section for pipe diameter and length. For sliplining, use diameter of carrier pipe.
- F. Retest: Any section of pipe which fails to meet requirements shall be repaired and retested.



### **3.05 TEST CRITERIA TABLES**

- A. Exfiltration and Infiltration Water Tests: Refer to Table 02533-1, Water Test Allowable Leakage, at the end of this Section.
- B. Low Pressure Air Test:
  - 1. Times in Table 02533-2, Time Allowed For Pressure Loss From 3.5 psig to 2.5 psig, at the end of this Section, are based on the equation from Texas Natural Resources and Conservation Commission (TNRCC) Design Criteria 317.2(a)(4)(B).

$$T = 0.0850(D)(K)/(Q)$$

where:

- T = time for pressure to drop 1.0 pounds per square inch gauge in seconds
- K = 0.000419 DL, but not less than 1.0
- D = average inside diameter in inches
- L = length of line of same pipe size in feet
- Q = rate of loss, 0.0015 ft<sup>3</sup>/min./sq. ft. internal surface

- 2. Since a K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as given in Table 02533-3, Minimum Testing Times for Low Pressure Air Test.

- Notes:
- 1. When two sizes of pipe are involved, the time shall be computed by the ratio of lengths involved.
  - 2. Lines with a 27-inch average inside diameter and larger may be air tested at each joint.
  - 3. Lines with an average inside diameter greater than 36 inches must be air tested for leakage at each joint.
  - 4. If the joint test is used, a visual inspection of the joint shall be performed immediately after testing.
  - 5. For joint test, the pipe is to be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure has stabilized, the minimum times allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be 10 seconds.

### **3.06 LEAKAGE TESTING FOR MANHOLES**



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

- 
- A. After completion of manhole construction, wall sealing, or rehabilitation, but prior to backfilling, test manholes for water tightness using hydrostatic or vacuum testing procedures.
- B. Plug influent and effluent lines, including service lines, with suitably-sized pneumatic or mechanical plugs. Ensure plugs are properly rated for pressures required for test; follow manufacturer's safety and installation recommendations. Place plugs a minimum of 6 inches outside of manhole walls. Brace inverts to prevent lines from being dislodged if lines entering manhole have not been backfilled.
- C. Vacuum testing:
1. Install vacuum tester head assembly at top access point of manhole and adjust for proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to the recommended maximum inflation pressure; do not over-inflate.
  2. Evacuate manhole with vacuum pump to 10 inches mercury (Hg), disconnect pump, and monitor vacuum for the time period specified in Table 02533-4, Vacuum Test Time Table.
  3. If the drop in vacuum exceeds 1 inch Hg over the specified time period tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.
- D. Hydrostatic exfiltration testing shall be performed as follows:
1. Seal wastewater lines coming into the manhole with an internal pipe plug. Then fill the manhole with water and maintain it full for at least one hour.
  2. The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot diameter per foot of manhole depth per hour.
  3. If water loss exceeds amount tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

**3.07 SMOKE TEST PROCEDURE FOR POINT REPAIRS**

- A. Application: Perform smoke test to:
1. Locate points of line failure for point repair.
  2. Determine if point repairs are properly made.
  3. Determine if service connections have been reconnected to the rehabilitated sewer.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

4. Check integrity of connections to newly replaced service taps to liners and to existing private service connections.
  - B. Limitations: Do not backfill service taps until completion of this test. Test only those taps in a single manhole section at any one time. Keep the number of open excavations to a minimum.
  - C. Preparation: Prior to smoke testing, give written notices to area residents no fewer than 2 days, nor more than 7 days, prior to proposed testing. Also give notice to City of Beaumont Police and Fire Departments 24 hours prior to actual smoke testing.
  - D. Isolate Section: Isolate the manhole section to be tested from adjacent manhole sections to keep smoke localized. Temporarily seal the annular space at manhole for sliplined sections.
  - E. Smoke Introduction:
    1. Operate equipment according to manufacturer's recommendation and as approved by Water Utilities Engineer.
    2. Conduct test by forcing smoke from smoke generators through sanitary sewer main and service connections. Operate smoke generators for a minimum of 5 minutes.
    3. Introduce smoke into upstream and downstream manhole as appropriate. Monitor the tap/connection for smoke leaks. Note sources of leaks.
  - F. Repair and Retest: Repair and replace any taps or connections noted as leaking and then retest. Taps and connections may be left exposed in only one manhole section at a time. If repair or replacement, testing or retesting, and backfilling of the excavation is not completed within one work day, properly barricade and cover each excavation as approved by Water Utilities Engineer.
  - G. Service Connections: On houses where smoke does not issue from plumbing vent stacks to confirm reconnection of sewer service to the newly installed liner pipe, perform a dye test to confirm reconnection. Introduce dye into the service line through a plumbing fixture inside the structure or a sewer cleanout immediately outside the structure and flush with water. Observe flow at service reconnection or downstream manhole. Detection of dye confirms a reconnection.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

**Table 02533-1  
WATER TEST ALLOWABLE LEAKAGE**

DIAMETER OF RISER OR STACK IN INCHES	VOLUME PER INCH OF DEPTH		ALLOWANCE LEAKAGE*	
	INCH	GALLONS	PIPE SIZE IN INCHES	GALLONS/MINUTE PER 100 FT.
1	0.7854	.0034	6	0.0039
2	3.1416	.0136	8	0.0053
2.5	4.9087	.0212	13	0.0066
3	7.0686	.0306	12	0.0079
4	12.5664	.0306	15	0.0099
5	19.6350	.0544	18	0.0118
6	28.2743	.1224	21	0.0138
8	50.2655	.2176	24	0.0158
			27	0.0177
			30	0.0197
			36	0.0237
			42	0.0276
For other diameters, multiply square of diameters by value for 1" diameter.			Equivalent to 50 gallons per inch of inside diameter per mle per 24 hours.	

\* Allowable leakage rate shall be reduced to 10 gallons per inch of inside diameter per mile per 24 hours, when sewer is identified as located within the 25-year flood plain.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

**Table 02533-2  
ACCEPTANCE TESTING FOR SANITARY SEWERS**

TIME ALLOWED FOR PRESSURE LOSS FROM 3.5 PSIG TO 2.5 PSIG															
Pipe Diam(in)	Min. Time (min:sec)	Length for Min. Time (ft)	Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)											
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	500 ft	550 ft	600 ft	
6	5:40	398	0.8548	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:25	7:07	7:50	8:33
8	7:33	298	1.5196	7:33	7:33	7:33	7:33	7:36	8:52	10:08	11:24	12:40	13:56	15:12	
10	9:27	239	2.3743	9:27	9:27	9:27	9:54	11:52	13:51	15:50	17:48	19:47	21:46	23:45	
12	11:20	199	3.4190	11:20	11:20	11:20	14:15	17:06	19:57	22:48	25:39	28:30	31:20	34:11	
15	14:10	159	5.3423	14:10	14:10	17:48	22:16	26:43	31:10	35:37	40:04	44:31	48:58	53:25	
18	17:00	133	7.6928	17:00	19:14	25:39	32:03	38:28	44:52	51:17	57:42	64:06	70:31	76:56	
21	19:50	114	10.4708	19:50	26:11	34:54	43:38	52:21	61:05	69:48	78:32	87:15	95:59	104:42	
24	22:40	99	13.6762	22:48	34:11	45:35	56:59	68:23	79:47	91:10	102:34	113:58	125:22	136:46	
27	25:30	88	17.3089	28:51	43:16	57:42	72:07	86:33	100:58	115:24	129:49	144:14	158:40	173:05	
30	28:20	80	21.3690	35:37	53:25	71:14	89:02	106:51	124:39	142:28	160:16	178:05	195:53	213:41	
33	31:10	72	25.8565	43:06	64:38	86:11	107:44	129:17	150:50	172:23	193:55	215:28	237:01	258:34	

**Table 02533-3  
MINIMUM TESTING TIMES FOR LOW PRESSURE AIR TEST**

PIPE DIAMETER (INCHES)	MINIMUM TIME (SECONDS)	LENGTH FOR MINIMUM TIME (FEET)	TIME FOR LONGER LENGTH (SECONDS)
6	340	398	0.855 (L)
8	454	298	1.520 (L)
10	567	239	2.374 (L)
12	680	199	3.419 (L)
15	850	159	5.342 (L)
18	1020	133	7.693 (L)
21	1190	114	10.471 (L)
24	1360	100	13.676 (L)
27	1530	88	17.309 (L)
30	1700	80	21.369 (L)
33	1870	72	25.856 (L)



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

**Table 02533-4  
VACUUM TEST TIME TABLE**

DEPTH IN FEET	TIME IN SECONDS BY PIPE DIAMETER		
	48"	60"	72"
4	10	13	16
8	20	26	32
12	30	39	48
16	40	52	64
20	50	65	80
24	60	78	96
*	5.0	6.5	8.0

\*Add T times for each additional 2-foot depth.  
(The values listed above have been extrapolated from ASTM C 924-85)



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

**Table 02533-5  
PIPE VS. MANDREL DIAMETER**

<b>Material and Wall Construction</b>	<b>Nominal Size (Inches)</b>	<b>Average I.D. (Inches)</b>	<b>Minimum Mandrel Diameter (Inches)</b>
PVC-Solid (SDR 26)	6	5.764	5.476
	8	7.715	7.329
	10	9.646	9.162
PVC-Solid (SDR 35)	12	11.737	11.150
	15	14.374	13.655
	18	17.629	16.748
	21	20.783	19.744
	24	23.381	22.120
	27	26.351	25.033
PVC-Truss	8	7.750	7.363
	10	9.750	9.263
	12	11.790	11.201
	15	14.770	14.032
PVC-Profile (ASTM F 794)	12	11.740	11.153
	15	14.370	13.652
	18	17.650	16.768
	21	20.750	19.713
	24	23.500	22.325
	27	26.500	25.175
	30	29.500	28.025
	36	35.500	33.725
	42	41.500	39.425
HDPE-Profile	48	47.500	45.125
	18	18.000	17.100
	21	21.000	19.950
	24	24.000	22.800
	27	27.000	25.650
	30	30.000	28.500
	36	36.000	34.200
	42	42.000	39.900
	48	48.000	45.600
	54	54.000	51.300
Fiberglass-Centrifugally Cast (Class SN 46)	60	60.000	57.000
	12	12.85	11.822
	18	18.66	17.727
	20	20.68	19.646
	24	24.72	23.484
	30	30.68	29.146
	36	36.74	34.903
	42	42.70	40.565
	48	48.76	46.322
	54	54.82	52.079
60	60.38	57.361	

End of Section



# City of Beaumont

## Water Utilities / Engineering

### Gravity Sanitary Sewer Line Pressure Test Sheet

JOB # \_\_\_\_\_

PROJECT: \_\_\_\_\_

DATE: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

WEATHER: \_\_\_\_\_

CONTRACTOR'S EQUIPMENT ON JOB: \_\_\_\_\_

ENGINEER: \_\_\_\_\_ PIPE TYPE/CLASS: \_\_\_\_\_

	Pipe Dia. (Inches)	Min. Time (Min:Sec)	Length for Min. Time (Feet)	Time for Longer Length (Seconds)
Allowable Time for Pressure Drop From 3.5 psi to 2.5 psi	6	5:40	398	0.855 * (L)
	8	7:33	298	1.520 * (L)
	10	9:27	239	2.374 * (L)
	12	11:20	199	3.419 * (L)
	15	14:10	159	5.342 * (L)
	18	17:00	133	7.693 * (L)
	21	19:50	114	10.471 * (L)
	24	22:40	99	13.676 * (L)
	27	25:30	88	17.309 * (L)
	30	28:20	80	21.369 * (L)
	33	31:10	72	25.856 * (L)

LOW PRESSURE AIR TEST					
LINE: _____		LINE: _____		LINE: _____	
SIZE/LENGTH: _____		SIZE/LENGTH: _____		SIZE/LENGTH: _____	
Allowable Time for 1.0 psi Pressure Drop: _____		Allowable Time for 1.0 psi Pressure Drop: _____		Allowable Time for 1.0 psi Pressure Drop: _____	
TIME	PRESSURE	TIME	PRESSURE	TIME	PRESSURE
End: _____	Start: _____	End: _____	Start: _____	End: _____	Start: _____
Start: _____	End: _____	Start: _____	End: _____	Start: _____	End: _____
Total: _____	Drop: _____	Total: _____	Drop: _____	Total: _____	Drop: _____
( ) PASS ( ) FAIL		( ) PASS ( ) FAIL		( ) PASS ( ) FAIL	
ALL 4" SERVICE LINES TESTED WITH MAIN? ( ) YES ( ) NO					

COMMENTS: \_\_\_\_\_

CITY REPRESENTATIVE: \_\_\_\_\_ SIGNATURE \_\_\_\_\_



---

**ITEM 02534**

**SPECIFICATIONS FOR SANITARY SEWER SERVICE STUBS  
OR RECONNECTIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Installation of service stubs in sanitary sewers serving areas where sanitary sewer service did not previously exist.
- B. Reconnection of existing service connections along parallel, replacement, or rehabilitated lines.

**1.02 MEASUREMENT AND PAYMENT**

- A. Unit Prices.
  - 1. Payment for sanitary sewer service stubs or service reconnections from the sanitary sewer main centerline to the property line or the edge of the right of way is on a unit price basis for each stub or reconnection based on it being a long side service or a short side service. Payment will be made for each service stub or reconnection installed complete in place, including service connections, couplings, adapters, disconnecting existing services, reconnecting new service, fittings, excavation, and backfill.
  - 2. Pay estimates for progress payments will be made as measured above according to the following schedule:
    - a. An estimate for 95 percent payment will be authorized when the reconnection is completely installed and backfilled.
    - b. An estimate for 100 percent payment will be authorized when the reconnection has been tested as specified in Item 02533- Acceptance Testing for Sanitary Sewers.
  - 3. One or more connections discharging into a common point are considered one service connection. The Contractor shall not add service reconnections without approval of the Water Utilities Engineer. The Water Utilities Engineer may require connections to be relocated to avoid having more than two service connections per reconnection.
  - 4. Protruding service connections which must be removed to allow liner insertion are paid as a service reconnection when connected.



5. No separate payment will be made for abandonment of service connection unless excavation is required. No separate payment will be made for excavation of sanitary sewer services within the new or replacement sewer trench.
  6. No separate payment will be made for removal of existing sanitary sewer service stubs. Include payment in unit price for Item 02534 - Sanitary Sewer Service Stubs or Reconnections.
  7. No separate payment will be made for an abandoned service connection if the service to be abandoned is within 4 feet of an active connection.
  8. If a faulty remote cut is later corrected using the procedures specified for reconnection by excavation, only one reconnection will be allowed for payment.
- B. Stipulated Price (Lump Sum). If the Contract is a Stipulated Price Contract, payment for work in this section is included in the total Stipulated Price.

### **1.03 REFERENCES**

- A. ASTM D 1784 - Specifications for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- B. ASTM D 3034 - Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- C. ASTM D 3212 - Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

### **1.04 PERFORMANCE REQUIREMENTS**

- A. Accurately locate in the field all proposed service stubs along the new sanitary sewer main.
- B. Accurately locate in the field existing service connections and proposed service stubs along the alignment of the new parallel or replacement sewer main.

### **1.05 SUBMITTALS**

- A. Conform to requirements of Section 1300 - Contractor Submittals.
- B. Submit product data for each pipe product, fitting, coupling and adapter.
- C. Show reconnected services on record drawings. Give the exact distance from each service connection to the nearest downstream manhole.



**PART 2 PRODUCTS**

**2.01 PVC SERVICE CONNECTION**

- A. As stub outs, use PVC sewer pipe of 4-inch through 10-inch diameter, conforming to ASTM D 1784 and ASTM D 3034, with a cell classification of 12454-B. The SDR (ratio of diameter to wall thickness) shall be 35 for pipe 8 inches in diameter or larger. PVC schedule 40 shall be used for 4 and 6-inch service line connections.
- B. PVC pipe shall be gasket jointed with gasket conforming to ASTM D 3212.
- C. For reconnection of existing services, select service connection pipe diameter to match existing service diameter. Reconnections to rehabilitated sanitary sewer mains shall be limited to the following maximum service connection diameter:

Sewer Diameter	Maximum Service Connection Diameter
8" or less	4"
10" or greater	6"

- D. Subject to the above limits, provide a 6-inch service connection when more than one service discharges into a single pipe.
- E. Connect service pipes to parallel or replacement sewer mains with prefabricated, full-bodied tee or wye fittings conforming to specifications for sewer main pipe material as specified in other Sections for sewers up to 18 inches in diameter.
- F. Where sewers are installed using pipe augering or tunneling, or where the sewer is greater than 18 inches in diameter, use Fowler "Inserta-Tee" to connect the service to sewer main.

**2.02 PIPE SADDLES**

- A. Use pipe saddles only on rehabilitated sanitary sewer mains. Comply with Paragraph 2.01E for new parallel and replacement sanitary sewer mains.
- B. Supply one-piece prefabricated saddle, either polyethylene or PVC, with neoprene gasket to accomplish a complete seal. Use a saddle fabricated to fit the outside diameter of the connecting pipe. The protruding lip of the saddle must be at least 5/8-inch long with grooves or ridges to retain the stainless steel band clamps.
- C. Use 1/2-inch stainless steel band clamps for securing saddles to liner pipe.

**2.03 COUPLINGS AND ADAPTERS**

- A. For connections between new PVC pipe stubouts and existing service, 4-, 6-, 8-inch



diameter, use a flexible adapter coupling consisting of a neoprene gasket and stainless steel shear rings with ½ inch stainless steel band clamps:

1. Fernco Pipe Connectors, Inc. Series 1055 with shear ring SR-8
  2. Band Seal by Mission Rubber Co., Inc.
  3. Approved equal.
- B. For connections between new PVC pipe stubout and new service, use rubber-gasketed adapter coupling:
1. GPK Products, Inc.
  2. IPS & Sewer Adapter
  3. Approved equal

#### **2.04 STACKS**

- A. Provide stacks for service connections wherever the crown of the sewer is 8 feet or more below finished grade.
- B. Construct stacks of the same material as the sanitary sewer and as shown on the Drawings.
- C. Provide stacks of the same nominal diameter at the sanitary service line.

#### **2.05 PLUGS AND CAPS**

- A. Seal the upstream end of unconnected sewer service stubs with rubber gasketed plugs or caps of the same pipe type and size. Provide plugs or caps by GPK Products, Inc., or approved equal.

#### **2.06 INSERTA TEE**

- A. The inserta tee is comprised of three parts; PVC hub, stainless steel band and rubber boot as manufactured by Fowler Manufacturing Co., Inc.
- B. PVC hub and rubber boot shall be engineered to accept the wall thickness and internal radius of the pipe. The PVC hub and rubber boot shall not protrude more than ½" into the sewer pipe.
- C. The PVC hub shall be in accordance with ASTM D-3034.
- D. The rubber boot shall be in accordance with ASTM C-443.
- E. The inserta tee shall be sized to accept 4" or 6" service lines, as required.



## **PART 3 EXECUTION**

### **3.01**

- A. Provide a minimum of 72 hours notice to customers whose sanitary sewer service will potentially be interrupted.
- B. Accurately field locate service connections, whether in service or not, along the rehabilitated sanitary sewer main. For parallel and replacement sewers, service connections may be located as pipe laying progresses from downstream to upstream.
- C. Properly disconnect existing connections from the sewer and reconnect to the rehabilitated liner, as described in this Section.
- D. Reconnect service connections, including those that go to unoccupied or abandoned buildings or to vacant lots, unless directed differently by the Water Utilities Engineer. Install a stack and cap the reconnection where the service is to a vacant lot or location where a structure has been demolished, unless directed otherwise by the Water Utilities Engineer.
- E. Complete reconnection of service lines within 24 hours after cured-in-place liner installation or after disconnection for sliplining, parallel, or replacement sanitary sewer mains.
- F. Reconnect services on cured-in-place liner at 10 feet depth or less by the excavation method. The Water Utilities Engineer reserves the right to require service connections by excavation when a remote cut service connection damages the lines.
- G. Reconnection by the excavation method shall include the stack and fittings and required pipe length to reconnect service line.
- H. All services which are connected to the rehabilitated sanitary sewer shall be properly shown on the "As Built" drawings with exact distances for the nearest down stream manhole.

### **3.02 PROTECTION**

- A. Provide barricades, warning light, and signs for excavations created for service connections as per the Special Provisions Section.
- B. Do not allow sand, debris, or runoff to enter sewer system.

### **3.03 PREPARATION**

- A. Determine the existing sewer locations and number of existing service connections from closed-circuit television (CCTV) inspection tapes or from field survey. Accurately field locate existing service connections, whether in service or not. Use existing service locations to connect or reconnect service lines or liner.
- B. For rehabilitated sanitary sewer mains, allow liner to normalize to ambient temperature and



recover from imposed stretch. For cured-in-place liners, verify that liner is completely cured.

- C. For new parallel and replacement sanitary sewer mains, complete testing and acceptance of downstream sewers as applicable. Provide for compliance with requirements of Paragraph 3.01E.

### **3.04 EXCAVATION AND BACKFILL**

- A. Excavate in accordance with Item 02317 - Excavation and Backfill for Utilities.
- B. Perform work in accordance with OSHA standards. Employ a Trench Safety System as specified in Item 712 - Trench Safety System for excavations requiring trench safety.
- C. Install and operate necessary ground water and surface water control measures in accordance with requirements of Item 01578 - Control of Ground Water and Surface Water.
- D. Determine locations where limited access, buildings or structure preclude use of mechanical excavation equipment. Obtain approval from Water Utilities Engineer for hand excavation.
- E. When the excavation shows that a service line is not connected, abandon the service reconnection and backfill the excavation.

### **3.05 RECONNECTION BY EXCAVATION METHOD**

#### **A. SADDLE METHOD**

- 1. Remove a portion of the existing sanitary sewer main or carrier pipe to expose the liner pipe. Provide sufficient working space for installing a pre-fabricated pipe saddle.
- 2. Carefully cut a hole in the liner pipe to accept the protrusion on the underside of the saddle. Length of protrusion shall be equal to the wall thickness of the line pipe.
- 3. Install the saddle with gasket using stainless steel bands on each side of the saddle. Tighten the bands to produce a watertight seal between the saddle and the liner pipe.

#### **B. INSERTA TEE METHOD**

- 1. Remove a portion of the existing sanitary sewer main or carrier pipe to expose the liner pipe. Provide sufficient space to install an inserta tee.
- 2. Precisely cut a circular hole, per the manufactures recommendations, in the liner pipe that will form a tight fit between the liner pipe PVC stub and rubber boot.
- 3. Install the rubber boot into the cored hole, making sure the boot is properly oriented to the mainline. Lubricate the rubber boot with a special solution provided by the

inserta tee manufacturer. Make sure the upper and lower ribs of the rubber boot are correctly seated against the inside and outside diameter of the liner pipe.

4. Insert the PVC hub into the rubber boot, per manufacturers recommended instructions. Place stainless steel band around the top of the rubber boot and tighten to form a water tight seal.

**C. SERVICE CONNECTIONS TO SADDLES AND/OR INSERTA TEE**

1. Remove and replace cracked, offset or leaking service line up to 8 feet (measured horizontally) from the center line of the new line.
2. Make connections between liner and existing service line using PVC sewer pipe and approved couplings/fittings using stainless steel bands to construct new stacks and/or service lines.
3. Test all service connections by smoke testing the sewer main and connections before backfilling.
4. Encase the entire service connection in cement stabilized sand or crushed stone. Place a minimum of 6 inches below and 12 inches above and on each side of the service line and pipe connection.

**3.06 RECONNECTION BY REMOTE METHOD**

- A. Make service reconnections using remote-operated cutting tools on cured-in-place liners at depth greater than 10 feet.
- B. Employ method and equipment that restore the service connection capacity to not less than 90 percent of original capacity.
- C. Immediately open any missed connections and repair any holes drilled in error using a method approved by the Water Utilities Engineer.
- D. If a faulty remote cut is later corrected using the procedures specified for reconnection by excavation, only one reconnection will be allowed for payment.

**3.07 RECONNECTION ON PARALLEL OR REPLACEMENT SEGMENTS**

- A. Install a full-bodied tee or wye fitting on the new sanitary sewer main for each service connection.
- B. Remove and replace cracked, offset or leaking service line for up to 5 feet, measured horizontally, from the centerline of the sanitary sewer main.
- C. Make up the connection between the main and the existing service line using PVC sewer



---

pipe and approved couplings, as shown on the Drawings.

- D. Test service connections before backfilling.
- E. Embed the service connection and service line as specified for the sanitary sewer main as shown on the Drawings. Place and compact trench zone backfill in compliance with Item 02317 - Excavation and Backfill for Utilities.

### **3.08 INSTALLATION OF NEW SERVICE STUBS**

- A. Install service connections on sanitary sewer main for each service connection. Provide the length to the report line or the right of way. Install plug or cap on the upstream end of the service stub as needed.
- B. Test service connections before backfilling.
- C. Embed the service connection and service line as specified for sanitary sewer main, and as shown on the Drawings. Place and compact trench zone backfill in compliance with Item 02317- Excavation and Backfill for Utilities. Install a minimum 2-foot length of magnetic locating tape along the axis of the service stub and 9 inches to 12 inches above the crown of the pipe, at the end of the stub.

### **3.09 TESTING**

- A. Test service reconnections and service stubs. Follow applicable procedures given in Item 02533 - Acceptance Testing for Sanitary Sewers to perform smoke testing to confirm reconnection.

### **3.10 CLEANUP**

- A. Backfill the excavation as specified in Item 02317 - Excavation and Backfill for Utilities.
- B. Replace pavement on sidewalks removed or damaged by excavation in accordance with Item 02951 - Pavement Repair and Resurfacing. In unpaved areas, bring surface to grade and slope surrounding the excavation. Replace a minimum of 4 inches of topsoil and seed according to requirements of Item 711 - Seeding and Sodding.

End of Section



---

**ITEM 02535**

**SPECIFICATIONS FOR FIELD TESTING OF LARGE DIAMETER  
SLIP-LINED PIPING SYSTEMS**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. Provide all necessary labor, materials and equipment, including test pumps and gauges, as well as temporary valves and piping to perform the testing operations of piping systems as specified herein.
- B. This specification describes in place testing requirements for slip-lined piping in excess of 36-inch diameter.
- C. All slip-lined pipes will be tested.
- D. CONTRACTOR's Responsibility:
  - 1. Take such precautions as required to prevent damage to lines and appurtenances being tested.
  - 2. Repair any damage resulting from tests.
  - 3. Repair and retest all items which do not pass the tests as specified here in.
  - 4. Conduct all tests in the presence of the Water Utilities Engineer and to his satisfaction and all State and local authorities having jurisdiction.
  - 5. All necessary pumps, water, pipe connections, meters, gauges, and any necessary apparatus to perform and conduct the tests shall be furnished by the CONTRACTOR. CONTRACTOR shall furnish all necessary equipment and make all tests at CONTRACTOR's expense without separate measurement and payment, but said expense shall be subsidiary to installation of pipe.
- E. Water used for testing purposes shall be potable water only and provided by the Contractor.

**1.02 REFERENCES STANDARDS**

Based on pipe material, the AWWA testing standards must be followed.

**1.03 SUBMITTALS**



- A. Submit record data describing proposed testing methods, procedures, and apparatus for the Water Utilities Engineer's record, prior to testing.
- B. Conform to any other applicable requirements of Section 01300 Contractor Submittals.
- C. Submit a certified test report for each test to the Water Utilities Engineer certifying the test pressures, duration of the test, leakage and pertinent observations and comments.

#### **1.04 GENERAL SEQUENCE OF WORK**

- 1. Obtain the OWNER's approval of proposed testing methods, procedures, and apparatus, before performing any test.
- 2. Upon receipt of the OWNER's approval, submit a schedule of testing dates and times at least 24 hours in advance of testing.
- 3. Perform tests as specified herein.

#### **PART 2 - PRODUCTS**

Not Applicable.

#### **PART 3 - EXECUTION**

##### **3.01 TESTING OF DRAINS, SEWERS, AND OTHER GRAVITY LINES**

- A. General:
  - 1. For all pipe, the method of testing shall be an hydrostatic exfiltration test. For any flexible, non-metallic or non-concrete pipe, such as plastic (PVC, PE, etc.) or fiber reinforced plastic pipe or similar flexible pipe materials, a deflection test shall also be performed.
  - 2. CONTRACTOR may make first test 24 hours after first section of line is installed and the annular space has been grouted. A section of pipe will normally be a run between two manholes, or between a structure and the first manhole.
  - 3. Do not install additional piping of the type being tested until test of first section is complete.
- B. Hydrostatic Exfiltration Test Procedure:
  - 1. Seal ends of section being tested with watertight plugs.
  - 2. Fill section with water prior to start of test.
  - 3. Vent line during filling so that no air is trapped in line.



4. Leave outlets of stacks, inlets, and service lines exposed and unplugged until after exfiltration test has been made.
5. Outlets terminating below level of test water surface to be temporarily extended upward by installing lengths of pipe.
6. Measure leakage or exfiltration during test period by adding measured quantities of water to maintain water level in test structure.
7. Quantity of water added to maintain water level is amount of leakage or exfiltration.
8. Test for at least two hours with minimum head of four feet measured above top crown, inside pipe at upper end of section being tested. Allow for increase in height due to ground water level, if any.
9. Storm sewer leads to be tested with water level at gutter grade.
10. After completion of satisfactory test, remove lengths of pipe added for test.
11. Allowable Leakage: Allowable leakage for exfiltration test in any individual section or entire sewer line under construction shall not exceed 10 gallons per inch of inside diameter per mile of pipe per 24 hours.

### **3.02 MANHOLE TESTING**

- A. Manholes shall be tested separately and independently of the wastewater lines. All wastewater lines coming into the manhole shall be sealed with an internal pipe plug before testing. All manholes shall be hydrostatically tested with a maximum loss allowance of 0.025 gallons per foot diameter per foot of head per hour. The testing period shall not be less than one hour.
- B. Vacuum testing of manholes may be allowed per OWNER's requirements.

End of Section



---

**ITEM 02550**

**SPECIFICATIONS FOR SLIPLINING SANITARY SEWERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sliplining existing sanitary sewers.

**1.02 UNIT PRICES**

- A. Measurement for sliplining is on a linear foot basis for installed liner pipe, measured from center line of upstream manhole to center line of downstream manhole. Depth range for payment is based on greatest depth measured at manholes from natural ground level to flow line of sanitary sewer for each pipeline segment.
- B. Insertion pits, access pits, clamp installation, embedment (bedding, haunching and initial backfill), field quality control (testing), sealing liner at manholes, grouting annular space, building up, shaping and reworking manhole inverts and benches, and pre-installation and post-installation cleaning and television inspection of completed work are included in sliplining unit price and not paid for separately.
- C. Excavations initially begun as obstruction removals or point repairs which the Contractor later decides to use as insertion pits are considered as insertion pits and not paid for separately.
- D. Trench safety systems, well pointing and other applicable bid items associated with insertion pits will be paid for at their respective contract unit prices.
- E. Payment will be issued for the footage installed.

**1.03 REFERENCES**

- A. ASTM D 1784 - Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds.
- B. ASTM D 1248 - Polyethylene Plastics Molding and Extrusion Materials.
- C. ASTM D 2122 - Determining Dimensions of Thermoplastic Pipe and Fittings.
- D. ASTM D 2412 - Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
- E. ASTM D 2837 - Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.



- F. ASTM D 2992 - Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings.
- G. ASTM D 3262 - "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
- H. ASTM D 3350 - Polyethylene Plastics Pipe and Fittings Materials.
- I. ASTM D 3681 - Chemical Resistance of "Fiberglass" (Glass-Fiber-Reinforced- Thermosetting-Resin) Pipe in a Deflected Condition.
- J. ASTM D 4161 - "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
- K. ASTM F 585 - Practice for Insertion of Flexible Polyethylene Pipe Into Existing Sewers.
- L. ASTM F 714 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
- M. ASTM F 794 - Specification for Poly (Vinyl Chloride ) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
- N. ASTM F 894 - Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.
- O. AWWA C 151 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

#### **1.04 DEFINITIONS**

- A. Sliplining: Reconstruction of sanitary sewers by insertion of liner pipe into existing sewers.

#### **1.05 SYSTEM DESCRIPTION**

- A. Sliplining is accomplished by pulling or pushing liner pipe into existing sewers by use of mechanical or hydraulic equipment. Once in place, liner pipe is allowed time to normalize and is then cut to fit between manholes. Annular spaces between liners and existing sewers are sealed at each manhole. Manhole inverts and benches are reworked and reshaped. Existing sewers remain in operation during sliplining process, with sewage flow diverted around operations in progress.

#### **1.06 QUALITY ASSURANCE**

- A. Liner Acceptance: Provide liner material manufactured, without defects, to standards and dimensions specified. Causes for rejection include physical defects or liner pipe, such as concentrated ridges, chain marks, discoloration, excessive spot roughness, pitting, visible cracks, foreign inclusions and varying wall thickness.



### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Prevent injury to or abrasion of pipe during loading, transportation and unloading. Do not drop pipe from vehicles nor allow pipe to roll down skids or slopes without proper restraining ropes. Use suitable pads, strips, skids or blocks for each pipe during transportation and while awaiting installation.
- B. Do not use, and remove from construction site, pipe with physical damage such as cuts, gashes, nicks or abrasions, whether from manufacturing, shipping, storage or handling, and which is deeper than 10 percent thickness.
- C. Use wide belly band slings for lifting and moving pipe. Do not use bare chains in contact with pipe.

### **1.08 PERFORMANCE REQUIREMENTS**

- A. Maintain sewage flow by diversion pumping or other method approved by the Water Utilities Engineer.
- B. Clear existing sewers of debris, obstructions and other foreign material and make point repairs to existing sewers as specified in Item 02553, Point Repairs and Obstruction Removals.
- C. Install sliplining according to this Section.
- D. Grout annular space(s) as per Manufacturer's specifications.
- E. Shape, refurbish or construct manhole inverts as specified in Item 02555, Manhole Rehabilitation.
- F. Test lines as specified in Item 02533, Acceptance Testing of Sanitary Sewers.
- G. Videotape-record completed lines as specified in Item 02558, Cleaning and Television Inspection of Sanitary Sewers.

### **1.09 SUBMITTALS**

- A. Comply with Section 1300, Contractor Submittals.
- B. Submit manufacturer's product data with complete information on pipeline materials, including physical properties and dimensions pertinent to this job.
- C. Submit independent testing laboratory test reports certifying that polyethylene pipe meets ASTM D 1248 and ASTM D 3350, that fiberglass reinforced plastic (FRP) pipe meets ASTM D 3681, or that PVC pipe meets ASTM F 794 and ASTM D 1784, as applicable.



- D. Submit grouting plan showing where grout is to be injected, materials and chemicals to be used in grout, anchoring methods, and planned grouting pressure.
- E. Submit videotapes as specified in Item 02558, Cleaning and Television Inspection of Sanitary Sewers.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Liner pipe systems shall be polyethylene, fiberglass reinforced plastic (FRP) PVC profile wall or polyethylene profile wall pipe, as approved by the City.
- B. Acceptable manufacturers for polyethylene line pipe: Chevron, CSR Pipeline System.
- C. Acceptable manufacturers for FRP liner pipe: Hobas USA, Inc.
- D. Acceptable manufacturers for profile wall PVC line pipe: Lamson Vylon
- E. Acceptable manufacturers for profile wall polyethylene liner pipe: Chevron (Spirolte).

**2.02 POLYETHYLENE LINER PIPE AND FITTINGS**

- A. Provide polyethylene liner pipe, manufactured of solid-wall, high-density, high-molecular-weight polyethylene meeting ASTM D 1248, Type III, Class C, Grade P-34, Category 5, with a PPI rating of PE 3408. Use polyethylene material with a minimum cell classification of 3454 34D or E (inner wall of light color) under ASTM D 3350. Higher-numbered cell classification limits giving desirable higher primary properties, according to ASTM D 3350, are also acceptable. Provide pipe with hydrostatic design value not less than 1600 psi when tested according to ASTM D 2837. Dimensions and workmanship shall be in accordance with ASTM F 714 and ASTM D 2122.
- B. Provide pipe with maximum Standard Dimension Ratio (SDR) and ratio of outside pipe diameter to wall thickness as specified below. Select SDR for the deeper of two manholes in each pipeline segment.

Maximum Liner SDR	Maximum dept feet
26	10
21	15
19	20
17	Greater than 20



C. Minimum Outside Diameter of liner:

Existing Sewer Nominal Diameter (Inches)	Minimum O.D. of Liner (Inches)
8	7.125
10	8.625
12	10.75
15	14.00
18	16.00
21	18.00
24	22.00
27	26.00
30	28.00

**2.03 FRP LINER PIPE AND FITTINGS**

- A. Pipe, joints and fittings: ASTM D 3262, Type 1, Liner 2, Grade 3.
- B. FRP Liner Pipe: Reinforced plastic mortar pipe manufactured by centrifugal casting process resulting in dense, nonporous, corrosion-resistant, consistent, composite structure. Minimum stiffness: 46 psi, measured accordance to ASTM D 2412. Use with a stiffness of 72 psi where specified or shown on the Drawings.
- C. Resin Systems: Thermosetting polyester epoxy resin, with or without filler, meeting ASTM D 3262.
- D. Reinforcing Glass Fibers: Commercial grad E.-type glass filaments, with binder and sizing compatible with impregnating resins.
- E. Filler: Sand with at least 98 percent silica content, and maximum moisture content of 0.2 percent.
- F. Joints: Low-profile FRP jacking bell-and spigot joints, with elastomeric sealing gaskets for watertight joints meeting ASTM D 4161.
- G. Dimensions and Tolerances:
  - 1. Pipe outside diameters and tolerances: Comply with ASTM D 3262, Cast Iron Pipe Equivalent Outside Diameters, and table below.
  - 2. When possible supply pipe in nominal lengths of 20 feet. Where radius curves in existing pipe or limitations in entry pit dimensions restrict pipe length, shorter lengths may be used.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

3. FRP pip minimum outside diameters and minimum wall thicknesses:

Existing Sewer Nominal Diameter (Inches)	Minimum Liner O.D. (Inches)	Minimum Wall Thickness 46 psi Stiffness (Inches)	Minimum Wall Thickness 72 psi Stiffness (Inches)
21	19.50	0.42	0.48
24	21.60	0.46	0.53
30	25.80	0.54	0.63
36	32.00	0.66	0.77
42	38.30	0.78	0.91
48	44.50	0.90	1.05
54	50.80	1.02	1.19
60	57.10	1.14	1.33
66	62.90	1.26	1.47
72	69.20	1.38	1.61
78	75.40	1.50	1.75

4. Fabricate pipe ends square to pipe axis plus or minus 0.25 inches, or plus or minus .05 percent of nominal diameter, whichever is greater.

H. Fittings:

1. Flanges, elbows, reducers, tees, wyes another fittings: Capable of withstanding operating conditions.
2. Fabrication: Contact-molded or manufactured from mitered sections of pipe joined by glass-fiber-reinforced overlays.

**2.04 PROFILE WALL PIPE**

- A. Profile wall pipe may be considered as liner pipe if appropriate submittals, including data, specifications and sizes were made and accepted during bid phase.
- B. PVC Profile Wall Pipe: Comply with Manufacturer’s recommendation.
  1. Minimum pipe stiffness: 46 psi.
  2. Pipe joints: Flush gasketed joint system meeting ASTM D 3212. Flush joints shall not increase outside diameter or reduce inside diameter of the pipe.



3. Minimum outside diameter for liners:

Existing Sewer Nominal Diameter (Inches)	Minimum O.D. of PVC Profile Wall Liner (Inches)
24	22.110
30	28.232
36	31.415
42	37.800
48	44.220

4. Supply pipe in nominal lengths of 15 feet.

C. Polyethylene Profile Wall Pipe:

1. Comply with ASTM F 894, Item 02505, High Density Polyethylene (HDPE) Solid and Profile Wall Pipe.
2. Minimum pipe stiffness: 46 psi.

**2.05 LINER PIPE SEALS AT MANHOLES**

- A. Sealer for annular spaces between liner pipes and host sewers at manholes: Oakum strips soaked in Scotch seal 5600 as manufactured by 3M Corporation, or approved equal.
- B. Non-Shrink Grout: Strong Seal's QSR patching material or approved equal.

**2.06 CLAMPS AND GASKETS**

- A. Clamps: Stainless steel, including bolts and lugs, as manufactured by JCM Industries, Type 108, or equal. Furnish full circle, universal clamp couplings with at least 3/16-inch thick neoprene grid-type gaskets. Select clamps to fit outside diameter of liner pipe as follows:

Liner Pipe O.D. (Inches)	Minimum Clamp Length (Inches)
7.125	15
8.625	18
10.750 or greater	30

**2.07 BEDDING MATERIAL**

- A. Bedding: Comply with Item 02320 - Utility Backfill Materials and Item 817 - Cement Stabilized Sand.



---

## **PART 3 EXECUTION**

### **3.01 OBSTRUCTION REMOVAL**

- A. Methods of removal and disposal of debris shall be approved by the Water Utilities Engineer.
- B. Refer to Item 02553, Point Repairs and Obstruction Removals, for requirements and procedures for point repairs and obstruction removals.

### **3.02 DIVERSION PUMPING**

- A. Refer to Item 01540, Diversion Pumping.

### **3.03 INSERTION OR ACCESS PITS**

- A. Locate pits so that the total number is minimized and footage of liner pipe installed in a single pull is maximized. Where possible, use excavations at point repair locations for insertion pits.
- B. Before excavating, check with various utility providers (e.g., Center Point Energy, Southwestern Bell, City of Beaumont, Entex), and determine locations of utilities in or near the work area. Costs of utility repairs, temporary service and other costs arising out of damage to or interruption of utilities, resulting from operations under this Contract, shall be borne by Contractor at no additional cost to City.
- C. Perform excavation and backfill in accordance with Item 02317, Excavation and Backfill for Utilities.
- D. Perform work in accordance with OSHA standards. Comply with Item 712, Trench Safety System, for excavations requiring trench safety.
- E. Install and operate necessary dewatering and surface water control measures in accordance with Item 01578, Control of Ground Water and Surface Water.

### **3.04 POLYETHYLENE LINER PIPE INSTALLATION**

- A. Joints:
  - 1. Assemble and join sections of polyethylene liner pipe on site, above ground. Make joints by heating and butt-fusion method in strict conformance to manufacturer's instructions.
  - 2. Use operators who are experienced with butt-fusion field-jointing of pipe. Operators shall be trained in fusing polyethylene pipe with similar equipment using proper jigs and tools in accordance with pipe manufacturer's standard procedures.
  - 3. Form joints with smooth, uniform double-rolled back beads made while applying



proper melt., pressure and alignment. Joints will be inspected by the Water Utilities Engineer before insertion.

- B. Preparation: After completing insertion pit excavation, remove top of existing sanitary sewer line down to spring line. Connect power winch cable to end of liner by use of suitable pulling head equal to outside diameter of liner. Secure pulling head to liner and attach to power winch cable so that liner can be satisfactorily fed and pulled through sanitary sewer line. Prevent ragged edges of existing pipe from scarring liner pipe. Follow insertion procedures in ASTM F 585. Do not allow sand or other debris to enter liner.
- C. Pulling Liner:
  - 1. Maximum length of continuous liner assembled above ground and pulled at any one time, do not exceed length recommended by manufacturer's printed instructions.
  - 2. Limit pulling force exerted on liner to that indicated below for the appropriate outside diameter of the polyethylene liner. Provide a suitable pulling force measuring device connected to the winch or pulling mechanism.

Polyethylene Liner O.D. (Inches)	Maximum Pulling Force (Tons)
7.125	3.5
8.625	5.0
10.750	8.0
12.750	12.0
14.0	14.0
16.0	19.5
20.0	29.0
28.0	52.0

- D. Alternate Insertion Techniques: Pushing, or a combination of pulling and pushing, may be used subject to the Water Utilities Engineer's approval. Avoid liner buckling or dimpling by limiting stroke of pushing implement. Cut out and remove portions damaged during insertion process.

**3.05 FRP LINER PIPE INSTALLATION**

- A. FRP liner pipe may be pushed or pulled into existing sewers. Insert pipes, spigot end first, with bell end trailing. Apply pushing force to pipe wall end inside bell in accordance with manufacturer's instructions. Do not apply jacking loads to end of bell. Maximum allowable joint angular deflection one degree. Keep within safe jacking loads as follows:

Nominal Diameter

Maximum Jacking Load



<u>(Inches)</u>	<u>(Tons) for 46 psi Stiffness</u>
21	22
24	30
30	42
36	50
42	65
48	80
54	100
60	120
66	140
72	160
78	180

### **3.06 PROFILE WALL PIPE INSTALLATION**

#### **A. PVC Profile Wall Pipe**

1. Evaluation: Prior to each installation of PVC profile wall pipe, pull trail liner approximately 15 feet long and of the same diameter proposed, to make sure proposed pipe will completely pass through existing line.
2. Preparation:
  - a. After completing insertion pit excavation, remove top of existing sanitary sewer host pipe down to spring line to expose channel for liner placement. Prevent ragged edges of host pipe from scarring liner pipe.
  - b. Regulate sewer flow so pipe is flowing approximately one-third full. Do not allow sand or other debris to enter liner or annular space during pipe insertion.
3. Installation:
  - a. Pushing Liner: Place liner pipe in channel and push forward. Use pushing plate or insertion ring to distribute load from hydraulic or mechanical pipe pusher to end of profile wall pipe. Attach device for measuring jacking/pushing force to pipe pusher. Constantly monitor jacking/pushing manufacturer for specific instructions and recommendations. Notify the Water Utilities Engineer each time there is deviation from proposed installation plan. Maximum length of PVC profile wall pipe inserted/pushed: Do not exceed manufacturer's recommendations.
  - b. Joints: After insertion of liner pipe, lubricate gasketed couplings and grooved spigots with special subaqueous lubricant furnished by pipe manufacturer.
  - c. Closely monitor grouting pressures; not exceed 5 psi. Remove liner pipe collapsed by excess grouting pressure of improper procedure and replace with undamaged liner pipe.



**B. Polyethylene Profile Wall Pipe**

1. Evaluation: Prior to each installation of profile wall pipe, pull trial liner approximately 15 feet long and of the same diameter proposed, to make sure proposed pipe will completely pass through existing line.
2. Preparation:
  - a. After completing insertion pit excavation, remove top of existing sanitary sewer host pipe down to spring line to expose channel for liner placement. Prevent ragged edges of host pipe from scarring liner pipe.
  - b. Do not allow sand or other debris to enter liner or annular space during pipe insertion.
3. Installation
  - a. Jack or push liner pipe into host pipe without obstruction such as dropped or shifted joints. Constantly monitor jacking/pushing force during the insertion. Place insertion ring or pushing plate between pushing/jacking device and end of pipe. Jacking/pushing force shall not exceed 10 tons.
  - b. Joints:
    - (1) Place gasket facing correct direction and properly seated in spigot groove.
    - (2) Apply to lubricant entire spigot groove, to exposed gasket surface and to entire inner surface of bell.
    - (3) Seat spigot in "home" position in bell.
  - c. Grout pressure: Do not exceed collapse resistance of the liner. Remove liner pipe collapsed by excess grouting pressure or improper procedure and replace with undamaged line pipe.

**3.07 CLAMP INSTALLATION**

- A. Where excavations for liner pipe insertion are made between two manholes, cut ends of liner pipe smooth, square to pipe axis. Join liner pipes with appropriately sized stainless steel universal clamp couplings. Butt together gap between ends of liner pipe with space between ends not exceeding 2 inches.
- B. Bedding: Install cement-stabilized sand in accordance with Section 712 - Cement Stabilized Sand. Extend bedding 12 inches above clamp/liner pipe.

**3.08 FRP COLLAR/CLOSURE**



- A. Install FRP collar closure pieces in accordance with manufacturer's recommendations.

### **3.09 FIELD QUALITY CONTROL**

- A. After liner installation, perform the following tests:
  - 1. Low pressure air test: Perform before sealing liner in place at manholes, and before making service re-connections to liner. Check integrity of joints made, and verify that liner has not been damaged.
  - 2. Service lateral connection test: After all service laterals have been completed for a particular sewer section, verify integrity of re-connections at points where they join liners and existing service lines by performing smoke test.
  - 3. Refer to Item 02533, Acceptance Testing for Sanitary Sewers, for applicable test procedures.

### **3.10 SEALING LINER IN MANHOLE**

- A. Allow liner pipe to normalize to ambient temperatures and recover from imposed stretch before cutting to fit between manholes, sealing at manholes and shaping manhole invert. Allow at least 12 hours for normalization of polyethylene.
- B. Cut liner so it extends 4 inches into manholes. Make smooth, vertical cuts and slope areas over top of exposed liner using non-shrink grout.
- C. Seal annular spaces between liner and sanitary sewer main at each manhole with chemical seal and non-shrink grout. Place strips of oakum soaked in sealer in a band to form effective watertight gasket in annular space between liner and existing pipes in manhole. Make width of the sealing band at least 12 inches, or one-half pipe diameter, whichever is greater.
- D. Finish seal liner pipe to host pipe with non-shrink grout placed around annular space from inside manhole. Apply grout in a band at least 6 inches wide. Obtain the Water Utilities Engineer's approval of sealing methods, including seal chemicals and materials.
- E. Use cementitious grout to form smooth transitions with reshaped inverts and raised manhole benches to eliminate sharp edges of liner pipe, concrete benches, and channeled inverts. Build up and smooth manhole invert to match flow line of new liner.

### **3.11 GROUTING ANNULAR SPACE**

- A. Obtain approval of grouting plan from the Water Utilities Engineer before proceeding with the Work.



- B. Grout annular space between the outside of liner and inside of existing pipe for sewer pipe 18 inches in diameter and larger, in accordance with Manufacturer's specifications.

### **3.12 POST-INSTALLATION VIDEOTAPE RECORDING**

- A. Provide the Water Utilities Engineer with videotape showing completed work including condition of restored connections. Comply with Item 02533 - Acceptance Testing for Sanitary Sewers and Item 02558 - Cleaning and Television Inspection of Sanitary Sewers.

### **3.13 FINAL CLEANUP**

- A. Upon completion of installation and testing, clean and restore project area affected by work of this Section. Restore site to a condition equal to or better than pre-construction.

End of Section



---

**ITEM 02553**

**SPECIFICATIONS FOR POINT REPAIRS AND  
OBSTRUCTION REMOVALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Repair of sanitary sewer lines by replacing short lengths of failed pipe with new pipe.
- B. Repair of service lines located within the utility easement or street right-of-way, by replacing short lengths of failed pipe with new pipe.
- C. Obstruction removal by remote device or excavation.

**1.02 MEASUREMENT AND PAYMENT**

- A. Unit Prices:
  - 1. Point Repair:
    - a. Measurement for sewer line point repair is on a unit price basis for each repair performed. Minimum length of pipe to be replaced for each repair, determined by depth of sewer line measured from natural ground to flow line at a point of repair:
      - (1) Up to 10-foot depth: 6 feet minimum length.
      - (2) 10 to 15-foot depth: 9 feet minimum length.
      - (3) Greater than 15-foot depth: 12 feet minimum length.
    - b. Measurement for sewer line extra length point repair is on a linear foot basis in excess of minimum replacement lengths specified above.
    - c. Payment for service line point repair is on a linear foot basis for all sizes of service lines and for all depths (same unit price per linear foot, regardless of size and depth). No separate payment will be made for point repair done within the limits of a service line reconnection as defined in Item 02534 - Sanitary Sewer Service Stubs or Reconnections. Minimum length of service line point repair is 3 feet.
    - d. Measurement for hand excavation is on a cubic yard basis when authorized by the Water Utilities Engineer in locations where excavation by machine is not suitable.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

- 
- e. Measurement for abandonment of point repair by excavation is on a cubic yard basis for excavation required to expose existing pipe. Separate measurement will be made for machine excavation and hand excavation.
  - f. Measurement for abandonment of point repair by Videotape inspection is on a linear foot basis for pre-installation Videotape inspection.
  - g. The cost of the following items of work are included in the unit prices for point repairs:
    - (1) Excavation, embedment and backfill.
    - (2) Hauling away and lawful disposal of excess excavated materials and debris.
    - (3) Pipe, pipe fittings, adapters and concrete collars.
    - (4) Smoke testing and any required retesting.
    - (5) Restoration of site improvements, including sodding.
    - (6) Pre- and post-cleaning videotape inspection.
2. Obstruction Removal:
- a. Obstruction removal by excavation will be paid on a unit price basis according to depth for each removal. Obstruction removal can be submitted for payment when the obstruction has been cleared from the sewer line to be lined. Liner obstruction will be considered (i.e., all obstruction within a distance of 6 feet is considered to be part of the same obstruction.)
  - b. Obstruction removal by remote device will be paid on a unit price basis, per manhole section, and shall include all obstruction removals within a manhole section.
  - c. Depth shall be measured from natural ground level to the flow line at the point of obstruction removal.
  - d. The cost of the following items of work are included in the unit prices for obstruction removal by remote device or excavation:
    - (1) Cleaning of sanitary sewers due to broken pipe, roots, dirt, loose deposits, etc.
    - (2) Television inspection.
    - (3) Excavation, embedment and backfill.

- (4) Hauling away and lawful disposal of excess excavated material and debris.
  - (5) Restoration of site improvements, including sodding.
  - e. Payment will not be made for obstruction removal if the existing sewer line, service line or tap is damaged and a point repair is required. Payment will not be made for removal of a protruding tap if the service reconnection is performed by excavation.
  - f. Removal of hard deposits, concrete, debris, pipes or any other material in a manhole, or that is accessible from the manhole wall, will be cleared under work items for rehabilitation of sanitary sewer pipes and manholes.
- B. Stipulated Price (Lump Sum): If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total stipulated Price.

### **1.03 PERFORMANCE REQUIREMENTS**

- A. Point Repair:
- 1. Locate and replace small lengths of one or more pipe sections where isolated line failure has occurred due to settlement, corrosion, crushing, or separation of joints.
  - 2. The Water Utilities Engineer may identify potential locations for point repair, but the Contractor is responsible for verifying locations. Point repairs to sewer lines are listed in Point Repair Rehabilitation Tables. Point repairs to service lines are listed in Lateral Line Rehabilitation Tables.
  - 3. Determine the location of service line repairs by smoke testing the manhole section in which the failed pipe is located. The Water Utilities Engineer will authorize the Contractor to make point repairs based on results of smoke testing.
  - 4. Conduct all smoke testing in accordance with the City of Beaumont "Procedures to Conduct Physical Inspections of the Wastewater Collection System". Smoke testing shall not be performed within 24 hours of a rainfall event or if ponded or standing water is present on the ground or in the drainage channels in the area planned for smoke testing.
  - 5. Smoke testing shall be accomplished utilizing two (2) minimum 1,750 CFM blowers designed specifically for smoke testing of sewers. Place blower on the upstream and downstream manhole of the line section to be tested. Place sand bags in the upstream and downstream manholes to isolate the section being tested and prevent the migration of smoke into sections not being tested. Utilize smoke canisters as necessary to ensure a continuous supply of smoke is provided for the entire duration of the test period.
  - 6. Determine the location of point repairs by smoke testing or videotape inspection of



the manhole section in which the failed pipe is located. The Water Utilities Engineer will authorize the Contractor to make point repairs.

7. The Water Utilities engineer will authorize each point repair after failure points are located. Do not make point repairs without prior authorization of the City Engineer. Perform point repairs only on those portions of service lines which are located in an easement or right-of-way; perform no repairs to service lines on private property.
  8. Replace carrier pipe for point repairs unless otherwise directed by the Water Utilities Engineer.
- B. Obstruction Removal: Remove obstructions by one of the following methods:
1. Obstruction removal by remote device:
    - a. Protruding taps: Service lines that protrude more than one inch into the sewer.
    - b. Other obstructions: Hanging gaskets, fixed debris, stabilized sand, hardened mineral deposits, roots, rust scale, tuberculation, etc.
  2. Obstruction removal by excavation: Obstructions encountered during liner insertion that are removed by digging and exposing the pipe.

#### **1.04 DEFINITIONS**

- A. Point Repair: Repair of broken or collapsed gravity sanitary sewer lines on public property, including mains, collectors and service lines, by replacing, at the point of failure, the length of failed pipe with new pipe.
- B. Obstruction Removal: Clearing sewer mains of obstructions to allow for rehabilitation.
- C. Sewer Lines: Gravity flow pipe lines in the easement or right-of-way which collect sanitary sewer discharges from commercial or residential service lines and discharge into another sewer line (main or collector), or into a lift station or treatment plant.
- D. Service Lines: Those gravity flow sewer lines from commercial or residential property that discharge into a sewer line.

#### **1.05 SUBMITTALS**

- A. Submittals: Comply with Section 1300 - Contractor Submittals.
- B. Submit product data for each pipe product, fitting and jointing material.



---

## **1.06 SEQUENCING**

- A. Before rehabilitating a sewer line section between adjacent manholes, complete point repair and obstruction removal on that section.
- B. Clean line and perform post-installation videotape inspection for each point repair on sewer lines not scheduled for rehabilitation.
- C. Post-installation videotape inspection of service line point repairs is not required.

## **PART 2 PRODUCTS**

### **2.01 PVC PIPE**

- A. PVC Sewer Pipe and Joints: 4-inch through 24-inch pipe complying with Item 702 - PVC Gravity Sewer Pipe and Fittings. If point repair is located at a service connection, use a full-bodied fitting for the service connection. No field fabrication of fittings allowed.

### **2.02 DUCTILE IRON PIPE**

- A. Ductile Iron Pipe: 4-inch through 48-inch, complying with Item 707 - Ductile Iron Pipe and Fittings.
- B. Fittings: Push-on end-joint fittings with bell-and-spigot ends, with bells modified for push-on joints, complying with Item 707 - Ductile Iron Pipe and Fittings.
- C. Interior Coating: Comply with Item 707 - Ductile Iron Pipe Fittings.
- D. Exterior Coating: 8-mil polyethylene tubular material as per Manufacturer's specifications.

### **2.03 REINFORCED CONCRETE PIPE**

- A. Reinforced Concrete Pipe and Joints: Comply with Section 02611 - Reinforced Concrete Pipe. Reinforced concrete pipe may be used for sewers 21 inches in diameter and larger.

### **2.04 FRP PIPE**

- A. FRP Pipe: Comply with Manufacturer's specifications.

### **2.05 JOINTING MATERIALS**

- A. Use flexible adapters secured with ½-inch stainless steel bands, as manufactured by Fernco, or approved equal.



- B. Form a concrete collar around each joint using concrete complying Manufacturer's specifications.

## **PART 3 EXECUTION**

### **3.01 PROTECTION**

- A. Provide barricades, warning lights and signs for excavations created by point repairs as per Special Provisions - Detours, Barricades, Warning Signs, Sequence of Work, etc.
- B. Do not allow soil, sand, debris or runoff to enter sewer system.

### **3.02 DIVERSION PUMPING**

- A. Install and operate diversion pumping equipment as required to maintain sewage flow and to prevent backup or overflow. Comply with Item 01540 - Diversion Pumping.

### **3.03 EXCAVATION**

- A. Excavation and backfill trenches in accordance with Item 02317 - Excavation and Backfill for Utilities.
- B. Perform work in accordance with ASHA standards Employ a trench safety system as required in Item 712 - Trench Safety Systems.
- C. Install and operate necessary dewatering and surface water control measures as required in Item 01578 - Control of Ground Water and Surface Water.
- D. Remove and lawfully dispose of excess excavated material and debris from the work site daily.

### **3.04 TYPICAL SEQUENCE OF POINT REPAIR**

- A. Perform pre-installation videotape inspection to verify location of sewer line point repairs. Perform service testing between manholes to verify location of service line point repairs.
- B. After the location of a point repair, excavate the required length for the point repair.
- C. Prior to replacing pipe, determine condition of the existing line on both sides of the point repair by lamping the line at least 10 feet in each direction. Determine whether additional lengths of line (beyond "minimum length" criteria) need replacement. Report need for additional replacement to the Water Utilities Engineer and obtain authorization before proceeding.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

- D. Remove the damaged pipe and replace with new pipe, shaping the bottom of the trench and placing the required pipe bedding so that the grade of the replaced pipe matches the grade of the existing line. Establish proper grade for the pipe being replaced using methods acceptable to the Water Utilities Engineer.
- E. Connect the new pipe to existing pipe using flexible adapters. If joints cannot be made watertight using flexible adapters, place waterstop gaskets on each joint and encase in a reinforced concrete collar. Place concrete as per Manufacturer's specifications. Reconnect affected service connections or stacks using full-bodied fittings. No field fabrication of fittings allowed.
- F. After completion of point repair, but prior to backfill, perform a smoke test to demonstrate the integrity of the repair, in the presence of the Water Utilities Engineer. Test as specified in Item 02533 - Acceptance Testing for Sanitary Sewers. Repair and retest sections that fail until repair passes test.
- G. Encase exposed pipe in cement stabilized sand complying with Item 817 - Cement Stabilized Sand.
- H. Backfill the excavation as specified in Item 02317 - Excavation and Backfill for Utilities.
- I. Site to be restored to a condition equal to or better than pre-construction.
- J. Perform a post-installation videotape inspection as specified in Item 02558 - Cleaning and Television Inspection. Point repairs that show offset joints, non-uniform grade, incorrect alignment, excessive deflection or similar conditions are considered defective work. Replace pipe and bedding as required to correct defective work.

**3.05 ABANDONMENT OF POINT REPAIR**

- A. If pipe is exposed by excavation and found to be in good condition, not requiring a point repair, that point repair shall be abandoned. Notify Water Utilities Engineer.
- B. If pre-installation videotape inspection reveals that no point repair is required in a manhole section, point repair shall be abandoned. Notify Water Utilities Engineer.
- C. Backfill the excavation, replace pavement or sidewalk, and repair and seed or sod unpaved areas, to a condition equal to or better than pre-construction.

**3.06 OBSTRUCTION REMOVAL**

- A. Remote Device: Remove obstructions identified on videotape of a sanitary sewer line segment which could cause a non-uniform liner pipe installation or obstruction of the liner during installation. Obtain authorization from the Water Utilities Engineer for obstruction removal with a remote device before proceeding.



- 
1. Use a power-driven cutting device (robotic cutter) to remove protruding taps. Cut protruding taps so that protrusions are no greater than 3/4 inch. If a protruding tap cannot be removed by the cutting device, then a point repair may be performed. Obtain authorization from the Water Utilities Engineer before proceeding.
  2. To remove other obstructions, use a remote device. Pull or drive the device from manhole to manhole up to a continuous length of 500 feet using a solid steel mandrel, porcupine, root saw, bucket, robotic cutter or similar device to remove the obstruction. Select a device that is adequately sized to remove the obstruction.
- B. Excavation: Use excavation as the method of obstruction removal when installation of the liner in the sanitary sewer is in progress. If during the liner insertion operation, a collapsed sewer, off-set joint or other obstruction is encountered which prevents or blocks the passage or insertion of the liner, notify the Water Utilities Engineer for authorization to excavate. Uncover and remove the obstruction as follows:
1. Excavate at the point where there is an obstruction. Use a trench safety system as required.
  2. Break out the existing sanitary sewer pipe (carrier pipe) as directed by the Water Utilities Engineer. Remove only that amount of material which is causing the obstruction. Remove the minimum amount of carrier pipe.
  3. Under such conditions, replacement of the carrier pipe is not required. Do not disturb the existing sewer bedding during excavation. However, if embedment is disturbed during the obstruction removal procedure, place cement-stabilized sand or crushed stone beneath the liner.
  4. When the liner is completely in place, encase it with crushed stone or cement-stabilized sand.

End of Section



---

**ITEM 02555**

**MANHOLE REHABILITATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Repair, rehabilitation or replacement of deteriorated, leaking or structurally unsound manholes.

**1.02 MEASUREMENT AND PAYMENT**

- A. Unit Prices:

- 1. Rehabilitated Manholes:

- a. Measurement for manhole wall lining (including bench repair) is on a vertical foot basis to the nearest tenth of a foot, measured from the bottom of the frame to the top of the bench. If the bench is not required, measurement will be from the bottom of the frame to the top of the effluent pipe. The price shall include manhole adjustment, a new manhole ring, frame and cover, new stainless steel insert, and surface restoration.
- b. Backfill, including cement-stabilized sand, is included in the unit prices for rehabilitated manholes; no separate payment will be made.

- 2. New/Replacement Manholes:

- a. Measurement for abandoned manholes is on a unit price basis per manhole abandoned.
- b. Measurement for new manholes is on a unit price basis, per manhole. Price includes excavation, removal of existing manhole/cleanout/end of line, new frame and cover, sealant and backfill materials. Price also includes up to 6 feet of sewer pipe, in each and every direction, measured from the outside wall of the manhole.
- c. Backfill, including cement-stabilized sand, is included in the unit price for new/replacement manholes; no separate payment will be made.

**1.03 REFERENCES**

- A. ASTM C 1140 - Standard Practice for Preparing and Testing Specimens from Shortcrete Test Panels.



- 
- B. ASTM D 698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft).

#### **1.04 PERFORMANCE REQUIREMENTS**

- A. Performance work needed to make manholes structurally sound, improve flow, prevent entrance of inflow or groundwater, prevent entrance of soil or debris, and provide protection against hydrogen sulfide gas attack.
- B. Manufacturer's Product Support: When requested by the Water Utilities Engineer, provide a representative employed by the manufacturer having technical training in admixture and manhole wall liner available for consultation on site upon 48 hours notice.

#### **1.05 SUBMITTALS**

- A. Submittals: Comply with Section 01300 - Contractor Submittals.
- B. Product Data: Submit product data, including surface preparation instructions and application instructions, from pre-approved manufacturer of wall repair materials, hydraulic cements, quick-set mortars, specialized sealants, grouts, manhole inserts, manhole frame covers and frame-to-manhole seals.
- C. Installer Qualifications: Installers of liners and wall repair systems shall submit qualifications to the Water Utilities Engineer. List installer's personnel who have satisfactorily completed manufacturer's training in product application within the previous 2 years. Include date of certification for each person.

#### **1.06 PROJECT CONDITIONS**

- A. Manholes Containing Mechanical or Electrical Equipment:
1. Drawings may not show locations of flow monitoring equipment. If a manhole contains any mechanical hardware or electrical flow monitoring equipment, immediately notify the Water Utilities Engineer.
  2. Reschedule work in such manholes until equipment has been removed by the City and further instructions are given.
  3. Do not subject manholes with mechanical hardware or electrical equipment to diversion or bypass pumping.
  4. Damage to installed equipment, due to Contractor's failure to adhere to this instruction, will be repaired by the City and cost of repairs charged to the Contractor.



- 
- B. Field Location of Manholes, Cleanouts and End of Lines:
1. Contractor is responsible for locating and uncovering all manholes, cleanouts and ends of lines. If Contractor is unable to locate manholes, cleanouts or ends of lines, Contractor shall notify Water Utilities Engineer in writing.
  2. Manholes may be located within project limits which are not part of the system being rehabilitated. Properly identify manholes before starting work.

### **1.07 SALVAGE**

- A. Manhole covers and frames from abandoned and replaced manholes remain the property of the City. Unless indicated to be re-used in the work, deliver salvaged items to 1350 Langham Road, Beaumont, Texas.

## **PART 2 PRODUCTS**

### **2.01 WALL CLEANING MATERIAL**

- A. High Pressure Water: 3500 psi minimum force.
- B. Cleaners: Detergents or muriatic acid capable of removing dirt, grease, oil and other matter which would interfere with bond of sealing material to wall; refer to sealing manufacturer's recommendations.

### **2.02 WALL REPAIR MATERIALS**

- A. Hydraulic Cements: Use a blend of cement powders or hydraulic cement to stop active leaks in the manhole structure.
- B. Quick-set Mortar: Use a quick-set mortar to repair wide cracks, holes or disintegrated mortar.

### **2.03 MANHOLE WALL LINERS, BENCH FORMING AND REPAIR MATERIAL**

- A. Use products approved by City of Beaumont Water Utilities Engineer.

### **2.04 MANHOLE COVERS, FRAME INSERTS AND FRAME-TO-MANHOLE SEALS**

- A. New Covers/Frames: Comply with Item 708 - Manholes.
- B. Existing manhole shall be water tight and include a stainless steel rain stopper.
- C. Provide manhole inserts including new dishes, gaskets and relief valves. Select appropriate watertight inserts to fit walls and frames of manholes.



1. Stainless steel (18 gauge minimum) inserts; Southwestern Packing and Seals "Rain Stopper," or approved equal.
  2. Inserts shall have a handle of plastic-coated stainless steel installed on the body of the insert dish. The handle shall be attached with a #6 high-grade stainless steel rivet. Each dish shall have a factory-installed 5-foot-long, 3/16" braided stainless steel retaining cable to connect the dish to the manhole frame.
- D. Frame-to-Manhole Seals: As manufactured by Cretex, or approved equal.
- E. Sealing materials between adjustments rings and manhole frame shall be Adeka Ultraseal P201 or approved equal.

### **PART 3 EXECUTION**

#### **3.01 PROTECTION**

- A. Provide barricades, warning lights and signs for manhole or cleanout removal excavations. Comply with City of Beaumont Special Provisions Section.
- B. Do not allow soil, sand debris or runoff to enter sewer system.

#### **3.02 EXCAVATION**

- A. Excavation in accordance with Item 02317 - Specifications for Underground Construction of Water and Sewer Pipes.
- B. Perform work in accordance with OSHA standards. Employ a trench safety system as required in Item 712 - Trench Safety System.
- C. Install and operate necessary dewatering and surface water control measures as required in Item 01578 - Control Ground Water and Surface Water.

#### **3.03 DIVERSION PUMPING**

- A. Install and operate diversion pumping equipment to maintain sewage flow and to prevent backup or overflow as specified in Item 01540 - Diversion Pumping.
- B. In the event of accidental spill or overflow, immediately stop the overflow and take action to clean up and disinfect spillage. Promptly notify the Water Utilities Engineer so that required reporting can be made to the Texas Commission on Environmental Quality and U.S. Environmental Protection Agency.



---

### **3.04 CLEANOUT/END OF LINE REMOVAL AND REPLACEMENT**

- A. Remove and replace clean-outs as per City of Beaumont Standard Details.

### **3.05 ABANDONMENT OF CLEANOUTS AND MANHOLES**

- A. Abandon manholes that are designated on Drawings or directed by the Water Utilities Engineer to be abandoned.
- B. Dismantle manholes to be abandoned, including frames, to 2 feet below ground level.
- C. If a manhole is to be abandoned on a rehabilitated line, install a carrier pipe through the manhole structure and fill the manhole with cement-stabilized sand, compacted to a level 2 feet above the top of carrier pipe.
- D. If a manhole is to be abandoned on an abandoned line, plug all lines in the manhole and backfill in accordance with Item 02317 - Specifications for Underground Construction of Water and Sewer pipes.
- E. If a manhole is to be abandoned in a paved street, backfill manhole as described above, but with cement-stabilized sand to underside of pavement repair in lieu of select backfill material. Patch paving in lieu of select backfill material. Patch paving in accordance with City of Beaumont Standard Details.
- F. If an abandoned manhole is not located in a paved street, fill remainder of manhole with select backfill material to 2 feet below ground level. Restore surface to match adjacent area.

### **3.06 MANHOLE WALL CLEANING**

- A. Clean bench/invert floor and interior walls of manholes by removing deleterious materials, including dirt, grease and other debris. Use high pressure water at a minimum force of 3500 psi. If required, use detergent or muriatic acid to remove grease, oil and other matter which would interfere with bond between existing manhole wall and approved repair materials.
- B. Prepare interior surfaces as recommended by the wall liner material manufacturer. Remove brick steps and cast iron steps prior to wall lining.

### **3.07 MANHOLE WALL SEALING**

- A. Seal active leaks in manhole structures with a blend of cement powder or hydraulic cement.
- B. Remove loose or defective wall material. Wipe or brush surfaces clean prior to application of hydraulic cements.



- 
- C. Stopping Leaks: Drill weep holes at bottom of manhole walls to relieve hydrostatic pressure. Plug pressure-relief holes after leaks are stopped using hydraulic cement materials. Lead wool may also be used to plug large leaks.
  - D. Repair wide cracks, holes and disintegrated mortar with quick-set mortars following manufacturer's instructions and recommendations.
  - E. Reshape manhole inverts before wall-sealing work. Apply concrete to cleaned manhole benches.
  - F. After active leaks have been stopped, clean and prepare walls for application of selected liner material.
  - G. Properly apply sealing compound to provide the minimum required uniform coating to the wall surface.
  - H. Prevent foreign material from entering adjoining pipes. Remove droppings of foreign and wall sealant materials before they harden on the bottom of the manhole.
  - I. Strictly follow product manufacturers' published instructions and recommendations for surface preparation, application and proportioning.

### **3.08 MANHOLE REMOVAL AND REPLACEMENT**

- A. When indicated on the Drawings or instructed by the Water Utilities Engineer, excavate and properly remove and dispose of the existing manhole, including base. Employ a trench safety system and keep the excavation dry from sewage flow and surface or ground water.
- B. Replace manhole with a new manhole as specified in Item 708- Manholes and per City of Beaumont Standard Details.
- C. Construct or reconstruct drop connections whenever the flowline elevation of an influent line is more than 24 inches above the bench elevation.
- D. Sewer pipe up to 6 feet outside new manholes may be replaced with new sewer pipe in conjunction with manhole removal and replacement.
- E. Properly backfill replacement manholes as required by Manufacturer.
- F. Furnish replacement manholes with new 32-inch frames and covers as per City of Beaumont Standard Details.



---

### **3.09 MANHOLE BENCHES/INVERTS**

- A. Remove obstructions and loose materials from benches prior to shaping inverts. Form smooth, U-shaped inverts having minimum depths of one-half the pipe diameter and channel it across the floor of the manhole using an approved manhole rehabilitation material. Control flow to allow sufficient setting time for material used.
- B. Make finished benches and inverts smooth and without defects which would allow accumulation of debris.

### **3.10 MANHOLE COVERS AND FRAMES**

- A. Adjust manhole frames and covers found above or below grade and reset loose frames. Combine precast concrete adjustment rings so that the elevation of the installed frame and cover extends 6 inches above the natural ground in unpaved areas. In paved areas, set flush and smooth with pavement grades. An approved sealant shall be applied between the top and adjustment ring and the manhole frame. No less than two beads shall be applied ½-inch wide and ¾-inch high. An approved manhole cementitious lining material shall be applied between the rings and no less than 1-inch of lining material shall be applied to the inside and outside face of the adjustment rings.
- B. Install new watertight manhole covers and frames at locations shown on the Drawings or where instructed by the Water Utilities Engineer. Use new frames and covers.

### **3.11 MANHOLE INSERTS**

- A. Install stainless steel manhole inserts in all replaced and rehabilitated manholes.
- B. Exercise care in selecting the proper insert dish to fit properly with the manhole frame and cover. The insert flange should have an outside diameter 3/16 inch less than the inside diameter of the manhole frame. Once proper fit is established, clean manhole frame surface of all dirt, grit and debris with a wire brush. Fully seal insert on the manhole frame, providing a watertight seal.
- C. Securely attach retaining tether to the manhole frame following manufacturer's instructions with a tamper-proof anchoring device.
- D. Replace damaged, tight-fitting or missing inserts identified prior to final inspection at no cost to the City.
- E. For new sanitary sewer manholes subject to loading or differential movement at manhole frames, and for rehabilitated manholes, install manhole chimney seals to prevent inflow between manhole frames and masonry chimneys.



---

### **3.12 FRAME-TO-MANHOLE SEALS**

- A. Surfaces on which the sleeve or extension is to be compressed shall be circular, clean, reasonably smooth and free of loose material and excessive voids. If a surface is rough or irregular and would not provide an effective seal, smooth it with an approved microsilica-enhanced grout. Repair flaws in manhole frames, such as cracks, pits or protrusions, by filling with concrete or grinding smooth. This type of surface work will need to be done on manholes that have not been lined; manholes that have been lined should not need any surface work in order to install seal.
- B. Install seals following manufacturer's installation instructions. Arrange for manufacturer's representative to train Installer's personnel in proper methods of installing seals and assist the Installer and Contractor with any problems they might encounter installing the seals.
- C. If internal surfaces of the chimney or corbel section of the manhole exceed a slope of 1 in 3, do not use a frame-to-manhole seal.
- D. Install frame-to-manhole seals so as to prevent water migration between manhole frames and manhole structures.

### **3.13 FIELD QUALITY CONTROL**

- A. Inform the Water Utilities Engineer immediately if materials being used are not producing required results or need modification. The Water Utilities Engineer has the right to stop the use of any material at any time.

### **3.14 INSPECTION**

- A. After manhole wall sealing or manhole rehabilitation is complete, visually inspect manholes in the presence of the Water Utilities Engineer. Check for cleanliness and for elimination of active leaks.
- B. At completion of manhole rehabilitation, assist the Water Utilities Engineer in verifying installation of minimum coating thickness of concrete liner. Test several points on manhole walls. Repair verification points prior to final acceptance for payment.

### **3.15 TESTING**

- A. Perform leakage testing for manholes, refer to Item 02533 - Acceptance Testing for Sanitary Sewers.

### **3.16 BACKFILL**

- A. Backfill and compact soil in area of excavation surrounding manholes in accordance with Item 02317 - Specifications for Underground Construction of Water and Sewer Pipes.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

- B. In unpaved areas, grade surface at a uniform slope of 1 to 5 from the manhole frame to natural grade. Provide at least 4 inches of topsoil.

End of Section

---

**ITEM 02558**

**SPECIFICATIONS FOR  
CLEANING AND TELEVISION INSPECTION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Cleaning sewer lines remove solids, roots, soil, sand, pieces of broken pipe, bricks, grease, grit from sewer lines and manholes and other debris, thus improving flow and facilitating television inspection for sewer evaluation. Cleaning includes initial manhole wall washing by high-pressure water jet.
- B. Television inspecting the line to obtain quality DVDs and Television Inspection Reports upon which the Water Utilities Engineer can make decisions regarding needed sewer rehabilitation and repair.

**1.02 MEASUREMENT AND PAYMENT**

- A. Unit Prices:
  - 1. Survey Normal Cleaning Equipment: Cleaning sanitary sewer mains with normal cleaning equipment will not be paid as a separate item and its cost should be included with other bid items. Cleaning using normal cleaning equipment includes:
    - a. Charges for transient water meter setup and water usage.
    - b. Collection, removal, transportation and legal disposal of liquid wastes, soil, sand and other debris.
    - c. Locating, exposing and opening manholes on sewers to be cleaned.
    - d. Initial manhole wall washing with high-pressure water. Payment for additional cleaning and scrubbing of manhole walls which may be required for manhole rehabilitation is included in the unit price for manhole wall sealing as specified in Item 02555 - Manhole rehabilitation.
    - e. Reconstruction of manholes dismantled for cleaning equipment access, and repair of damage caused by dismantling or cleaning equipment.
  - 2. Cleaning Using Mechanical Cleaning Equipment: Cleaning sanitary sewer mains with mechanical cleaning equipment will not be paid as a separate item and its cost should be included with other bid items. Mechanical cleaning is limited to locations approved by the Water Utilities Engineer on a case-by-case basis after normal cleaning methods have failed to produce satisfactory results, as determined by viewing videotapes.



- a. Mechanical cleaning prior to normal cleaning does not relieve the Contractor of the responsibility for fully cleaning the pipe with normal cleaning equipment.
  - b. Reconstruction of manholes dismantled for cleaning equipment access, and repair of damage caused by dismantling or cleaning equipment.
3. Survey Television Inspection: Measurement of survey television inspection for pipe segments selected by the Water Utilities Engineer will not be paid as a separate item and its cost should be included with other bid items. The following will not be acceptable:
- a. Poor or unacceptable-quality tapes. Hazy, unclear pictures will not qualify for payment.
  - b. Re-taping any segment without prior approval of the Water Utilities Engineer.
  - c. Portions of sanitary sewer not videotaped.
4. Survey Television Inspection by Floating Camera: Measurement of survey television inspection by floating camera for pipe segments selected by the Water Utilities Engineer will not be paid as a separate item and its cost should be included with other bid items. Such inspections may be required in 36-inch through 84-inch diameter sewer pipes, without any cleaning, for purely investigative studies.
5. Pre-Installation Cleaning: No separate payment will be made for pre-installation cleaning using normal cleaning equipment. Include cost for pre-installation cleaning using normal cleaning equipment. Include cost for pre-installation cleaning in cost of line work for which the rehabilitation effort is performed.
6. Pre-Installation Television Inspection: No separate payment will be made for pre-installation television inspection. Include cost for pre-installation television inspection in the cost of line work for which the rehabilitation effort is performed.
7. Post-Installation Television Inspection: No separate payment will be made for post-installation television inspection. Include cost for post-installation television inspection in the cost of line work for which the rehabilitation is performed.

### **1.03 DEFINITIONS**

- A. Normal Cleaning Equipment: Cleaning devices such as rods, metal pigs, porcupines, root saws, snakes, scooters, sewer balls, kites, and other approved equipment in conjunction with hand-winch devices and gas or electric rod-propelled devices. Variable-pressure water nozzles (3000 psi) are considered normal cleaning equipment.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

- B. Mechanical Cleaning Equipment: Buckets, scrapers, scooters, porcupines, kites, heavy-duty brushes, metal pigs and other debris-removing equipment and accessories used in conjunction with approved power winching machines. High-to very-high-pressure water nozzles (10,000 psi) are considered mechanical cleaning equipment.
- C. Survey Cleaning and Television Inspection: Video inspection of existing sanitary sewers to evaluate lines and determine whether conditions exist which would require line rehabilitation.
- D. Pre-Installation Television Inspection: Video inspection by Contractor of sewer lines designated for rehabilitation to confirm cleaning, location of service connections and constructability of line rehabilitation according to Drawings and Specifications.
- E. Post-Installation Television Inspection: Video inspection to determine whether rehabilitation or a sanitary sewer has been completed according to Drawings and Specifications.
- F. Television Inspection Report: A form that is filled out by each television operator for any television inspection effort that is submitted to the City, on a form provided by the City.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Clean designated sanitary sewers and manholes using mechanical, hydraulically-propelled or high-velocity sewer cleaning equipment. Select cleaning processes which will remove grease, soil, sand, silt, solids, rags and debris from each sewer segment and associated manholes.
- B. The Water Utilities Engineer may determine that no additional line rehabilitation work is required if the cleaning operation shows the sewer line to be free of damage or deterioration. The Water Utilities Engineer may delete from the project any or all sanitary sewer lines which do not show a need for rehabilitation.

**1.05 SUBMITTALS**

- A. Comply with Section 01300 - Contractor Submittals.
- B. Submit equipment manufacturer's operational manuals and guidelines to the Water Utilities Engineer for review. Strictly follow such instructions unless otherwise directed by the Water Utilities Engineer.
- C. Submit a list of lawful disposal sites proposed for dumping debris from cleaning operations.
- D. Submit and maintain Liquid Waste Manifests conforming to City of Beaumont Health and Human Services requirements. Send the owner's and regulator's copies of the completed manifests to the Water Utilities Engineer within 24 hours after disposal of waste materials.
- E. Submit digital videotapes (DVD) and Television Inspection Reports to the Water Utilities



---

Engineer for review.

1. Provide DVDs of quality sufficient for the Water Utilities Engineer to evaluate the condition of the sanitary sewer, locate the sewer service connections and verify cleaning. If quality is not sufficient, re-tape the sanitary sewer segment and provide a new dvd and report at no additional cost to the City. Camera distortion, inadequate lighting, dirty lens and blurred or hazy pictures will be causes for rejection of tape and associated line segment.
2. DVDs submitted become the property of the City and will be retained by the Water Utilities Engineer.
3. Contractor shall maintain the master originals of all DVDs and Television Inspection Reports submitted, until final acceptance of the Contract.

## **1.06 QUALITY ASSURANCE**

- A. Qualifications: Use experienced personnel to operate cleaning equipment and devices.
- B. Acceptance of sewer cleaning work is subject to successful completion of the television inspection. If videotape inspection shows solids, sand, grease, grit or other debris remaining in the line, the cleaning is considered unsatisfactory. Repeat cleaning, inspection and videotaping of the sewer line until cleaning is acceptable by the Water Utilities Engineer.
- C. For reporting overflow or spillage of wastewater immediately contact the Water Utilities Engineer.

## **PART 2 PRODUCTS**

### **2.01 CLEANING EQUIPMENT**

- A. Select cleaning equipment and methods based on the condition of the sanitary sewer mains at the time work begins. More than one method or type of equipment may be required on a single project or at a single location.
- B. When requested by the Water Utilities Engineer, demonstrate at the performance capabilities of cleaning equipment and methods proposed for use on the project. If results obtained by demonstration are not satisfactory, provide other equipment that will clean the sewer line.
- C. For high-velocity cleaning use a water jet capable of producing a minimum volume of 50 gpm with a pressure of 1500 psi at the pump. Install a gauge to indicate working pressure on the discharge of high-pressure water pumps. In addition to conventional nozzles, use a nozzle which directs the cleaning force to the bottom of the pipe for sewers 18-inches and larger.



- D. When hydraulic or high-velocity cleaning equipment is used, install a suitable sand trap, weir, dam or suction device in the downstream manhole so that solids and debris are trapped for removal.

**2.02 CLEANING ACCESSORIES**

- A. When an additional quantity of water from the public water supply is needed to meet the cleaning requirements of the equipment and the sewer, obtain transient water meters from the City for installation on fire hydrants refer to Item 814- Fire Hydrant Service Agreement.
- B. All cleaning equipment must be equipped with backflow preventers to prevent contamination to the public water supply.

**2.03 VIDEO EQUIPMENT**

- A. Video Equipment: Select and use video equipment that will produce color digital videotape.
- B. Videotape: Provide digital video in the format to be viewed on Microsoft windows media player version 11.0. Permanently label each tape with the following information:

Project No.: _____	
Contractor's Name: _____	
Inspection Type: <input type="checkbox"/> Survey <input type="checkbox"/> Pre-Installation <input type="checkbox"/> Post-Installation	
Tape No.: _____	Date Taped: _____
Date Submitted: _____	
Address: UPS: _____	
DWN: _____	
Pipe Diameter: _____	Pipe Length: _____
Manhole No.: From _____ To _____	

- C. Pipe Inspection Camera: Produce a videotape using a pan-and-tilt radial-viewing pipe inspection camera that pans ± 275 degrees and rotates 360 degrees. Use a camera with an accurate footage counter which displays on the monitor the exact distance of the camera from the centerline of the starting manhole. Use a camera with camera height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being taped. Provide a lighting system that allows the features and condition of the pipe to be clearly seen. A reflector in front of the camera may be required to enhance



lighting in dark or large diameter pipe.

1. Two labels are required, one on the spine and the other on the face of the video tape.
2. Tapes shall show only one basin. Only line segments from the same basin shall be included on a single video.
3. Up to 5 (maximum) line segments may be included on the same videotape if they are in the same basin.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Do not begin cleaning until both upstream and downstream manholes have been checked for flow monitors and other mechanical devices. Refer to Item 02555 - Manhole Rehabilitation.

#### **3.02 PREPARATION**

- A. Cleaning:
  1. Take precautions to protect sanitary sewer mains and manholes from damage that might be inflicted by the improper selection of cleaning processes or improper use of equipment. When using hydraulically-propelled devices take precautions to ensure that the water pressure created does not cause damage to or flooding of public or private property. Do not surcharge any sanitary sewer to an elevation that could cause overflow of sewage into area waterways, homes or buildings, or onto the surface.
  2. Do not use or obstruct fire hydrants when there is a fire in the area. Remove water meters, fittings and piping from fire hydrants at the end of each working day.
  3. Exercise care to prevent contamination of the potable water system. Use an appropriately sized backflow preventer as required by the City of Beaumont Water Department when drawing water from a public hydrant.
  4. Where possible, use the flow of wastewater present in the sanitary sewer main to provide fluid for hydraulic cleaning devices.
- B. Document results of videotape inspections using the Television Inspection Report form following this section.

#### **3.03 CLEANING**



- A. Conserve Water. Do not waste water from the public water supply through poor connections, hydrants left open, or any other cause.
- B. Collapsible Dams: Use collapsible dams for hydraulically-propelled devices which require a head of water to operate. Dam shall be easily collapsible to prevent damage to the sewer, public property and private property.
- C. High Velocity Cleaning: Operate high-velocity cleaning equipment so that the pressurized nozzle moves continuously. Turn off or reduce the flow to the nozzle to prevent damage to the line any time the nozzle becomes stationary.
- D. Mechanical Cleaning: In addition to normal cleaning equipment, perform mechanical cleaning when required and approved using equipment and accessories as defined in this Section.
- E. Debris Disposal: Remove sludge, soil, sand, rocks, grease, roots and other solid or semi-solid material resulting from the cleaning operation at the downstream manhole of the section being cleaned. Passing debris from any sewer section to any other sewer section is not allowed. Load debris from the manholes into an enclosed container permitted by the City of Beaumont Health Department for liquid waste hauling. Remove solids and semi-solids resulting from cleaning operation from the site and dispose them lawfully at the end of each work day. Do not accumulate debris, liquid waste, or sludge on the site except in totally enclosed containers approved by the Water Utilities Engineer.
- F. Disposal Sites: Dispose of waste at a lawfully-permitted disposal site using a transporter having a valid City Liquid Waste Transporter Permit.

### **3.04 TELEVISION INSPECTION**

- A. Immediately after cleaning, videotape the sanitary sewer line to document the condition of the line and to locate existing service connections. Notify the Water Utilities Engineer 24 hours in advance of any television inspection so that the Water Utilities Engineer may observe inspection operations.
- B. Perform television inspection of sanitary sewers as follows:
  - 1. Perform a survey television inspection on sanitary sewers within the boundary of the project, as directed by the Water Utilities Engineer. After reviewing survey videotapes, the Water Utilities Engineer will determine which sanitary sewers will be rehabilitated or need additional work.
  - 2. Perform pre-installation television inspection immediately after line cleaning and before line rehabilitation work. Pre-installation videotape is not required for sewer lines designated to be removed and replaced. Verify that the line is clean and ready to accept rehabilitation. Prepare Television Inspection Report forms. Maintain

copies of tapes and reports for reference by the Water Utilities Engineer for the duration of the project.

3. Videos shall pan beginning and ending manholes to show that all debris has been removed. Camera operator shall slowly pan each service connection, clamped joint and pipe material transition from one material to another. Complete and submit a Television Inspection Report for every sewer segment videotape submitted to the Water Utilities Engineer.
  4. Perform post-installation television inspection to confirm completion of rehabilitation work, including removal and replacement. Verify that rehabilitation work conforms to the requirements of the Drawings and Specifications. Provide a color videotape showing the completed work, including the condition of restored service connections. Prepare and submit Television Inspection Report forms providing location of service connections along with location of any discrepancies. Post-installation videotape of completed manholes may be substituted for photographic documentation, as described in Item 02555 - Manhole Rehabilitation. Manhole work, including benches, inverts and pipe penetrations into manhole, should be complete prior to post-installation videotape work.
- C. Survey television inspection tapes shall be continuous for pipe segments between manholes. Do not leave gaps in the videotaping of a segment between manholes and do not show a single segment on more than one videotape, unless specifically allowed by the Water Utilities Engineer.

### **3.05 FLOW CONTROL**

- A. Perform survey television inspection on one manhole section at a time. Adequately control the flow in the section being taped. Do not exceed the depth of wastewater flow shown below:

<u>Pipe Diameter (Inches)</u>	<u>Depth of Flow (Percentage of Pipe Diameter)</u>
6-10	10
12-24	15
Over 24	20

1. If during survey television inspection of a manhole section, the wastewater flow depth exceeds the maximum allowable, reduce the flow depth to an acceptable level by performing the survey television inspection during minimum flow hours, by diversion pumping, or by pulling a camera with swab, high-velocity jet nozzle or other acceptable de-watering device. Videotape made while floating the camera is not acceptable unless approved by the Water Utilities Engineer.
- B. Minimize flow in the line while performing pre-installation television inspection. Divert the



---

normal flow as specified in Item 01540 - Diversion Pumping, and clean the line to be inspected.

- C. No flow is allowed in the line while performing post-installation videotape inspection.

### **3.06 PASSAGE OF VIDEO CAMERA**

- A. Do not pull or propel the video camera through the line at a speed greater than 30 feet per minute.
- B. If during survey television inspection of a manhole section, the camera is unable to pass an obstruction even though flow is unobstructed, televise the manhole section from the other direction (reverse setup) in order to obtain a complete video of the line. Whenever such a condition arises, notify the Water Utilities Engineer to determine whether an obstruction removal or point repair is necessary. If a point repair is authorized, repair the pipe at the designated location and then re-televise the manhole section to verify completion of the point repair, unless waived by the Water Utilities Engineer.
1. When the camera is being pulled from the other direction in order to survey on either side of an obstruction, and a second obstruction or repair location is encountered away from the first obstruction, notify the Water Utilities Engineer and request a review of the videotape. The Water Utilities Engineer may direct the Contractor to make one or both point repairs. No downtime shall be allowed.
  2. If two point repairs are allowed and completed, re-tape the manhole section. Generally, up to 20 feet of the sewer pipe from the finished end of the first point repair to the starting end of the second point repair may be lamped or physically inspected to verify the condition of the sewer without further television inspection.
  3. The City makes no guarantee that the sanitary sewer designated for survey television after cleaning is clear for the passage of the camera set-up. Select the appropriate equipment, tools and methods for securing safe passage of the camera.
- C. During pre-installation television inspection, camera passage should show the line is ready for rehabilitation. Report to the Water Utilities Engineer any variations between previous reported (existing data) conditions and actual conditions encountered.
- D. For post-installation television inspection, exercise the full capabilities of the camera equipment to document the completion of the rehabilitation work and the conformance of the work to the Drawings and Specifications. Provide a full 360-degree view of pipe, joints and service connections.

### **3.07 TELEVISION INSPECTION REPORT**

- A. For each television inspection video provide a completed Television Inspection Report, as attached at the end of this Section. The Report is a written narrative log of pipe defects, sags and service connection locations and conditions, indexed to the footage counter. Fill out the Television Inspection Report as follows.
- B. HEADER SECTION
1. ADDRESS UPS/DWN: The upstream and downstream address of the line segment; an alpha-numeric field with 6 spaces available for the street number and 21 spaces available for the street name (e.g., UPS: 2150 Sunnyland DWN: 2110 Sunnyland).
  2. W.W. File NO.: The Wastewater File number; found on the Contract Documents; an alpha-numeric field with 10 spaces available (e.g., 4250-49).
  3. WORK ORDER NO.: Since this number will be provided by the City, this field shall be left blank. This is a numeric field with 10 spaces available.
  4. TAPING DATE: The date that the videotape was produced (same as the date shown on the display screen), a numeric field with 8 spaces available (e.g., 2/21/95).
  5. BASIN: The basin that the line segment is located in; an alpha-numeric field with 10 spaces available (e.g., IA010).
  6. VIDEO CONTRACTOR: The Video Contractor's name; an alpha-numeric field with 5 spaces available (e.g., KIN (Kinsel), IGS (Insituform or Chief).
  7. WEATHER: The existing weather conditions at the time that the videotape was made; an alpha-numeric field with 10 spaces available (e.g., Cloudy).
  8. VTR FORMAT: An alpha-numeric field with 4 spaces available (e.g., VHS).
  9. TAPE NUMBER: Each videotape produced must have tape number for identification, affixed to the cassette label. This number must not be duplicated in the same project. This is an alpha-numeric field with 6 spaces available (e.g., IA0101).
  10. VTR INDEX: The numeric location of the line segment on the tape;; an alpha-numeric field with 6 spaces available for each number (e.g., 1336 to 2185).
  11. SUMMARY:
    - a. Use for additional information about the line segment as follows:
      - 1) Type of video tape (e.g., Post, Survey, Pre-Rehabilitation)
      - 2) General Contractor (e.g., Allco, Brystar, Texas Sterline)
      - 3) Rehabilitation Method (e.g., FF, CPP, PG, SL, RR)

- 4) Rehabilitation System Manufacturer or Trade Name when applicable (e.g., Insituform, Inliner II, PIM System, McConnell Pipe Crushing, U Liner).
  - 5) Pipe Trade Name for PVC, PEP or FRP pipe (e.g., Hobas Drisco 1000, Lamson Vylon, Quail).
- b. Note information according to the following examples:
- 1) Post/Cullum/FF/U Liner/Quail (a typical listing for a **Fold and Form** line segment).
  - 2) Post/Insituform/PPP/Insituform (a typical listing for a **Cured-in-Place** line segment).
  - 3) Post/McLat/PB/McConnell Pipe Crushing/Drisco 1000 (a typical listing for a **Pipeburst**).
  - 4) Post/Kinsel/SL/Hobas (a typical listing for a **Sliplined** line segment).
  - 5) Post/Texas Sterling/RR/Lamson Vylon (a typical listing for a **Remove and Replaced** line segment).
12. LOCATION: The physical location of the line segment (for the line segment, not the manholes). If the line segment covers more than one location, then state the location at the majority of line segment. Location codes are listed on the attached Television Inspection Codes list. This is an alpha-numeric field with 2 spaces available (e.g., C).
13. SURFACE COVER: The type of surface that covers the majority of the line segment. Codes for surface cover are listed on the attached Television Inspection Codes list. This is an alpha field with only 1 space available (e.g., F).
14. PIPE SIZE: The inside diameter of the liner or pipe in inches, based on new pipe size, material and SDR; a numeric field with 6 spaces available, including 2 spaces for decimal (e.g., 6.58 IN).
15. PIPE TYPE: The pipe or liner type installed; an alpha field with 3 spaces available (e.g., PEP, CPP, PVC).
16. LENGTH: The length of the line segment, in feet. The length shown on the Television Inspection Report must be the same as the length shown on the videotape. Also, the length on the top portion of the Television Inspection Report shall match that shown on the bottom portion of the Television Inspection Report. This is a numeric field with 4 spaces available, with no decimals (e.g., 305 FT).
17. UPS DEPTH: The depth, measured from the top of the manhole frame of the upstream manhole to the invert of the upstream manhole, in feet and tenths of a



foot; a numeric field with 3 spaces available, including one space for a decimal (e.g., 6.9 FT).

18. DWN DEPTH: The depth, measured from the top of the manhole frame of the downstream manhole to the invert of the downstream manhole, in feet and tenths of a foot; a numeric field with 3 spaces available, including one space for a decimal (e.g., 7.4 FT).
19. JOINT LENGTH: The pipe joint length, in inches. Show "0" joint length for CPP, FF and PEP line segments (since they have no joints). This is a alpha field with 2 spaces available (e.g., 40 IN).
20. FLOW DEPTH: The pipe or liner flow depth shall be placed in this field. The unit of measure is inches. This is a numeric field with 3 spaces available, which includes one decimal place (e.g., 2.5 IN).
21. MASTER TAPE NO.: Contractor's master tape number (if one exists).
22. REVERSE SET UP: When a reverse set up is done on a line segment, check "yes"; if not check "no".
23. SKETCH: If a sketch of the line segment is included check "yes"; if not check "no".
24. PRIOR HISTORY: If any prior information exists on this line segment check "yes"; if not check "no".
25. EVALUATION DVD: If the Television Inspection Report is for a line segment evaluation or survey purpose, check "yes"; if not check "no".
26. PRE-REHAB DVD: If the Television Inspection Report is for pre-installation video inspection to show that the line is ready for rehabilitation, check "yes"; if not check "no".
27. POST-REHAB DVD: If the Television Inspection Report is for post-rehab video inspection to document completion of the rehabilitation work, check "yes"; if not check "no".
28. LINE DETERIORATION: Indicate here the existence and extent of pipe deterioration. If no deterioration, check "N"; if deterioration is light, check "L" if medium, check "M"; if heavy, check "H".
29. DIRECTION OF FLOW: Indicate that direction of flow in the line segment. Typically, the larger number is the upstream manhole and the smaller number is the downstream manhole. Do not reverse the manhole designation; if a reverse set up is shown, check the "Reverse Setup" box.

## C. CODE INPUT SECTION

1. TELEVISION INSPECTION CODES: Codes to be used in reports are specified and defined on the Television Inspection Codes sheet (attached following this Section and Sample Report form).
2. FOOTAGE READING U/D: Show the up/down designation under the section titled "footage Reading" in the boxes marked "U" and "D". This will make it clear what direction footage is measured from.
3. CLOCK POSITION: Show the clock position with 12 o'clock straight up, of each defect (e.g., 12:00, 3:00). Also, show the clock position of each service connection and state the condition of the connection. Include the distance the connection is protruding into the pipe, when appropriate, and the type of connection, such as "plumber service".
4. CRACKS: List cracks in the pipe Television Inspection Codes. Report the size (length and width) of all cracks.
5. JOINTS: List misaligned and broken joints using Television Inspection Codes.
6. LATERALS: List all laterals using Television Inspection Codes.
7. ROOTS: List any root intrusions into the pipe using Television Inspection Codes.
8. DEBRIS: List any debris in the pipe using Television Inspection Codes.
9. INFLOW/INFILTRATION: Report any inflow and infiltration using Television Inspection Codes.
10. ALIGNMENT: Report the existence of any sags in the field using Television Inspection Codes. Report the beginning of sags for one-quarter pipe, one-half pipe and underwater, as well as where the camera pulls out of the sag.
11. STRUCTURAL: Report structural condition of the pipe using Television Inspection Codes.
12. PICTURE NO.: Leave this field blank
13. COMMENTS: Place comments in this field. Comments must be accompanied by a corresponding footage reading. Items to report in this field: collapses in pipe, stabilized material, mineral deposits, changes in pipe material, reverse setup, drop stack, large voids, multiple cracks, when unable to continue video, etc.
14. CLAMP/SPLICE LOCATION: The clamp/splice location shall be shown in the Comments field. Clamp/splice location must be accompanied by a footage reading.
15. START SURVEY AT M.H. XYZ: Note the depth of the line segment in the Comments field. (E.g., "Start Survey at M.H. 021 - Line Depth 10.2 FT"). Measure depth from the top of the manhole frame to the invert of the pipe being televised in feet and

tenths of a foot. (This depth may be different from the manhole depth).

16. END OF SURVEY AT M.H. XYZ: Note the depth of the line segment in the Comments field. (E.g., "End Survey at M.H. 022 - Line Depth 10.8 FT). Measure depth from the top of the manhole frame to the invert of the pipe being videotaped in the feet and tenths of a foot. (This depth may be different from the manhole depth).

### **3.08 FIELD QUALITY CONTROL**

- A. Do not under any circumstances, allow sewage or solids removed in the cleaning process to be released onto streets or into ditches, catch basins, cleanouts, storm drains, or sanitary or storm sewer manholes.
- B. Acceptance of sewer cleaning work is subject to successful completion of the television inspection. If the television inspection shows solids, soil, sand, grease, grit, or other debris remaining in the line, cleaning will be considered unsatisfactory. Repeat cleaning, inspection, and videotaping of the sewer line until cleaning is judged satisfactory by the Water Utilities Engineer.

### **3.09 MANHOLE REPAIR**

- A. Repair manholes dismantled or damaged during the cleaning process, and replace manhole frames and covers damaged during the cleaning process.

End of Section



---

**ITEM 02611**

**SPECIFICATIONS FOR REINFORCED CONCRETE PIPE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Reinforced concrete pipe for sanitary sewers and storm sewers.

**1.02 MEASUREMENT AND PAYMENT**

- A. Unit Prices

1. Payment will be made for reinforced concrete pipe based on the linear foot of pipe installed from center of manhole to center of next manhole.

**1.03 REFERENCES**

- A. ASTM C 76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- B. ASTM C 443 - Joints for Circular Concrete Sewer and Culvert Pipe.
- C. ASTM C 497 - Method of Testing Concrete Pipe, Sections, or Tile.
- D. ASTM C 506 - Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.
- E. ASTM C 507 - Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe.
- F. ASTM C 655 - Reinforced Concrete D-load Culvert, Storm Drain, and Sewer Pipe.
- G. ASTM C 822 - Standard Definitions and Terms Relating to Concrete Pipe and Related Products.
- H. ASTM C 877 - Standard Specification for External Sealing Bands for Non circular Concrete Sewer, Storm Drain, and Culvert Pipe.

**1.04 SUBMITTALS**

- A. Submittals shall conform to requirements of Section 01300 - Contractor Submittals.
- B. Submit complete product data for pipe, fittings and gaskets for approval. Indicate conformance to appropriate reference standards.



- C. Submit certificates by a testing laboratory, hired and paid by the manufacturer, that concrete pipes meet applicable standards when tested in accordance with ASTM C 497.

**PART 2 PRODUCTS**

**2.01 REINFORCED CONCRETE PIPE**

- A. Circular reinforced concrete pipe shall conform to requirements of ASTM C 76, for Class III wall thickness. Joints shall be rubber gasketed conforming to ASTM C 443.
- B. Reinforced concrete arch pipe shall conform to the requirements of ASTM C 506 for Class A-III. Joints shall conform to ASTM C 877.
- C. Reinforced concrete elliptical pipe, either vertical or horizontal, shall conform to the requirements of ASTM C 507 for Class VE-III for vertical or Class HE-III for horizontal. Joints shall be rubber gaskets conforming to ASTM C 877.
- D. Reinforced concrete D-load pipe shall conform to the requirements of ASTM C 655.

**2.02 GASKETS**

- A. When no contaminant is identified, furnish rubber gasket conforming to ASTM C 443 for circular reinforced concrete pipe and rubber gasket conforming to ASTM C 877 for reinforced concrete elliptical pipe.
- B. Pipes to be installed in potentially contaminated areas, especially where free product is found near the elevation of the proposed sewer, shall have the following gasket materials for the noted contaminants:

CONTAMINANT	GASKET MATERIAL REQUIRED
Petroleum (diesel, gasoline)	Nitrile Rubber
Other Contaminants	As recommended by the pipe manufacturer

**2.03 LINERS FOR SANITARY SEWER PIPE**

- A. Reinforced concrete pipe for sanitary sewers shall be PVC lined and conform to manufacturer's recommendations.
- B. Reinforced concrete pipes to be installed in potentially contaminated areas shall have liners that are recommended by the manufacturer as resistant to contaminants identified in the Phase II Environmental Site Assessment Report.



## **2.04 SOURCE QUALITY CONTROL**

- A. Representatives of Water Utilities Engineer will inspect manufacturer's plant and casting operations as deemed necessary.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Conform to requirements of the following Items, as applicable:
  - A. Item 600 - Specifications for Underground Construction of Water and Sewer Pipes.
  - B. Item 02226 - Pipe Jacking, Boring and Tunneling.
- B. Install reinforced concrete pipe by sliplining, open cut and jacking in accordance with manufacturer's recommendations.

End of Section



---

**ITEM 02821**

**SPECIFICATIONS FOR CHAIN LINK AND WOODEN FENCES AND GATES**

**I - CHAIN LINK FENCES AND GATES**

**PART I - GENERAL**

**1.01 SECTION INCLUDES**

- A. Fence framework, fabric, and accessories.
- B. Excavation for post bases, concrete foundation for posts and center drop for gates.
  - 1. Manual gates and related hardware.

**1.02 MEASUREMENT AND PAYMENT**

- A. No separate payment for fencing and gates shall be made. Fencing cost shall be included in other bid items.

**1.03 REFERENCES**

- A. ANSI/ASTM A 123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- B. ANSI/ASTM F 567 - Installation of Chain-Link Fence.
- C. ASTM A 116 - Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.
- D. ASTM A 120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless, for Ordinary Uses.
- E. ASTM A 153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- F. ASTM A 392 - Zinc-Coated Steel Chain Link Fence Fabric.
- G. ASTM A 428 - Weight of Coating on Aluminum-Coated Iron or Steel Articles.
- H. ASTM C 94 - Ready-mixed Concrete.
- I. ASTM F 573 - Residential Zinc-Coated Steel Chain Link Fence Fabric.
- J. ASTM F 668 - Poly (Vinyl Chloride) (PVC) Coated Steel Chain Link Fence Fabric.



- 
- K. Chain Link Fence Manufacturers Institute (CLFMI) - Product Manual.
  - L. FS RR-F-191 - Fencing, Wire and Post Metal (and Gates, Chain Link Fence Fabric, and Accessories).

#### **1.04 SYSTEM DESCRIPTION**

- A. Fence height shall match height of existing before it was damaged.
- B. Extension arms for barbed wire shall match existing arms before it was damaged.
- C. Line post spacing shall not exceed 10 feet, or should match with existing posts before they were removed.

#### **1.05 SUBMITTALS**

- A. Submit under provisions of Section 01300 - Contractor Submittals.
- B. Product Data: Provide data on fabric, posts, accessories, fittings, and hardware that indicates that items match or exceed the quality of existing items.

#### **1.06 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

### **PART 2 PRODUCTS**

#### **2.01 GALVANIZED FENCING**

- A. Fence fabric shall be No. 9 steel wire, hot galvanized after weaving, to match or exceed existing fence fabric.
- B. Framework shall be hot-dipped galvanized with a minimum coating of 2 ounces/sf, or one ounce/sf plus 30 micrograms/square-inch chromate conversion coating.
- C. Line posts shall conform to ASTM A 570 Grade 45 steel or ASTM A 569, cold rolled steel.
- D. End corner, angle, and pull posts shall conform to ASTM A 570 Grade 45 steel or ASTM A 569 for steel pipe.
- E. Top rails shall be 1.65 x 1.25-inch formed C-section; or 1.6-inch round ASTM A 569, 1.35 lbs/ft; or 1-5/8-inch outside diameter steel pipe, 2.27 lbs/ft. Top rails shall pass through openings provided for that purpose in post tops.



- 
- F. Fabric ties shall be hog rings, galvanized steel wire not less than 9-ga with a zinc coating of not less than 1.2 ounces/sf.
  - G. Bolts and nuts shall be in conformance with ASTM A 307 and shall be galvanized in accordance with AASHTO M 232.
  - H. Install horizontal braces fabricated of 1-5/8-inch, 2.27-lb copper bearing steel pipe at all corner, gate and end posts.
  - I. The replaced damaged gates shall match existing gates. Swing gates shall be hinged to swing 90 degrees from closed to open or hinged to swing 180 degrees from close to open. All gate leaves shall have intermediate members and diagonal stress rods as required for rigid construction and shall be free from sag or twist. All gates shall be fitted with vertical extension arms or shall have frame end member extended to carry barbed wire. Gate posts for gates shall be 4-inch, 9.1 lb pipe. Gate frames shall be made of 2-inch outside diameter, castings. Fabric shall be the same as for the fence. Gates shall have malleable iron ball and socket hinges, catches, stops and padlocks with 3 keys each. Posts for single gates shall be the same as end posts.

### **PART 3**      **EXECUTION**

- A. Install chain link fence in accordance with the directions of the manufacturer and these Specifications.
- B. Install fence posts at not more than 10-foot centers and at least 36 inches into the ground in a Class B concrete base. Allow concrete to cure for at least 7 days before erecting remainder of fence. Fasten fabric to line posts with wire ties spaced about 14 inches apart and to top rail spaced about 24 inches apart.
- C. Use standard chain link fence stretching equipment to stretch the fabric before tying to the rails and posts. Repeat the stretching and tying operations about every 100 feet.
- D. Erect gates so they swing or slide in the appropriate direction. Provide gate stops as required. Secure hardware, adjust, and leave in perfect working order. Adjust hinges and diagonal bracing so that gates will hang level.
- E. At small natural or drainage ditches where it is not practical for the fence to conform to the contour of the ground, span the opening below the fence with wire fastened to stakes of required length. The finished fence shall be plumb, taut, true to line and ground contour. When directed, stake down the chain link fence at several points between posts.
- F. Where the new fence joins an existing fence, set a corner post and brace post at the junction and brace as directed. If the connection is made at other than the corner of the new fence the last span of the old fence shall contain a brace.



RICH WITH QUALITY  
**BEAUMONT**  
T • E • X • A • S

**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

**II- WOODEN FENCES AND GATES:**

All wooden fences and gates damaged during construction shall be replaced with the same existing material at no additional cost to the City.

End of Section



---

**ITEM 02951**

**SPECIFICATIONS FOR PAVEMENT REPAIR AND RESURFACING**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Repairing and resurfacing streets, highways, driveways, sidewalks, and other pavements that have been cut, broken or otherwise damaged during construction.

**1.02 MEASUREMENT AND PAYMENT**

- A. Unit Prices
  - 1. No separate payment will be made for pavement repair and resurfacing under this Section. Include payment in unit price for work in appropriate sections.

**PART 2 - PRODUCTS**

**2..01 MATERIALS**

- A. Subgrade:
  - 1. Provide backfill material as required by City of Beaumont and Texas Department of Transportation Standards.
  - 2. Provide material for stabilization as required by City of Beaumont and Texas Department of Transportation Standards.
- B. Base: Provide base material as required by City of Beaumont and Texas Department of Transportation Standards.
- C. Pavement: Provide paving materials as required by City of Beaumont and Texas Department of Transportation Standards for Asphaltic Concrete Pavement, Concrete Paving, Concrete Driveways, Curb, Curb and Gutter, and Headers, and Concrete Sidewalks.

**PART 3 - EXECUTION**

**3..01 PREPARATION**

- A. Conform to requirements of Item 02221 - Removing Existing Pavements and Structures, for removals.



- 
- B. Saw cut pavement 18 inches wider than width of trench needed to install utilities unless otherwise indicated on Drawings.
  - C. Protect edges of existing pavement to remain from damage during removals, utility placement, backfill, and paving operations. For concrete pavement leave and protect minimum of 18 inches of undisturbed subgrade on each side of trench to support replacement slab.

### **3.02 INSTALLATION**

- A. Parking Areas, Service Drives, Driveways and Sidewalks: Replace with material equal to or better than existing or as indicated on Drawings. Conform to applicable requirements of sections referenced in Paragraph 2.01 Materials.
- B. Street Pavements and Curbs, Curbs and Gutters: Replace subgrade, base and surface course with like materials or as indicated on Drawings. Curbs and curbs and gutters shall match existing. Conform to requirements of sections referenced in Paragraph 2.01, Materials.
- C. For concrete pavement, install size and length of reinforcing steel and pavement thickness or as indicated on Drawings.
- D. Where existing pavement consists of concrete pavement with asphaltic surfacing, resurface with minimum 2-inch depth asphaltic pavement.
- E. Repair State highway crossing in accordance with TxDOT permit and within 1 week after utility work is installed.

### **3.03 WASTE MATERIAL DISPOSAL**

- A. Dispose of waste material to sites approved by the Water Utilities Engineer.

### **3.04 PROTECTION**

- A. Maintain pavement in good condition until completion of the Work.
- B. Replace damaged pavement.

End of Section



---

**ITEM 03301**

**SPECIFICATIONS FOR PRECAST CONCRETE MANHOLES**

**PART 1 - GENERAL**

**1.01 SCOPE**

The work included in this section of the Specifications shall consist of providing precast and/or cast-in-place manholes, rims, and covers where indicated on the Plans.

**1.02 QUALITY ASSURANCE**

A. ACCEPTABLE MANUFACTURERS

1. Hanson

B. Comply with the latest edition of the following referenced standards:

1. ASTM C270, Type M Mortar.
2. ASTM C478, Reinforced Concrete Manhole Sections.
3. ASTM C443, Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets.

**1.03 SUBMITTALS**

Submit the following information in accordance with the requirements of Section 01300: Contractor Submittals.

A. Record Data

Submit record data of detailed drawings showing dimensions, materials thickness of materials, manufacturer's installation instructions, accessories, fittings, hardware, anchorages, schedule of components, and other pertinent data.

B. Certificate of Adequacy of Design.

**PART 2 - PRODUCTS**

**2.01 MORTAR**

Comply with Mortar for Unit Masonry, ASTM C 270, for Type M mortar. The cement material used in the preparation of the mortar shall be Portland cement, Type I, normal, or Type II, moderate sulfate resistant.



## **2.02 CAST IRON FRAMES AND COVERS**

Frames and slotted covers shall be furnished and installed in accordance with the details on the Plans and shall be East Jordan Iron Works V-1418-2 with City of Beaumont logo or approved equivalent, unless otherwise shown on the drawings.

## **2.03 PRECAST REINFORCED CONCRETE MANHOLE SECTIONS**

- A. Conform to Precast Reinforced Concrete Manhole Sections, ASTM C478. Cement shall be Type I or Type II. Aggregate for concrete work per C33, coarse aggregate shall be crushed limestone, with a resulting minimum concrete alkalinity of 70 percent calcium carbonate equivalency in the final concrete product. Admixtures, if used, shall conform to ASTM C494, no calcium chloride shall be used.
- B. Provide and install concrete grade rings to bring the cast iron frames to grade. Grade rings shall be 2 inches by 8 inches with an inside diameter of 24 inches. Grade rings shall be grouted in place with 2-#3 bars in accordance with the City of Beaumont Standard Specifications.
- C. The concrete manhole riser sections, with the exception of the grade rings, shall be formed with male and female ends and installed with bell ends turned down.
- D. The joints and gaskets in the riser sections shall comply with the requirements of ASTM C443, Joints for Circular Concrete Sewer and Culvert Pipe, using rubber gaskets, as modified to incorporate an O-ring type gasket.
- E. Manhole riser sections shall be of sufficient diameter to allow personnel to work inside them and to allow proper joining of all pipes to the manhole wall while maintaining the structural integrity of the riser sections. All manholes shall have a minimum diameter of four feet unless a larger diameter is noted in the Plans or required by the piping configuration shown. Provide larger diameter manholes where necessary to maintain at least a 12-inch clearance between any holes cut in the riser section.
- F. Provide eccentric cone immediately below the grade rings sections for each manhole. For manholes larger than 48-inches, precast concrete covers with integrally-cast frames and covers may be used when approved by ENGINEER.
- G. Where PVC piping is connected to manholes, provide and install PVC sleeves with rubber gaskets and an abrasive silica out coating. Sleeve shall be as manufactured by GPK products, Inc., of Fargo, North Dakota, or approved equivalent. Sleeve shall be firmly grouted into manhole opening in accordance with manufacturer's instructions.



---

## **2.04 MANHOLE INSERT**

- A. Manhole inserts shall be furnished and installed at each manhole and shall be a stainless steel Preco Sewer Guard ME C-4 watertight manhole insert or equivalent.
- B. The manhole insert shall be stainless steel and each of its components, the valve bodies, the valve plugs, the valve springs, and the gasket shall be manufactured of plastic, stainless steel, or other corrosion proof material.
- C. Each insert shall contain a gasket manufactured of Grade RE-41 black closed cell neoprene and meet the requirements of ASTM D-1056-73T. The gasket shall have a pressure sensitive adhesive on one side and be placed on the underside of the insert rim by the manufacturer.
- D. Each insert shall have a gas relief valve and a vacuum relief valve each designed to release at a pressure differential equivalent to approximately ½ psi and approximately 2.25 psi, respectively. The valve body shall be manufactured of specially formulated plastic polymers and the valve plug shall be neoprene confined within a stainless steel spring.
- E. The manhole insert shall be manufactured and finished to fit upon the manhole frame rim upon which the manhole cover rests.
- F. The manhole frame shall be cleaned of all dirt/debris before placing the insert upon the rim.
- G. The insert lip with gasket shall be placed in contact with 360 degrees of manhole frame rim to retard water seepage between the insert and the manhole frame.
- H. After the manhole insert has been installed on the manhole frame rim, note that the insert does not come in contact with the cover upon its removal or replacement (flipping).
- I. After installation of the watertight manhole insert, the seal shall be water tested and shall not allow more than 1-gallon of inflow during a period of 24 hours.

## **3.00 EXECUTION**

### **3.01 INSTALLATION**

- A. Manhole Base:
  - 1. Inverts: Inverts shall be built of concrete or half-sections of pipe (unless otherwise shown on the Plans) and shall be true and troweled to a smooth, hard finish. The invert depth shall be equal to one-half of the diameter of the largest pipe connected to the manhole, and shall be sloped at 1:1 between the inlet and outlet pipe flowlines. The top of the poured manhole invert outside of the flow channel shall be steeply-sloped to prevent solids deposition.



2. Hanson pre-cast manhole base shall be utilized and placed in accordance with the details on the Plans and the applicable provisions of these Specifications.
  3. All concrete used in the construction of manholes including precast and cast-in-place bases, sections, lids, etc., shall have a minimum concrete alkalinity of 70 percent calcium carbonate equivalency in the final concrete product. Alkalinity shall be tested in accordance with methodology set forth in Concrete Pipe Handbook, published by the American Concrete Pipe Association, or equivalent industrial standards, with test results provided to the ENGINEER for record data.
- B. Provide an adequate connection where the pipe connects to the manhole such that infiltration and exfiltration is prevented from occurring at the connection. When required, manhole adaptors shall be used. If the manhole base is concrete and cast-in-place around the pipe, then an adapter gasket shall be installed such that the gasket will serve as a watertight seal (water stop) between the pipe and concrete. If the manhole base has a pipe fabricated integrally with the manhole, then a manufacturer's recommended adaptor shall be used to connect the pipe to the manhole pipe. If a "boot type" flexible connection is used, then a minimum of two stainless steel straps shall be used to secure the flexible connector to the pipe.
  - C. Frames and covers shall be furnished and installed as required and indicated on the Plans.
  - D. Use no more than 4 grade rings per manhole. Ring hold down bolts shall pass through the rings into the top of the cone.
  - E. Where piping is connected to a manhole, CONTRACTOR shall provide a resilient connector in accordance with ASTM C-923 and the specifications and drawings. Where resilient connectors cannot be made at manhole connections, CONTRACTOR shall ensure that the pipe on each side of the manhole does not extend further than five (5) feet from the outside of the manhole wall or base, and the concrete cradle extends to within one (1) foot of the end of the pipe.
  - F. Where main sewer (lowest line) passes straight through manhole or degree of deflection of main sewer is less than 5 degrees, and no other line or stub-out is shown entering manhole below centerline of main sewer, lay sewer continuous through manhole. After manhole wall sections have been completed above top of sewer, break out and remove top half of barrel of sewer pipe that was previously laid through manhole. Use barrel of sewer pipe that was previously laid through manhole. Use concrete with 1-inch mortar topping and shape floor.

Where main sewer (lowest line) alignment deflects greater than 5 degrees at manhole or where another sewer or stub-out enters at or below centerline of main sewer, terminate main sewer pipe laying in such a manner that ends of pipe are 2 inches inside of manhole wall.

End of Section



---

**ITEM 4015**

**PLUG ABANDONED SEWERS**

**4015.01 - INTENT**

It is the intent of this specification to provide for the plugging of abandoned sewer lines, or the repair of existing plugs, at points indicated on the plans or designated by the Owner's Representative.

**4015.02 - GENERAL**

Each designated abandoned sewer line shall be plugged at its entrance into a manhole or junction box, or at such other point as may be designated. The Contractor may use a prefabricated plug of approximately the diameter of the pipe; Class B Concrete as specified by the Texas State Department of Highways and Public Transportation; or any other method acceptable to the Owner's Representative.

The Contractor shall seal around the plug with a approved adhesive so as to make the entire plug permanently watertight.

Where designated, the Contractor shall remove and replace existing plugs, or shall repair or seal them to make them watertight.

**4015.03 - MATERIALS**

All material used for plugs or adhesives shall be impermeable and shall be resistant to chemicals, temperature cycles, and wet-dry cycles. These materials shall not be brittle or biodegradable.

**4015.04 - PAYMENT**

No separate payment will be made for plugging abandoned sewers in the course of new sewer construction. This work shall be included in the applicable sewer and manhole costs.

End of Section



**ITEM 4020**

**PIPE BURSTING/CRUSHING**

**4020.01 - GENERAL**

This specification defines the approved methods and materials for the rehabilitation of existing gravity sewer lines by the Pipe Bursting or Pipe Crushing (Pipe Bursting/Crushing) process.

**4020.02 - METHODS**

This section specifies the method and process for furnishing all labor, materials, tools, equipment and incidentals necessary to provide for the complete rehabilitation of deteriorated gravity sewer lines by the Pipe Bursting/Crushing process that is to be installed by licensed Contractor of one of the following or prior approved equivalent. All other processes will need approval by the Engineer in writing and must be granted a minimum of ten (10) days prior to the bid opening.

**PULLING HEAD/TOOL LENGTH MUST BE MINIMUM SIX (6) FEET LONG. TOOLS LESS THAN SIX (6) FEET LONG WILL NOT BE ACCEPTED.**

**RELINING USING PIPE BURSTING/CRUSHING**

GENERIC NAME	MANUFACTURER	TRADE NAME
Pipe Bursting	TT Technology Miller Pipeline Corp. McLat Construction TRS, LTD	Grundocrack System Xpandit McConnell Pipe Crushing TRS Hydrahaul System

**4020.03 - DEFINITION**

The Pipe bursting process is defined as the reconstruction of gravity sewer pipe by installing an approved pipe material, by means of one of the pre-approved processes set forth in Section 4020.02 of this specification. Essentially the process involves the use of a hydraulic "moling" device or pneumatic hammer, suitably sized to break out the old pipe or using a modified boring "knife" may be aided by the use of a hydraulic winch, as specified in the patented process. The replacement pipe is pulled by means of hydraulic force into place size on size or up sizing. This specification is based on the precedent that the Pipe Bursting/Crushing system used has been pre-approved by the Engineer. No other Pipe Bursting systems other than those set forth in Item 4020, Section 4020.02 of these specifications or otherwise prior approved by the Engineer is acceptable.



**4020.04 - MATERIAL SPECIFICATIONS**

A. Solid Wall Polyethylene Pipe (HDPE).

1. The replacement pipe shall be manufactured from a high density high molecular weight polyethylene resin having a PPI designation of PE 4710 and a minimum cell classification of 345444C or E, in accordance with ASTM D3350. The pipe shall be manufactured in compliance with ASTM F714. The interior of the pipe shall be gray or black in color. A certificate of "Compliance with Specification" shall be furnished for all materials to be supplied.  
 Before beginning work, the Contractor shall submit to the Engineer for approval the vendor's specific technical data with complete physical properties of pipe and pipe dimensions pertinent to this job.
2. The outside diameter and minimum wall thickness shall conform to dimensions listed in Table 1 and shall be measured in accordance with ASTM D-2122.

**TABLE I**  
**POLYETHYLENE REPLACEMENT PIPE DIMENSIONS**  
**(ASTM F714, IPS SIZING SYSTEM)**

IPS NOMINAL OD	MINIMUM OD	MINIMUM WALL THICKNESS (Inches)			
		SDR 21	SDR 19	SDR 17	SDR 11
(Inches)	(Inches)				
6	6.625	.315	.349	.390	.602
7	7.125	.340	.375	.420	.648
8	8.625	.411	.454	.507	.784
10	10.750	.512	.566	.632	.977
12	12.750	.607	.671	.750	1.159
14	14.000	.667	.737	.824	1.273

3. The SDR Classification for various depths shall be as follows:

The Standard Dimension Ratio (SDR), which is the ratio of the outside diameter (OD) of the pipe to its minimum wall thickness, shall be SDR-17 for all depths.



---

#### **4020.05 - BACKFILL**

At all points where the polyethylene pipe has been exposed, such as at the insertion pits, or other points where the old pipe must be removed, the polyethylene pipe and fittings shall be encased in 1½ sack cement stabilized sand or other high density material as specified by the Engineer to prevent deflection due to earth loading or subsidence. At this point, in preparation for the placing of the encasement material, debris and soil shall be removed along each side of the existing pipe down to the spring line. After the encasement material is in place and accepted by the Engineer, backfill is placed and compacted to required finished grade in accordance with specification Item 02317 - Excavation and Backfill for Utilities. Particular care shall be taken to ensure compaction of earth beneath the lateral pipe in order to reduce subsidence and resultant bending at the lateral connection at the sewer main.

#### **4020.06 - PRE-INSTALLATION PREPARATIONS**

The Contractor shall submit a work plan to the Engineer for review and acceptance. The work plan shall address the following minimum preparation/steps, unless approved otherwise by the Engineer.

A. Safety

The Contractor shall carry out operations under this section in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving work on an elevated platform and entry into a confined space. It shall be the Contractor's responsibility to comply with OSHA Standards and Regulations pertaining to all aspects of the work.

B. Bypassing Sewage

When required for acceptable completion of the pipe bursting/crushing process, the Contractor shall provide for continuous sewage flow around the section(s) of pipe designated for the installation of replacement pipe. The pump bypass lines shall be of adequate capacity and size to handle the flow in accordance with Item 01540 - Diversion Pumping.

#### **4020.07 - INSTALLATION PROCEDURES**

The Contractor shall submit information, in detail, of the procedure and the steps to be followed for the installation of the pipe bursting/crushing method selected, even if the process is named in the specification. All such instructions and procedures submitted shall be carefully followed during installation. Any proposed changes installation procedures shall require submittal of revised procedures and accepted by the Engineer.

A. Finished Pipe

The installed replacement pipe shall be continuous over the entire length of each pipe segment from manhole to manhole. Should additional insertion or access pits be required between manholes, the Contractor shall with the approval of the Engineer, provide materials and perform



a permanent type of repair as recommended by the pipe manufacturer. Small diameter HDPE pipe shall be coupled utilizing a flange fused to each end of the coupling section and the flanges bolted together. HDPE pipe sizes larger than twelve inches (12") in diameter shall be coupled utilizing a flanged spool piece fabricated to precisely fit the length of the coupling and bolted to the flanges fused to the open ends. If the Contractor is unable to assess the open ends of the pipe in the additional access pit for pipe fusion, he shall with the approval of the Engineer, provide and place a stainless steel full circle bolt-on wrap-around clamp with a stainless steel stiffener insert into each end of the pipe. A minimum clamp length of two (2) times the nominal pipe diameter shall be provided. The full circle clamps shall be recommended by the manufacturer for use on HDPE pipe. No additional payment will be made for coupling repairs performed for the lengths less than 500 foot runs between manholes.

The installed replacement pipe shall be free from visual defects such as foreign inclusions, concentrated ridges, discoloration, pitting, varying wall thickness and other deformities. Replacement pipe with gashes, nicks, abrasion, or any such physical damage which may have occurred during storage and/or handling, which are larger/deeper than 10% of the wall thickness shall not be used and shall be removed from the construction site. The replacement pipe passing through or terminating in a manhole shall be carefully cut out in a shape and manner approved by the Engineer and shall be as shown in the details. The invert and benches shall be streamlined and improved for smooth flow. The installed pipe shall meet the leakage requirements of the pressure test specified later.

**B. Pipe Joining**

Sections of polyethylene replacement pipe shall be assembled and joined on the job site above the ground. Joining shall be accomplished by the heating and butt-fusion method in strict conformance with the manufacturer's printed instructions and ASTM D-2657.

The butt-fusion method for pipe joining shall be carried out in the field by operators with prior experience in fusing polyethylene pipe with similar equipment using proper jigs and tools per standard procedures outlined by the pipe manufacturer. These joints shall have a smooth, uniform, double rolled back bead made while applying the proper melt, pressure, and alignment. It shall be the sole responsibility of the Contractor to provide an acceptable butt-fusion joint. All joints shall be made available for inspection by the Engineer before insertion. The replacement pipe shall be joined on the site in appropriate working lengths near the insertion pit. The maximum length of continuous replacement pipe which shall be assembled above ground and pulled on the job site at any one time shall be 600 linear feet. Prior to installation, the contractor shall locate the joined pipe to minimize disruption of traffic and access to private property adjacent to the site.

**C. Insertion or Access Pits**

The location and number of insertion or access pits shall be planned by the Contractor and submitted in writing for approval by the Engineer prior to excavation. The pits shall be located such that their total number shall be minimized and the length of replacement pipe installed in a single pull shall be maximized. Locations of damaged pipe shall be used for insertion pits if approved by



---

the Engineer. Insertion pits shall adhere to ASTM F-585.

The cost for diversion pumping required around an insertion pit, from a manhole upstream to a manhole downstream, and excavation for insertion pits shall not be paid separately, but shall be included in the unit price bid for pipe bursting/crushing.

D. Service Connections

Each existing service connection shall be replaced upon replacement of the sanitary sewer main. Each service connection shall be located and exposed prior to replacement of the main line segment. Upon completion of any necessary pressure testing of the replacement sanitary sewer main, the replacement main shall be punctured at each service connection to limit inconvenience to existing customers and to prevent sewer backups. **The replacement main shall be punctured at each service connection on the same day that the replacement main is installed.** Service connections and service lines shall be replaced as soon as possible after replacement of the main. If service connections and service lines are not replaced on the same day as the main replacement, the Contractor shall provide adequate covers and markers to prevent nuisance conditions and to protect the public health and safety.

Service connections on the replacement main shall be made using "DFW Flexible Tee Saddles" or approved equal, installed in accordance with the manufacturer's instructions. The hole in the replacement main shall be cut with a hole saw and shall be placed 45° above horizontal. The service connection shall be embedded in 1½ sack per cubic yard compacted cement stabilized sand, extending at least 6" below and 12" above the replacement main for a distance of not less than 6 feet. If the service connection is within 5 feet of a paved area, the access pit shall also be backfilled with stabilized sand.

Service connections into manholes shall be made in accordance with Section 4020.08, below.

Unless otherwise indicated in the contract, each service line shall be also be replaced up to the customer's property line or edge of easement, as the case may be, with 4" or 6" PVC, Schedule 40 (ASTM D1785), to match the existing line size. The replacement service line shall be installed at the same grade and elevation as the existing service line. The existing service line shall be replaced by open trenching, pipe bursting, static pipe bursting, or other method approved by the Engineer. The replacement service line shall be connected to the customer's service line at the property line with a flexible "Fernco" coupling and a cleanout assembly shall be installed at the property line.

The cost for locating service connections shall not be paid directly, but shall be considered subsidiary to the various bid items in the contract.

E. Process Limitations



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

Though the installation process may be licensed or proprietary in nature, the Contractor SHALL NOT change any material, thickness, design values or procedural matters stated or approved in the submittals, without the Engineer's prior knowledge and pre-approval. The Contractor shall submit, in writing, full details about component materials, their properties and installation procedures and abide by them fully during the entire course of the project.

All sewer rehabilitation by pipe bursting/crushing methods are being considered structurally equal processes as far as "end product" required by the Owner. The minimum required performance criteria, and/or standards, physical/structural properties, chemicals resistance tests, and the replacement pipe thicknesses as given in this specification shall be strictly complied with. It shall be the responsibility of the Contractor to comply with the specifications in full without any request for any change after the award of the contract. The City reserves the right to accept, reject, or modify any later requests for change at no additional cost to the City or even to the extent of asking credit for the City.

#### **4020.08 - SEALING AND BENCHES IN MANHOLE**

The replacement pipe shall be installed with a tight fitting seal at existing or new manholes to prevent inflow at the manhole as per details in the plans.

For entry into fiberglass manholes above the invert, a molded entry saddle with flexible boot connector and stainless steel clamp shall be used. The replacement pipe shall extend at least 6 inches into the manhole. For entry into concrete or brick manholes above the invert, the contractor shall provide a half-inch diameter activated oakum band soaked in non-shrink grout or equal, applied circumferentially on the replacement pipe passing through the manhole wall, and encased with a non-shrink grout. The replacement pipe shall extend at least 6 inches into the manhole. For all entries into manholes above the invert, the hole cut in the manhole riser shall be circular and no more than 1" larger than the outside diameter of the pipe.

For entry into new or existing manholes at or near the flow line, the pipe shall extend at least 6 inches into the manhole. When the pipe continues through the manhole, top half of the pipe crossing through the manhole shall be neatly cut off and not broken or sheared off, at least six inches away from the manhole walls. Twelve inches of 4½ sack concrete shall be placed around the pipe on the outside of the manhole. The channel in the manhole shall be a smooth continuation of the pipe(s) and shall be merged with other lines or channels, if any. Channel cross-section shall be U-shaped with a minimum height of half pipe diameter to three-fourths of the pipe diameter for fifteen inches and larger. The side of the channels shall be built-up with grout to form an invert, as specified, to provide benches at 1H : 1V pitch towards the channel. The invert shall extend above all pipes entering the manhole near the flow line.

When pipe bursting through an existing manhole, the contractor shall remove a sufficient portion of the manhole base and invert to avoid a "hump" in the newly installed line.

Payment for above work shall be incidental to sewer rehabilitation by the pipe bursting/crushing method.



**CITY OF BEAUMONT  
WATER UTILITIES DEPARTMENT  
STANDARD SPECIFICATIONS**

---

The replacement pipe in the manhole shall be sealed as specified in the plans and details before proceeding on to the next manhole section and all manholes shall be individually inspected for replacement pipe cut-offs, benches and sealing works.

**4020.09 - TESTING OF THE REPLACEMENT PIPE**

A low pressure air test will be required for each pipe section, as specified in Item 02533 - Acceptance Testing for Sanitary Sewers. The Owner reserves the right to require deflection testing and television inspection, in accordance with Item 02533 - Acceptance Testing for Sanitary Sewers. All costs for testing the replacement pipe will be incidental to the installation.

**4020.10 - PAYMENT**

The unit price bid for rehabilitating the sewer main in the manner described shall be full compensation for all materials, labor, equipment, and incidentals required to install the replacement pipe within the sewer main, reworking the manholes inverts and benches, etc. Payment shall be for actual linear footage for replacement pipe installed in the field and shall be measured between the center lines of the manholes.

All costs for testing the replacement pipe shall be considered incidental to the cost of rehabilitating the sewer. The Contractor shall be responsible for making adequate and suitable arrangements for any bypass pumping that may become necessary to prevent any backflow into houses or buildings, or onto the streets between the time the replacement pipes are installed and the service reconnections have been made, tested, and approved by the City. Bypass pumping shall be considered incidental to the cost of rehabilitating the sewer. All other payments shall be made as per bid items. No payment shall be made for work considered incidental or complimentary to a pay item already in bid item. The Contractor shall clarify, for his own benefit, all work required for any item, incidental or otherwise, prior to bidding.

End Of Section