

DESIGN CRITERIA AND SPECIFICATIONS

FOR

PRESSURE SEWERS, FORCE MAINS,

GRINDER PUMPS AND APPURTENANCES

CITY COUNCIL

CITY OF HORSESHOE BAY

SPECIFICATIONS NO. 1 2006 REV 05.07

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These Specifications give the minimum requirements for installation of pressure sewer lines, force mains and appurtenances in the CITY OF HORSESHOE BAY. Any special construction problems or conditions not covered under these Specifications shall be submitted to the City for approval.

The standard drawings are a part of these Specifications and all construction shall conform to the details shown on the drawings.

SECTION 1

PRESSURE SEWERS AND FORCE MAINS

1 Scope of Work

The work to be accomplished under this Section consists of the furnishing of all labor, materials, equipment, and services necessary for the construction of low pressure force mains (pumped sewer lines) and the force mains between the central lift stations and the waste water treatment plant.

The low pressure sewer system to be constructed will incorporate a number of individual grinder pumps which will pump the sewage generated at the various residential, institutional and commercial establishments through a complete network of low pressure force mains (pumped sewer lines ranging in size from 2-inch to 12-inch). The wastewater will be discharged directly into low pressure collection lines or may be repumped by conventional sewage pumps located in central pumping stations through separate force mains to the central sewer treatment plant.

Any contractor, developer, or individual planning to install a pressure sewer system in a new or unsewered development must submit detailed plans prepared by a registered utility engineer in compliance with THE CITY OF HORSESHOE BAY Specifications and Details.

The grinder pump installations and associated appurtenances are covered under Section 2 "Grinder Pumps and Appurtenances".

2 Location of Force Mains

The approximate location of the force mains in relation to the limits of rights-of-way, pavement, etc., is shown on the Plans but not guaranteed. The location shown was chosen to minimize overall project cost with rock excavation, pavement replacement, crushed stone for traffic bound roadway, customer water services, etc., considered. The final location as constructed may be varied by the contractor with the approval of the City of Horseshoe Bay provided (1) the proposed location is approved by the CITY OF HORSESHOE BAY or Engineering firm; and (2) the effect lessens the project cost. The final location in any event may be varied by necessity due to construction conditions at the direction of the City Engineer or Engineering firm.

3 Pipe Fittings for Force Mains

a. Polyvinyl Chloride Pipe

Polyvinyl Chloride pipe for force mains shall be made from Type 1, Grade 1 or 2, Polyvinyl Chloride plastic as defined in ASTM Specification D 1784, "Specifications for Rigid Poly (Vinyl Chloride)

-2 Physical Properties

The pipe shall conform to Commercial Standard CS-256-63 or ASTM Specification D 2241-80 "Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR and Class T)" as it applies to Type I, Grade 1 or 2 Polyvinyl Chloride plastic pipe, SDR 21, water pressure rating of 200 psi at 23° C (72.4° F).

-3 Joints

The joints for pipe 2 inch in diameter and larger shall be push-on (bell and spigot) joints designed so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded, rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket, thereby compressing the gasket radially to the pipe to form a positive seal. The gasket and the annular recess shall be so designed and shaped that the gasket is locked in place against displacement as the joint is assembled. Details of the joint design and assembly shall be in accordance with the joint manufacturer's standard practice. The joints shall be designed so as to provide for the thermal expansion or contraction experienced with the total temperature change of at least 75° F in each joint per length of pipe. Joints shall comply with ASTM-D3139.

Joints for fittings shall be of the push-on type as described above unless otherwise noted or directed by the CITY. Solvent welded type joints shall be allowed on certain types of valves, fittings and piping connections 2-inch and smaller in diameter. Generally solvent weld joints shall be limited to certain assemblies that can be pre-assembled in the shop and then installed together as a unit in the field. Examples include the ball valve and blow off assemblies, the ball and check valve assembly that form a unit in a house service junction box, etc. Solvent cement joints shall be formed by deep-socket couplings integrally cast on the ends of the fittings or valves. Solvent cement shall conform to ASTM D-2564.

-4 Lubricant

Lubricant furnished for lubricating joints shall be non-toxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material, and shall not impart color, taste or odor to water. The lubricant containers shall be labeled with the manufacturer's name.

-5 Gasket

Gaskets shall meet all applicable requirements of ANSI Standard A21.11 and/or ASTM F477-76.

Gasket dimensions shall be in accordance with the manufacturer's standard design dimensions and tolerances. The gasket shall be of such size and shape as to provide an adequate compressive force against the spigot and after assembly to effect a positive seal under all conditions of joint and gasket tolerances. The trade name or trademark, size, mold number, gasket manufacturer's mark and year of manufacture shall be molded in the rubber on the back of gaskets.

Gaskets shall be vulcanized natural or vulcanized synthetic rubber. No reclaimed rubber shall be used. When two hardnesses of rubber are included in a gasket, the soft and hard portions shall be integrally molded and joined in a strong vulcanized bond. They shall be free of porous areas, foreign material and visible defects.

-6 Pipe Lengths

The pipe shall be furnished in nominal lengths of 20 feet. The pipe shall be supported at least every 10 feet of its length during all handling, and special care shall be taken to avoid placing undue stress on the pipe during handling, and any actions that may damage the bell or spigot ends of the pipe shall be avoided.

-7 Fittings

Fittings to be installed in conjunction with the force mains between the central pumping stations and the treatment facilities (6-inch and larger) shall be ductile iron mechanical joints as described in subparagraph 3.c of this Section.

Fittings to be installed in conjunction with the low pressure force main (pumped sewer lines) shall be of the same material and quality as the pipe and have joints as described in subparagraph 3.d(3) of this Section. The fittings shall be designed to withstand the same pressures required for the pipe. The supplier shall be capable of supplying fittings with combinations of spigot (plain) end and bell.

The pipe supplier shall be capable of supplying special pieces for use in connection with PVC pipe to cast or ductile iron pipe.

-8 Approval

The pipe and fittings shall be approved by the CITY OF HORSESHOE BAY

-9 Marking of Pipe

As a minimum, the pipe shall have the following data applied to each piece:

- 1 Nominal Size
- 2 Type of Material
- 3 SDR or Class (color coded)
- 4 Manufacturer
- 5 NSF (National Safety Foundation seal of approval)
- 6 Quality Control Code

-10 Testing

The following tests shall be performed by the manufacturer of PVC pipe:

Long Term Pressure Test (Min.)	1000 HRS @ 400 PSI
Burst Pressure Short Term (Min.)	640 psi
(Min.)	60 ft/lbs @ 72* F
Impact (Max)	16 ft/lbs @ 0* F
(Min.)	30 Minutes, no flaking or degradation

Crush (Ring Section) 100% crush no cracking

Vacuum Test (Min.) 22 in HG for 24 hrs

Must meet AWWA standards.

4 Excavation for Pipeline Trenches

Unless specifically directed otherwise by the CITY or unless required to uncover or determine the presence of underground obstructions, not more than three hundred (300) feet of trench shall be opened ahead of the pipe laying, and no more than two hundred (200) feet of open ditch shall be left behind the pipe laying. All barricades, lanterns, watchmen, and other such signs and signals as may be necessary to warn the public to the dangers in connection with open trenches, excavations and other obstructions, shall be provided by and at the expense of the contractor. All existing traffic control signals, signs or other facilities shall be kept in place and/or in operation by the contractor. Traffic control signs and construction procedures required by the Texas Department of Transportation shall be strictly followed on the portion of the work done on State of Texas rights-of-way.

When so required, or when directed by the CITY, only one-half of the street crossings and road crossings shall be excavated before placing temporary bridges over the side excavating for the convenience of the traveling public. All backfilled ditches shall be maintained in such manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and the property owners abutting the improvements shall be taken into consideration.

All public or private drives shall be promptly backfilled or bridged at the direction of the City or contractor. Excavated materials shall be disposed of so as to cause the least interference, and in every case the disposition of excavated materials shall be satisfactory to the City.

Trenches shall be opened to a depth so that the top of the pipe shall not be less than two and one-half (2-1/2) feet below the surface of the ground when laid through wooded areas, fields and other such areas outside the pavement or traveled surface of highways and roadways. Any alterations must be approved by the city. The minimum depth of cover shall not be less than three and one-half (3-1/2) feet for pipelines laid within the pavement, traveled surface, or shoulder of any highway and/or roadway. Any line crossing a State Highway shall have a minimum depth of cover of four (4) feet. All depths of cover are measured to the top of the pipe.

Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by CITY, trenches shall in no case be excavated or permitted to become wider than one foot six inches (1' 6") plus the nominal diameter of the pipe, at the level of the crown of the pipe.

In all areas along State Highways where the pipeline is being laid in the pavement or in the right-of-way of the road, the Texas Department of Highways requires that excavation during each day be limited to the footage of pipe that can be laid and the trench be backfilled, all in accordance with the applicable provisions of this Section of the Detailed Specifications, and so that no open ditch is left overnight in such areas. The open end of lines in such areas shall be securely plugged when the line is left overnight.

Depth of excavation for footings shall be as shown on the Plans and /or as directed by City Utilities Operations to obtain sufficient bearings. All excavated material not needed for backfilling purposes shall be disposed of in a manner satisfactory to CITY OF HORSESHOE BAY.

The contractor, at his own expense, shall provide adequate facilities for promptly removing water from all excavations.

The excavation in earth shall be carried to the depth as indicated in the Plans and/or directed by the CITY to permit proper bedding of the pipe.

Before laying the pipe, the contractor shall open the trench far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.

The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the CITY, or Designated Engineer.

The sides of excavations in unstable material shall be supported by substantial sheeting, bracing and shoring or the sides sloped to the angle of repose. Adequate and proper shoring and bracing shall be solely the responsibility of the contractor.

All excavations shall be accomplished in accordance with applicable safety laws and regulations.

5 Rock Excavation

This includes the excavation of all solid rock, such as limestone or sandstone occurring in mass or ledge formation or such character as to warrant removal by blasting; and it shall also include the removal of boulders equal to or greater than one-half cubic yard in size.

In excavating for pipelines in rock, the excavation shall be carried to a depth of six inches below the invert of the pipe.

6 Unauthorized Excavation and Over-Breakage

Whenever the excavation is carried beyond or below the lines and grades given by the CITY OF HORSESHOE BAY, the contractor, at its own expense, shall refill such excavated space with such material and in such a manner as will insure stability of the line involved including the use of crushed stone or flowable fill.

Over-breakage is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the CITY, including slides. All over-breakage shall be removed by the contractor and disposed of as directed.

7 Chert or Crusher-run Stone for Pipe Bedding and Encapsulating

Force mains, 12" and smaller, laid in rock are to be encapsulated in a crushed stone envelope and all force mains shall be bedded with crushed stone. Material for this purpose shall be washed sand or flowable fill meeting the requirements of the engineer or THE CITY. A minimum of six inches above the pipe, six inches below, and extending to the ditch line on the sides is required where the pipeline is laid in rock. Care should be taken to insure that the bedding material has been worked under the pipe and on each side to provide adequate side support. 16" pipe and larger will require 12" of fill above and below the line.

If unsuitable material is encountered in the trench bottom, then the CITY may require additional excavation to insure a firm foundation for the pipe. In such cases, the trench bottom shall be brought backup to proper grade with bedding material as provided herein.

8 Pipe Laying

The trench shall be excavated to the required depth and width and bell holes and /or jointing holes shall be dug in advance of pipe laying.

The bedding material shall be placed and the bed of each piece of pipe carefully prepared so that each individual piece of pipe has a uniform bearing. Pipes shall be laid in a straight line and grade without kinks or sags, and shall be laid in a workmanlike manner.

Bell holes and /or jointing holes must be large enough so that the bell or hub will clear the ground and leave ample room for making joint and inspection of joints.

Before each piece of pipe is lowered into the trench, it shall be thoroughly swabbed out to insure its being clean. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the CITY.

Care shall be taken to prevent injury to the pipe coating, both inside and out. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fittings are discovered after the pipeline is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe. Pipe shall be cut only by approved methods as listed in the AWWA Specification covering that type of pipe and lining.

All angles or bends in the pipelines, either vertical or horizontal, shall be satisfactorily braced or anchored against the tendency of movement with a joint harness, concrete or equal anchors to the satisfaction of the CITY OF HORSESHOE BAY or engineer.

Open ends of unfinished pipelines shall be securely plugged or closed at the end of each day's work or when the line is left temporarily at any other time.

9 Backfilling Pipeline Trenches

After the line is bedded and properly laid, road base shall be placed to a level of at least six inches above the top of the pipe where the pipe is laid in rock. The entire width of the trench shall be filled to this level and compacted adequately to provide uniform side support for the pipeline.

Where the pipe is laid in earth, the backfill from the “haunch” of the pipe to six inches above the top of the pipe may be the earth material excavated from the trench **provided** that it is free from lumps, frozen material, etc. Large particles which could damage the pipe shall not be placed in the first 12 inches of backfill above the top of the pipe. It shall be compacted to a minimum of 90% Standard Proctor Density as determined by ASTM D690. A minimum of one field density test by an independent testing laboratory per 1,000 feet of line shall be provided and included in the unit price for the pipe. Additional tests may be ordered by THE CITY OF HORSESHOE BAY and any such tests that indicate specified compaction has been achieved shall be paid by the Owner. If the test indicates inadequate compaction, it and the re-test to verify adequate compaction will be paid for the contractor.

In filling the remainder of the trench, the backfill material may be shoveled into the trench without compacting, and heaped over whenever, in the opinion of THE CITY OF HORSESHOE BAY, this method of backfilling may be used without inconvenience to the public.

Where street paving or shoulders are to be repaired immediately, the contractor will be required to backfill the entire trench with road base. Open cut crossings of paved city or county streets will be backfilled with road base and flowable fill.

In areas where the trench is cut into rock or larger broken stone or boulders, and suitable earth backfill is not available, sand backfill may be required to within six inches of the finished grade. In any trench where the level of excavated rock extends above the level of the top of the pipe, the trench will be backfilled with sand at least six inches above the top of the pipe as a part of the unit price pipe cost.

Before final acceptance, the contractor will be required to level off all trenches where backfill material has been piled up, or to bring the trench up to level of the surrounding street, roadway, or terrain. The contractor will be required to remove from the streets, roadways, and private property all excess earth or

10 Inspection of Lines - During Construction

The contractor shall notify the CITY OF HORSESHOE BAY when pipe will be received on the job so that proper arrangements may be made for inspecting the unloading and stringing, as well as inspecting the pipe proper and examining for the manufacturer’s markings for size, class, material code, seal, etc.

Before the contractor backfills any of the lines, they shall be first inspected by the City Inspector or their designated inspector; and the CITY OF HORSESHOE BAY shall give the contractor permission to proceed with the backfilling. If any joints, pipes, or other workmanship of materials are found to be defective, they shall be removed and replaced by the contractor without any extra compensation. Contractor's will be charge 1-1/2 times the normal labor rates for after hours inspections. Normal hours are M-F, 8am-5pm.

11 Pipeline Marking with Metalized Tape and Detection Wire

All force mains, pumped sewer lines and house service lines from house service junction box to low pressure force main shall be marked by laying a metalized tape in the ditch above the line to allow location by a metal detecting device. The tape shall be color coded and labeled to identify the type of line and shall be manufactured by Alarmatape, Allen Systems, or equal. TAPE SHALL BE WITHIN ONE FOOT OF FINISH GRADE AND SHALL BE AT LEAST SIX INCHES WIDE.

A detection tape shall be installed with all force mains. Wire shall be installed with the pipe at the trench bottom and stubbed up at each house service connection and valve. The wire shall be 14 gauge insulated copper wire, commonly called “bell wire”.

12 Testing of Lines

Testing of lines shall comply with the provisions listed below, or similar requirements which will insure equal or better results.

Pipelines of whatever material shall be tested at the pressure as shown in the following table at which pressure the allowable leakage shall not exceed the requirements of Section 13 AWWA specification C600-64 as follows:

a.

<u>Pipe Size</u>	<u>Pressure Test</u>	<u>Allowable Leakage per 1,000 Feet</u>
1-1/2 inch	150 psig	0.15 gallons per hour
2 inch	150 psig	0.19 gallons per
2-1/2 inch	150 psig	0.23 gallons per hour
3 inch	150 psig	0.28 gallons per hour
4 inch	150 psig	0.37 gallons per hour
6 inch	150 psig	0.6 gallons per hour
8 inch	150 psig	0.74 gallons per hour
10 inch	150 psig	0.92 gallons per hour
12 inch	150 psig	1.1 gallons per hour

Pressure shall be measured at low point on section of pipelines. The contractor shall furnish all gauges, meters, pumps, and other equipment required and shall maintain said equipment in condition for accurate testing as determined by the CITY OF HORSESHOE BAY inspector, or authorized city engineer.

b.

Where practical, pipelines shall be tested in lengths between line valves or plugs of no more than 1,500' feet.

c.

- d. Where leaks are visible at exposed joints and/or evident on the surface where joints are covered, the pipe shall be rejoined and leakage minimized regardless of total leakage as shown by test.
- e. Duration of test shall be not less than two hours where joints are exposed and not less than eight hours where joints are covered.
- f. Lines which fail to meet tests shall be repaired and re-tested as necessary until the test requirements are complied with.
- g. All pipe, fittings, and other materials found to be defective under the test shall be removed and replaced at the contractor expense.
- h. Pipelines should be held under normal operating pressures for at least 24 hours before testing.
- i. Generally, pressure testing shall be done after services are laid. The test shall include the entire service line to the grinder service tap .

13 Concrete Kickers, Anchors and/or Encasements

Concrete kickers, anchors and/or encasement of force mains shall be placed where and as shown on the Plans or as directed by the CITY OF HORSESHOE BAY. Concrete for anchors, cradle or encasement shall be Class "C" and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. In pouring thrust blocks on plastic pipe, **the pipe will first be wrapped with 4 mil visqueen to prevent adherence of the concrete to the pipe.**

14 Resilient Seat Gate Valve

Resilient seat gate valves shall be as manufactured by AMERICAN DARLING, suitable for utilization with domestic sewage and working pressures of 200 psi. The valve shall consist of a cast iron body epoxy coated, a modified wedge disc, resilient rubber seat ring, non-rising stem bronze stem nut cast integrally with valve disc, and O-ring seals mounted above and below the thrust collar. The resilient seat gate valve shall provide bubble tight shutoff and a full port flow-way. The valve interior shall be fully protected by a two part thermosetting epoxy coating. The modified wedge shall be fully supported with the backside traveling along a machined surface in the valve body. Solid guide lugs on the disc will allow travel within channels cast in the sides of the valve. The resilient rubber seat ring shall be attached to an annular mounting surface on the front side of the disc with stainless steel screws.

All valves shall be furnished with mechanical joint end connections, unless otherwise shown on the Plans or specified herein. The end connections furnished shall be suitable for connections to the pipe furnished.

All valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.

All valves shall be provided with a two-inch square operating nut and shall open by turning to the left (counterclockwise).

Valve boxes shall be cast iron, three piece, screw type with drop cover marked "Sewer". They shall be set vertically and properly adjusted so that the cover shall be in the same plane as the finished surface of the ground or street.

15 Ball Valves

Shutoff valves on the pumped sewer lines for sizes two-inch or smaller shall be full ported brass ball valve, Ford brand type. Ball valves shall have socket end. Port opening through ball shall be same size as pipe. Valves shall be as manufactured by Ford or Cambridge.

16 Service Connections

The CITY OF HORSESHOE BAY will designate the location of the points on the pumped sewer lines or force mains where fittings are to be installed for service connections. The contractor shall keep a detailed record of the locations of these fittings as referenced to surface landmarks to allow easy location of each service connection. Location records shall be submitted to the City Inspector as the work progresses.

The pressure service lines from each grinder pump installation to the low pressure force main (pumped sewer line) shall be schedule 40 PVC. The pressure service line shall be 1-1/2 inch unless otherwise specified on the Plans and shall be laid to follow the ground profile. Service lines installed between grinder pumps and house service junction box will require sand bedding when laid in earth and shall have a minimum cover of 18 inches. Service lines installed from junction box to pumped sewer line connection point shall be installed in accordance with the requirements of the applicable paragraphs of this Section of the Specifications.

17 House Service Junction Box

A house service tap with shutoff valve and redundant check valve shall be installed in the service line from each grinder pump installation near its intersection with the low pressure force main (pumped sewer line) system. The exact location of the service junction box shall be determined in the field by the CITY OF HORSESHOE BAY and shall be in non-traffic areas.

The shutoff valve shall be a full ported brass ball valve. Ball valves shall be 1-1/2 inch in size.

The redundant brass check valve shall be 1-1/2 inch of the gravity-operated, flapper type. The check valve will provide full-ported passageway when open and shall introduce a friction loss of less than six inches of water at maximum rated flow. Working parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability and fatigue strength.

18 Valve and/or Cleanout Assemblies

The various types of valve and/or blow off assemblies shall be installed at the general locations shown on the Plans. The exact location of these assemblies shall be determined in the field by City Personnel.

Valves 2-inch or less in diameter associated with the valve and/or blow off assemblies shall be brass valves. Valves 3-inch or larger shall be resilient seat gate valves as described in Paragraph 14 of this Section of the Specifications.

Pits shall be as shown on the Plans complete with frame and cover, connecting piping and all accessories as shown on the Plans.

19 Air Release Valves and Pits

Automatic sewage type air release valves and pits shall be installed on the force main at all high points in the lines as shown on the Plans. The exact location of air release valves shall be shown on the plans or in the field by the CITY OF HORSESHOE BAY engineer.

Air release valves shall be the short version of ARI, Inc. Valves shall be 2-inch inlet diameter and shall be fitted with proper size of orifices. The body and cover shall be of PVC, the trim shall be stainless steel and the float shall be of stainless steel. The valves shall be suitable for use in lines having a maximum water pressure of 150 psi. The valve shall be supplied with backwash accessories.

Pits shall be pre-cast or built in place as shown on the Plans, complete with frame and cover, connecting Brass or sch 80 piping, cutoffs, blow offs and all accessories as shown on the Plans. Cover shall be hinged, hot dipped galvanized.

20 Combination Air and Vacuum Valves and Pits

Automatic sewage type air and vacuum valves and pits shall be installed on the force main at specific high point locations as shown on the Plans. The exact location of the combination air and vacuum valve pits shall be as shown on the plans or in the field by the CITY OF HORSESHOE BAY engineer.

Each combination air and vacuum valve assembly shall be an ARI air release valve. The air release valve shall have a two-inch inlet diameter and the air and vacuum valve shall have a one-inch minimum inlet. Each valve shall be fitted with proper size of orifices. The body and cover of each valve shall be of PVC, the trim shall be stainless steel and the float shall be of stainless steel. The valves shall be suitable for use in lines having a maximum water pressure of 150 psi. Each valve shall be supplied with backwash accessories.

Pits shall be pre-cast or built in place as shown on the Plans, complete with frame and cover, connecting brass or sch 80 piping, cutoffs, blow offs, and all accessories as shown on the Plans or as otherwise required for a complete installation.

21 Replacing Streets and Roadways

a. General

The contractor shall replace all streets, alleys and roadways which may be removed, disturbed or damaged in connection with his operation under the contract. The contractor shall reconstruct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to his operations. The re-use of materials removed in making excavations will be permitted in the manner described, provided said materials are in good condition and acceptable to the CITY OF HORSESHOE BAY.

All City or County Streets and State Highway crossings shall be backfilled with compacted road base.

b. Removal of Pavement

Where pipelines cross or run within paved surfaces of roadways or driveways, extreme care shall be taken to minimize damage to the paving. Insofar as possible, paving will be sawed or machine cut to neat, even lines before excavation is started. Trenches within paved surfaces shall be kept to the smallest width possible consistent with safety requirements. Where necessary, trench jacks, temporary sheeting or other methods shall be employed to minimize the width of paving cuts and to maintain adequate safety measures.

In addition, the contractor shall make every effort to avoid incidental damage to pavement outside the immediate ditch line by using, insofar as is practical, rubber tired equipment, pads for backhoe leveling jacks, and other such measures that would minimize damage.

c. Traffic-Bound Base Course

Replacement of streets after trenching shall be handled in the following manner:

After the backfill has been compacted to within about three inches of finished grade in accordance with Paragraph 9 of this Section, the contractor shall place approximately four inches of road base as a traffic-bound base course, at the proper elevation to allow settlement, but not in such a way as to prevent traffic from using it. Crushed stone shall be in accordance with current requirements of the CITY OF HORSESHOE BAY.

The contractor shall maintain the traffic-bound base course by adding crushed stone -- as specified herein before -- in a safe and passable condition for a period of 60 days, or until such time as, in the opinion of CITY OF HORSESHOE BAY sufficient settlement has taken place and trenches are ready for final re-surfacing. Final depth of base is anticipated to be approximately six inches.

d. Sub grade for Final Re-surfacing

The traffic-bound course described above shall comprise the base course for all types of re-surfacing.

When, in the opinion of the CITY OF HORSESHOE BAY, the trench has reached a condition of settlement satisfactory for final re-surfacing, the contractor shall first strip the base course or backfill with road base (size as specified above) to obtain the proper sub grade elevation. The sub grade shall then be rolled with an approved type roller, or tamped until thoroughly compact and six inches thick.

Any depressions shall be filled with road base (as specified above) and the process of rolling or tamping continued until the sub grade has a smooth and uniform surface.

e. Asphaltic Concrete Pavement

Where asphaltic concrete pavement is to be replaced, the sub grade shall be prepared as above specified and this sub grade shall comprise the base course upon which the bituminous pavement shall be laid. The existing pavement shall be neatly cut back approximately one foot outside the trench and the new pavement tied into the existing.

The sub grade or base shall be thoroughly cleaned and broomed and a prime coat of medium tar shall be uniformly applied at a rate of 0.20 to 0.25 gallon per square yard.

When the prime coat has become tacky, but not dry and hard, a bituminous surfacing consisting of asphaltic concrete shall be placed, spread, finished, and compacted in accordance with the current standards of the Texas Department of Transportation. Compacted thickness of asphaltic concrete pavement replacement shall generally match the thickness of existing paving.

If the existing paving thickness exceeds six inches, the CITY OF HORSESHOE BAY shall be notified for a determination of the required thickness for replacement. If paving is less than two inches thick, the replacement paving shall be two inches.

f. Bituminous Surfacing (Surface Treatment)

Where bituminous surfacing is to be replaced, as shown on the Plans, or as directed by the CITY OF HORSESHOE BAY, the traffic-bound base shall comprise the subgrade upon which the bituminous surfacing shall be constructed. After the subgrade or base has been prepared, thoroughly cleaned and broomed, a prime coat of medium tar shall be applied at the rate of 0.30 to 0.35 gallon per square yard.

When the prime coat has become tacky, but not hard, bituminous material (asphalt of the grade directed by the CITY OF HORSESHOE BAY) shall be applied in two applications at the rate of 0.35 to 0.45 gallon per square yard for each application. The contractor shall apply approximately fifty pounds per square yard to road base ships between the two applications of bituminous material.

g. Untreated Surface

Where the existing surface is untreated crushed stone, the contractor shall replace the surfacing that is disturbed or removed with crushed stone as above specified, to at least the thickness of the existing surface.

h. Portland Cement Concrete Streets

Where Portland Cement concrete pavement must be removed and/or replaced, it shall conform to the existing pavement and/or the Plans and shall be replaced to a thickness equivalent to the existing pavement, but in no case less than six inches. It shall be accomplished with Class "A" concrete.

22 Remove and/or Replace Concrete Driveways

Where Portland Cement concrete driveways must be removed and/or replaced, they shall be replaced to a thickness equivalent to the existing pavement, but in no case less than six inches. It shall be accomplished with Class "A" concrete.

23 Removing and Replacing Sidewalks and Paved Ditches

Whenever sidewalks or paved ditches are removed or disturbed in connection with the construction work, they shall be replaced to the original lines and grades in fully as good or better condition that which existed prior to the contractor's operations.

After the sub-base has been brought to a satisfactory grade, a 3-inch layer of cinders or crushed stone shall be spread over it and thoroughly tamped. Immediately prior to pouring the concrete, the cinders or stone shall be thoroughly wetted, or the concrete shall be poured on a layer of heavy building paper.

The sidewalk shall consist of 4-1/2 inches of Class "A" concrete, struck off to accurately placed screeds and worked with a wooden float until the mortar appears on the top. After the surface has been thoroughly floated, it shall be brushed to leave markings of a uniform type similar to the existing walk. All joints and edges shall be finished with an edging tool. The allowable variation shall be 1/8 inch to ten feet transversely and longitudinally.

Other types of sidewalks, such as brick, stone, etc., shall be replaced with material removed during the progress of the work, in equally as good condition as that found before work started.

24 Removing and Replacing Curb and Gutter

Where a concrete curb and gutter is damaged or disturbed during the construction, it shall be replaced, using Class "A" concrete, in fully as good or better condition than which existed prior to the contractor's operation.

25 Seeding

All disturbed areas shall be left smooth and thickly sown with a mixture of 20% Blue Grass, 30% Italian Rye Grass, 50% Kentucky Fescue #31 and/or such other grasses as are specified by the Engineer. When the final grading has been completed, the entire area to be seeded shall be fertilized with ammonium nitrate at the rate of five lbs. per 1,000 square feet. The analysis of the commercial fertilizer shall be determined by soil tests. After the fertilizer has been distributed, the contractor shall disc or harrow the ground to thoroughly work the fertilizer into the soil. The seed shall then be sowed in two operations broadcast either by hand or by approved sowing equipment.

The application shall be thirty pounds per acre for each operation. If the CITY OF HORSESHOE BAY determines to use "hulled" or "unhulled" Bermuda, the application rate shall be seven pounds per acre. After the seed has been distributed, the contractor shall then lightly cover the seed by use of a drag or other approved device. All seed shall be certified not more than three percent weed. The seeded area shall then be covered with straw at the rate of 1-1/4 tons per acre. The straw mulch shall be tacked with asphalt or held in place by a fabric mat to prevent erosion by water or wind.

Any necessary re-seeding or repairing shall be accomplished by the contractor prior to final acceptance. If the construction work is brought to completion when, in the opinion of the City of Horseshoe Bay, the season is not favorable for the seeding of the grounds, then the contractor shall delay this item of work until the proper season for such seeding as directed by CITY OF HORSESHOE BAY.

All planting and seeding shall be watered thoroughly as soon as completed and shall be watered twice daily or more often if necessary to provide continuous growth without setback until all growth is thoroughly established. If the contractor does not plan to permanently re-seed within 60 days of backfilling the trench, he shall temporarily re-seed with rye or other appropriate grasses in order to reduce erosion.

26 Highway Crossings (Bored or Jacked)

The contractor should familiarize himself with the requirements of the County of State Highway Department within whose rights-of-way the contractor is working. The City will obtain and pay for any permit it is required to obtain to place the utility within the right-of-way and the contractor, at his expense, shall secure any permit he is required to obtain to work within the right-of-way, if such a permit is required. The contractor shall pay for any insurance to the amount and extent required by the Highway Department involved.

Pipeline crossings of U. S. and State of Texas highways and where otherwise directed by the CITY OF HORSESHOE BAY will be made by boring or jacking a smooth wall steel casing pipe under the road bed and inserting the carrier therein. Where boring is required, holes shall be bored under the highway at least five feet below the surface with no disturbance to the surface or as otherwise directed by the CITY OF HORSESHOE BAY. The steel pipe shall be manufactured and tested in accordance with ASTM A139-74, Grade A, with minimum wall thickness and diameter as shown on the Plans, and shall have a minimum yield strength of 35,000 psi. Casing pipe shall be so constructed as to prevent leakage of any substances from the casing throughout its length except at ends. Casing shall be so installed to prevent the formation of a water way under the roadway, with an even bearing throughout its length, and shall slope to one end (except for longitudinal occupancy).

An approved bituminous protective coating shall be applied to the casing pipe to prevent corrosion both inside and outside.

Bored or jacked installations shall have a bored hole diameter essentially the same as the outside diameter of the pipe plus the thickness of the protective coating. If voids should develop or if the bored hole diameter is greater than the outside of the pipe (including coating) by more than approximately one inch, remedial measures as approved by the Highway Department shall be taken.

If approval of the Highway Department is obtained, open cutting of crossings may be permitted. Installations by open-trench methods shall comply with Highway Department specifications. Deletion of the casing pipe for open cut highway crossings or bored and jacked crossings will be permitted provided (1) it meets the approval of the Highway Department; (2) ANSI A21.51 ductile iron pipe with Class 52 minimum wall thickness is used as the carrier and; (3) the overall effect is to reduce the project cost.

27 Bank Erosion

The contractor shall maintain all areas where excavation and backfilling operations are being performed or have been performed in order that siltation and bank erosion will be kept to a minimum during

28 Environmental Statement

During construction of the project, extreme care shall be exercised to protect graded and cleared areas. To accomplish this end, temporary grassing, berm ditches and containment dikes may be necessary to minimize the effects of runoff and erosion in the work areas.

29 Cleanup

Prior to final acceptance of the work, the contractor will clean up the areas in which it has performed work, and the area shall be left free of debris, neatly graded, seeded where required and ready for use.

SECTION 2

GRINDER PUMPS AND APPURTENANCES

1 Scope

This Section of Specifications describes in general terms the grinder pumps and appurtenances procured by the CITY OF HORSESHOE BAY for installation of any and all low pressure sewer systems installed in the City. Developers, contractors, or individuals will purchase the grinder pumps and appurtenances from the City to insure that all low pressure sewer systems installed are uniform, compatible and of the quality standards required by the City. Installation will be in accordance with Sections 1 and 2 of these Standard Specifications along with the attached Standard Installation Details.

Any contractor, developer, or individual planning to install a pressure sewer system in a new or unsewered development must submit detailed plans prepared by a registered engineer in compliance with these CITY OF HORSESHOE BAY Standard Specifications and Details and all applicable State requirements to the CITY OF HORSESHOE BAY and the State Department of Environment and Conservation for review and approval.

2 Standard Simplex Grinder Pump Units

a. General

The standard simplex grinder pump station shall consist of a single grinder type submersible pump housed in a fiberglass wet well having a fiberglass cover and complete with all appurtenances required for a fully operable pumping system. Pump level controls, alarm, piping, fittings, valves, and all accessories shall be furnished, (by the City) and paid for by the Owner / Contractor as a part of the factory fabricated package so that after burying the wet well, the field connection of the house inlet line, discharge line and electrical service line to control box will complete the installation of the grinder station.

b. Manufacturer

Each grinder pump station shall be manufactured and assembled by a single manufacturer and shall be shipped to the CITY OF HORSESHOE BAY complete and ready for installation. Warranty requirements shall be in accordance with paragraph 6 of this Section. Manufacturer shall be Hydromatic Pumps.

c. Pump

The pump shall be of the centrifugal type with an integrally built-in grinder unit and submersible type motor.

The grinder unit shall be capable of macerating all material in normal domestic and commercial sewage, including reasonable amounts of foreign objects such as wood, plastic and the like to a fine slurry that will pass freely through the pump and 1-1/4 inch discharge pipe.

The pump,(hydromatic model HPG-200-m-2), shall be capable of pumping sewage at a design rate of 18 gpm against a total dynamic head of 90 feet. The pump shall have a maximum capacity of 40 gpm at a total head of approximately 53 feet with a shutoff head of 105 feet. The pump shall be capable of operating at any point on the hydraulic performance curve without overloading the motor or sustaining damage from hydraulic cavitation. The pump shall be C.S.A. labeled, or equal. Model HPG- 200VM3-2 is available for hi-head applications.

The pump motor shall be of the submersible type rated 2 HP at 3450 RPM and operating on 230 Volt, Single Phase, 60 Hertz power. The motor shall be of the capacitor start, capacitor run type for high starting torque. Motor bearings shall be pressed on for perfect alignment and best heat transfer. Stator winding shall be of the open type, with Class A insulation. Oil will cool the windings and lubricate the bearings and seals.

Two ball bearings shall support shaft and rotor and take axial thrust. A separate sleeve bearing in seal chamber shall take radial load from grinder impeller.

Tandem rotary shaft seals in an oil filled chamber shall prevent moisture from entering motor housing. A seal leak probe connected to a warning light on the control box exterior shall indicate when excessive moisture has entered through bottom seal signaling that repair is necessary.

The motor end cap and cord seal shall consist of a rubber compression gasket that will seal around the power cable jacket and give substantial mechanical strength to the assembly. The motor wires shall also be sealed into housing by potting material, (Epoxy) that will keep moisture from entering the motor and oil from wicking out.

A bronze recessed impeller mounted on stainless steel shaft shall handle ground slurry without clogging or binding. There shall be no close clearances and all flow passages shall be unobstructed. The common motor pump and grinder shaft shall be 416 stainless steel threaded to take pump impeller and grinder impeller.

The grinder assembly impeller and shredding ring shall be mounted below the volute passage and shall be replaceable without taking pump apart. The shredding ring shall be pressed into an iron flange. The flange shall be provided with tapped back-off holes so that screws can be used to push the shredding ring from the housing. All grinding of solids shall be from action of the impeller against the shredding ring. Grinder assembly parts shall be of 440C stainless steel hardened to C-58-60 Rockwell.

All leads from SEOOW and STWA cords shall be potted into the cap with polyurethane resin to prevent moisture from entering even if the cord is damaged or exposed to moisture.

A heat sensor thermostat shall protect motor from burnout due to excessive heat from any overload condition and automatically reset when motor has cooled.

All iron castings shall be pretreated with phosphate and chromic rinse and shall be coated inside and out with a high temperature baked epoxy paint before and after manufacturing. All fasteners shall be stainless steel.

d. Wet well Basin

The wet well shall consist of a heavy fiberglass basin adequately reinforced for buried service. The nominal dimensions of the wet well basin shall be 36 inches diameter by a depth of 48 inches unless otherwise required. The basin shall be molded of fiberglass reinforced resin of the lay-up and spray technique to assure that the interior surface is smooth and resin rich. The basin shall have a minimum wall thickness of 1/4-inch and a minimum of 25% glass fibers shall be used. A vertical heavy rib or bottom flange shall be provided for anchoring the basin in concrete to prevent floatation.

A removable fiberglass lid shall be provided to allow easy access to pump, piping and level controls. Cover shall be bolted to basin with cap screws and washers for screws shall be completely embedded in the fiberglass to prevent turning and for corrosion resistance. Tapped-back holes shall be provided in the cover so that cover can be lifted with screws instead of prying on the basin flange. Cover shall be sealed with foam gasket material provided to prevent leakage of gas.

The standard depth of the wet well basin upon which the base lid of each simplex grinder pump installation is to be based shall be 48 inches. Extensions are available for deeper applications.

e. Electrical Motor and Level Controls

Electrical and level controls shall be provided by the pump manufacturer. Pump on an off levels as well as high level alarm shall be controlled by micro,(HPLC by Hydromtaic pumps) or mechanical float tube switches. Each mercury type switch shall be sealed in a solid polyurethane float ball. Two float controls shall be required for starting and stopping the pump and a third float control will activate a flashing red alarm light and audible horn in the event a high liquid level occurs. Each float shall be weighed internally or a weight shall be attached to the cord above the float to hold each float in place in the sump. All controls shall be mounted so that they can be cleaned or replaced without disturbing pump or piping. The float controls shall be supported .

The control panels and all associated components on each standard simplex grinder pump station shall be U. L. Approved and shall bear the U. L. Approved label. All equipment associated with each grinder pump station shall meet the current requirements of National Electric Codes and all applicable Federal, State, and local electrical codes. The contractor, developer, or individual will arrange for the City Inspector to perform the required electrical codes inspection.

All electrical elements shall be furnished pre-wired and housed in a NEMA 3R enclosure (control box). The control box shall be constructed of a gray thermoplastic/fiberglass material and shall be approximately 12 inches by 14 inches in length and width. The power supply to the control box shall be 230 volt, single phase, 4 wire system. Control circuit shall be 115 volt.

The outer door of the control box shall be hinged of the dead front type with locking hasp and suitable accessories to allow wall mounting.

Motor start and run capacitors and start relay shall be mounted in the control box. Motor shall be activated by a magnetic type contactor and a reset overload shall protect the motor against excessive current conditions.

A heat sensor thermostat in the motor winding wired in series with the magnetic contactor coil shall protect the motor against excessive heat. Sensor shall reset automatically when motor cools. A seal leak probe shall be installed in motor and be connected to a signal light on the exterior of the control box. An alarm test switch, HOA switch, run light, horn auto/off switch, and overload reset button shall be supplied inside the control box.

A terminal strip with box type connectors shall be supplied to make all power and control connections. All terminals shall be marked for easy identification. A ground terminal strip shall also be provided and labeled.

The basin junction hub shall be constructed of a corrosion resistant material, properly reinforced and of adequate thickness to provide good mechanical strength. The cover shall be fully gasketed and held in place with stainless steel screws. Only if required by City personnel.

Sealtite Conduit, or rigid electrical pvc conduit, shall be supplied for the power supply. The sealtite fittings shall also seal to the junction hub wall with an "O" gasket or other effective means.

The electrical junction box shall have a PVC solvent weld socket type or sealtite type conduit fitting mounted in the bottom of the a/c type disconnect. The hub shall be of a corrosion resistant material and shall be of adequate size to accommodate the number of wires required to operate the pump. A method for sealing the incoming wires shall be supplied so that condensation from the conduit or ground water will not enter the enclosure.

A 2" inch conduit fitting (rigid) or ("sealtite") shall also be provided for sealing cords from control box into the basin in order to allow room for carrying multiple wires to control box.

g. Piping and Valves

All piping, fittings, valves, connections, and associated appurtenances shall be provided as required for a complete pumping unit. In addition to the combined check valve and seal fitting mentioned previously, a 1-1/4 inch (minimum) ball valve shall be installed,(inside basin) in the discharge line for closing when pump assembly is removed. A 1-1/4 inch (minimum) discharge connection shall be provided as required.

Provide a, 3" inch or 4"-inch, "adapt-a-flex" inlet grommet to be installed by plumbing contractor on-site.

The inlet flanges shall be suitable for field mounting on the grinder pump wet well. All hardware, gaskets, and accessories required to effect a watertight seal between the hub and wet well and the gravity inlet sewer and hub shall be supplied.

h. Manufacturer's Representatives

The manufacturer shall include in its bid price the costs of the services of manufacturer's factory trained representative to supervise the installation and to supervise the initial start-up and the field acceptance tests of the grinder pump station installations. The manufacturer's proposal shall include a schedule showing a daily and weekly rate for the factory representative plus travel and per diem charges. **The CITY OF HORSESHOE BAY may require this service at various times as pressure systems are installed. Any qualifications, escalation clauses, the lead time notification periods should be stated in the manufacturer's proposal.**

I. Installation and Operating Instructions

Installation of the pump station and related appurtenances shall be done in accordance with written instructions provided by the City of Horseshoe Bay. The City shall provide two copies of a complete and detailed Installation, and Operating forms.

3 Standard Duplex Grinder Pump Station

The standard duplex grinder pump station shall consist of two grinder type submersible pumps housed in a fiberglass wet well having a fiberglass cover and complete with all appurtenances required for a fully operable pumping system. Pump level controls, alarms, piping, fittings, valves, and all accessories shall be furnished as a part of the(City) fabricated package so that after burying the wet well, the field connection of the gravity inlet line(s), discharge line and electrical service line to control box will complete the installation of the grinder station.

Each grinder pump station shall be manufactured and assembled by any of two manufacturers and shall be shipped complete and ready for installation. Warranty requirements shall be in accordance with Section 6 of these Specifications. Manufacturer shall be HydroMatic or E-One.

The components of the standard duplex grinder pump station are basically identical to the standard simplex grinder station's components with the exception that two grinder pumps are required instead of one pump. Therefore, the standard duplex pump station installation shall meet the requirements of Paragraph 2 of this Section of these Specifications with the exception that all additional components required for the operation of two grinder pumps shall be provided. Some of these additional items and other exceptions to the above specified requirements are listed below.

Each pump shall be capable of pumping sewage at a design rate of 18 GPM against a total dynamic head of 90 feet. Each pump shall also have a maximum capacity of 40 GPM at a total head of approximately 53 feet with a shutoff head of 105 feet. Each pump motor shall be of the submersible type rated 2 HP at 3450 RPM and operating on 230 volt single phase, 60 Hertz power. Each pump shall be capable of operating at any point on the hydraulic performance curve without overloading the motor or sustaining damage from hydraulic cavitation.

The wet well for a standard duplex station shall consist of a heavy fiberglass basin having a nominal diameter of 42 inches. The standard depth of the wet well basin upon which the base bid of each standard duplex grinder pump installation is to be based shall be 48 inches. Unit prices for other basin depths may also be requested. The prices for each depth shall include all hardware, piping, and other appurtenances for a complete installation.

Electrical and level controls similar to that required for simplex grinder units shall be provided by the City for full operation of two grinder pumps in the standard duplex grinder stations. Three mercury tube switches sealed in solid polyurethane float balls, or HPLC level control unit, shall be required for starting and stopping the two pumps and a fourth float control will activate a flashing red alarm light mounted on top of the station control box in the event a high liquid level occurs in the wet well.

All electrical elements shall be furnished pre-wired and housed in a NEMA 3R control box. The power supply to the control box shall be 230 volt, single phase, line voltage of 115 volts for control circuit. The control box shall include all circuit breakers, HOA switches, alarm switches, run lights, seal lights, overload reset button relays, wiring and other electrical components required for operating the duplex grinder pumping system.

An alternator relay shall be supplied to alternate pumps on each successive cycle. An override relay shall be used to start both pumps if inflow is greater than one pump can handle and shall start the second pump in case operational pump fails.

Heat sensor thermostats shall be provided with each motor to protect motors against excessive heat. A seal probe installed in each motor shall be connected to red signal lights on the exterior of the control box.

4 Shop Drawings

Five sets of complete shop drawings for the simplex and duplex pump station shall be submitted for review and approval prior to manufacture and shipment of the units. This may be required only at the City's request.

5 Warranty

Each manufacturer will be required to provide a warranty on the grinder pumps and accessories. As a minimum, a standard 12-month warranty on material and workmanship will be required. Any proposed additional or extended warranty provisions which the manufacturer wishes to offer should be described in detail as a part of its proposal and significant weight will be given to such provisions in evaluating the proposals.

Blasting

A permit is required by the city before any blasting occurs. See city ordinance- # ORD--07-03-20

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