

SECTION VII
LOW PRESSURE SEWER SYSTEM

7:01 SCOPE:-

This Section covers the general design consideration in the development of plans and specifications for the construction of low pressure sewer system. Materials and construction considerations are covered under Section VI.

7:02 DESIGN CONSIDERATIONS:-

The following design parameters shall be used in the preparation of plans and specifications for Low Pressure Sewer System:

- a. Minimum velocity in any part of the system shall be 2.0 feet per second.
- b. Maximum velocity at full development of an area shall not exceed 7.5 feet per second.
- c. The following "c" values shall be used in the design of pipes:
 1. Polyvinylchloride (PVC) = C = 140
 2. Ductile Iron Pipe (DI) = C = 120
- d. Pipes shall be designed on minimum head loss for each section.
- e. Flushing Station Locations:
 1. At all dead end lines.
 2. On main lines not to exceed 1500 feet between stations.
 3. At intersection of lines.
- f. Main Line Valving:
 1. Valves shall be located as shown on the drawings and be in accordance with Section 6:16 "Detailed Specifications for Installation of Force Mains"
 2. Concrete Tops shall be in accordance with the drawings and be 3,000 lbs - 28 days compressive strength.
 3. Valve Boxes shall be in accordance with Section 6:17 "Detailed Specification for Installation of Force Mains"
- g. Pipe: Pipe shall be either PVC, Class 200 - SDR 21 of D.I. Class 50 in accordance with Section VI - Detailed Specifications for Installation of Force Mains.
- h. Force Mains: Force Mains shall be in accordance with Section VI - Detailed Specifications for Installation of Force Mains.

7:03 PAYMENT:-

The unit price bid in the proposal shall include all work and cost incidental to work performed under this Section.

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WATER WORKS AND SEWER BOARD
OF THE
CITY OF GUNTERSVILLE, INC.

SECTION VII

SPECIFICATIONS FOR: LOW PRESSURE SEWER SYSTEM

- 7:01 SCOPE
- 7:02 DESIGN CONSIDERATIONS
- 7:03 PAYMENT

COPY

COVENANTS AND RESTRICTIONS

SEWAGE DISPOSAL

No individual sewage disposal system shall be permitted on any lot. Each individual lot shall be individually connected into the gravity-independent, low-pressure sewer (LPS) system, powered by Environment One Grinder Pumps. The individual property owner shall furnish and install at his expense the disposal system. Before a building permit for the construction of a dwelling can be obtained, approval of the system and approval to connect to the city sewer system shall have been obtained from the Water and Sewer Board of the City of Guntersville, Alabama.

GRINDER PUMPING STATIONS

The Grinder Pumping Stations shall meet the following specifications and installed pursuant to the manufacturers attached recommendations:

The manufacturer shall furnish complete Environment One factory-built and tested Grinder Pump Station(s) or equivalent furnished by Jim House & Associates of Birmingham, Alabama, 1-800-292-6335. Each station to consist of one (1) grinder pump mounted in a basin constructed of high density polyethylene (HDPE), electrical quick disconnect pump removal system, shut-off valve, anti-siphon valve, and check valve assembled within the basin, remote electrical alarm/disconnect panel, and all necessary internal wiring and controls. For ease of serviceability, all pump motor/grinder units shall be of like type and horsepower throughout the system.

The pumps shall be capable of delivering 15 gpm against a rated dynamic head of 0 feet (0 psig) and 9 gpm against a rated total dynamic head of 138 feet (60psig). The pump(s) must also be capable of operating at negative total dynamic head without overloading the motor(s). The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with mechanical seal.

The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece stainless steel motor shaft. The grinder will be of the rotating type with a stationary hardened and ground chrome steel shredding ring spaced in accurate close annular alignment with the driven impeller assembly, which shall carry two hardened type 400 series stainless steel cutter bars. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions.

The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign Objects," such as paper, wood, plastic,

glass, rubber, and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter s/s discharge piping.

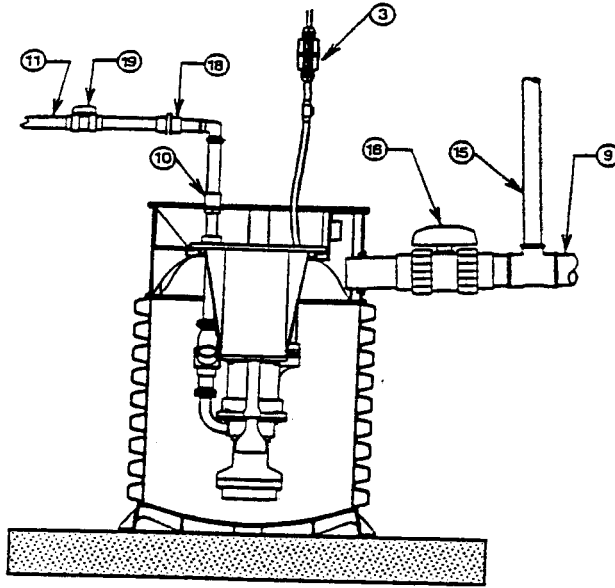
The motor shall be a 1 HP, 1725 RPM (maximum), 240 Volt, 60 Hertz, 1 Phase, capacitor start, ball bearing, squirrel cage induction type with a low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds.

The accessway shall include a single NEMA 4X electrical quick disconnect for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. The accessway shall also include a 2" PVC vent to prevent sewage gases from accumulating in the tank. The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. Necessary controls shall be located in the top housing of the core unit. The top housing will be attached with stainless steel fasteners. Non-fouling wastewater level detection for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air-bell level sensor connected to a pressure switch.

Each grinder pump station shall include a NEMA 3R, UL Listed ALARM/DISCONNECT PANEL suitable for wall or pole mounting. The enclosure shall include a hinged, padlocked cover, secured dead bolt front and component knockouts. For each core, the panel shall contain one (1) - 15 amp, double pole circuit breaker for the power circuit and one (1) 15 amp single pole circuit breaker for the alarm circuit. The panel shall contain terminal blocks, integral power bus, push to run feature, and a complete alarm circuit.

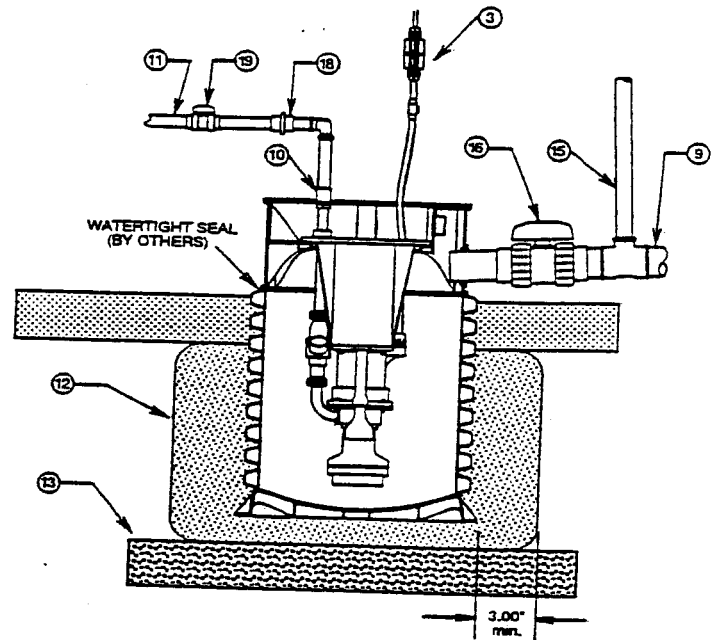
INDOOR, ON-FLOOR INSTALLATION

Figure 1a

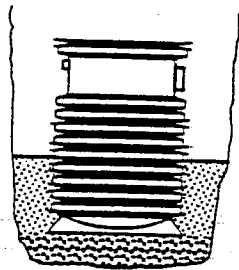


INDOOR, IN-FLOOR INSTALLATION

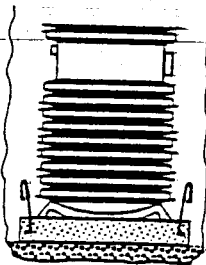
Figure 1b



BALLASTING OPTIONS

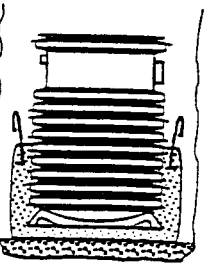


POURED IN-PLACE



SLAB

Consult factory for details.

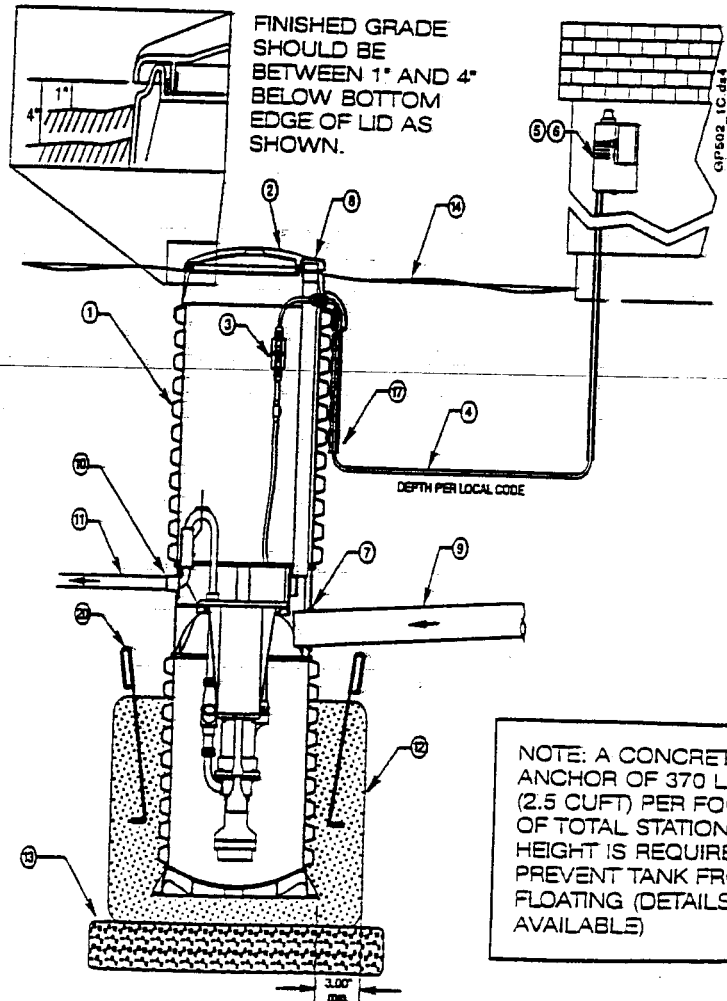


PRECAST

GP502_1C 04*

OUTDOOR INSTALLATION

Figure 1c



FINISHED GRADE
SHOULD BE
BETWEEN 1" AND 4"
BELOW BOTTOM
EDGE OF LID AS
SHOWN.

DEPTH PER LOCAL CODE

NOTE: A CONCRETE
ANCHOR OF 370 LBS.
(2.5 CUFT) PER FOOT
OF TOTAL STATION
HEIGHT IS REQUIRED TO
PREVENT TANK FROM
FLOATING (DETAILS
AVAILABLE)

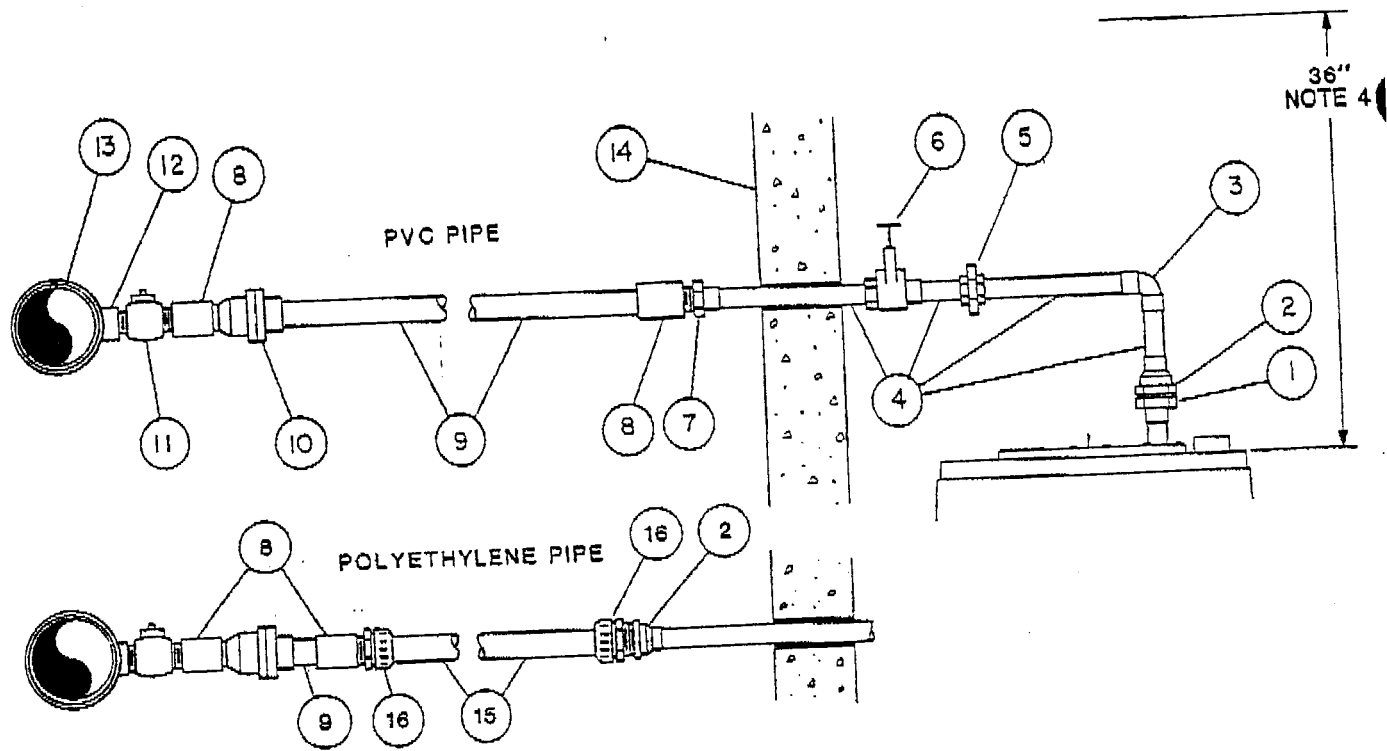
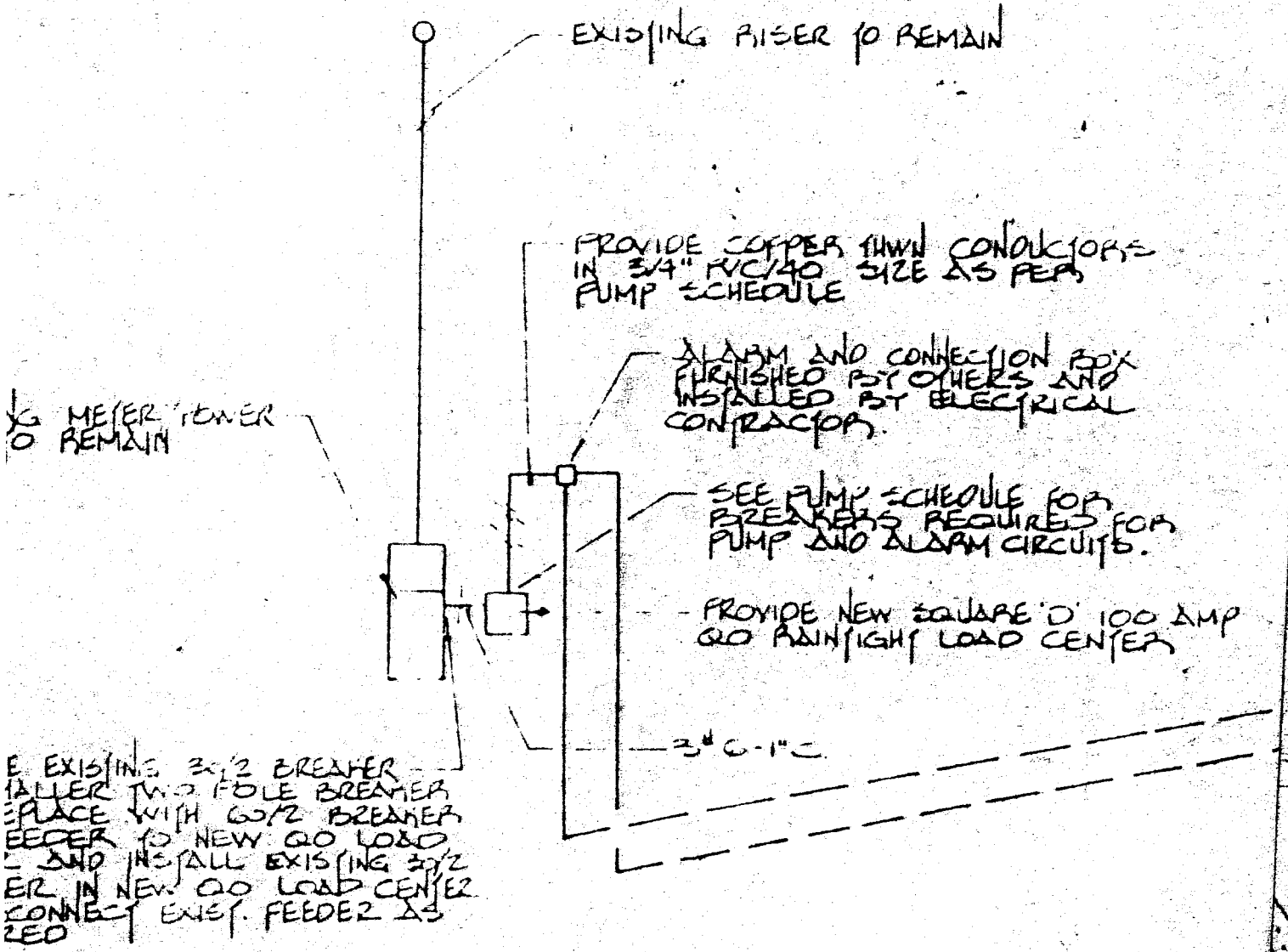
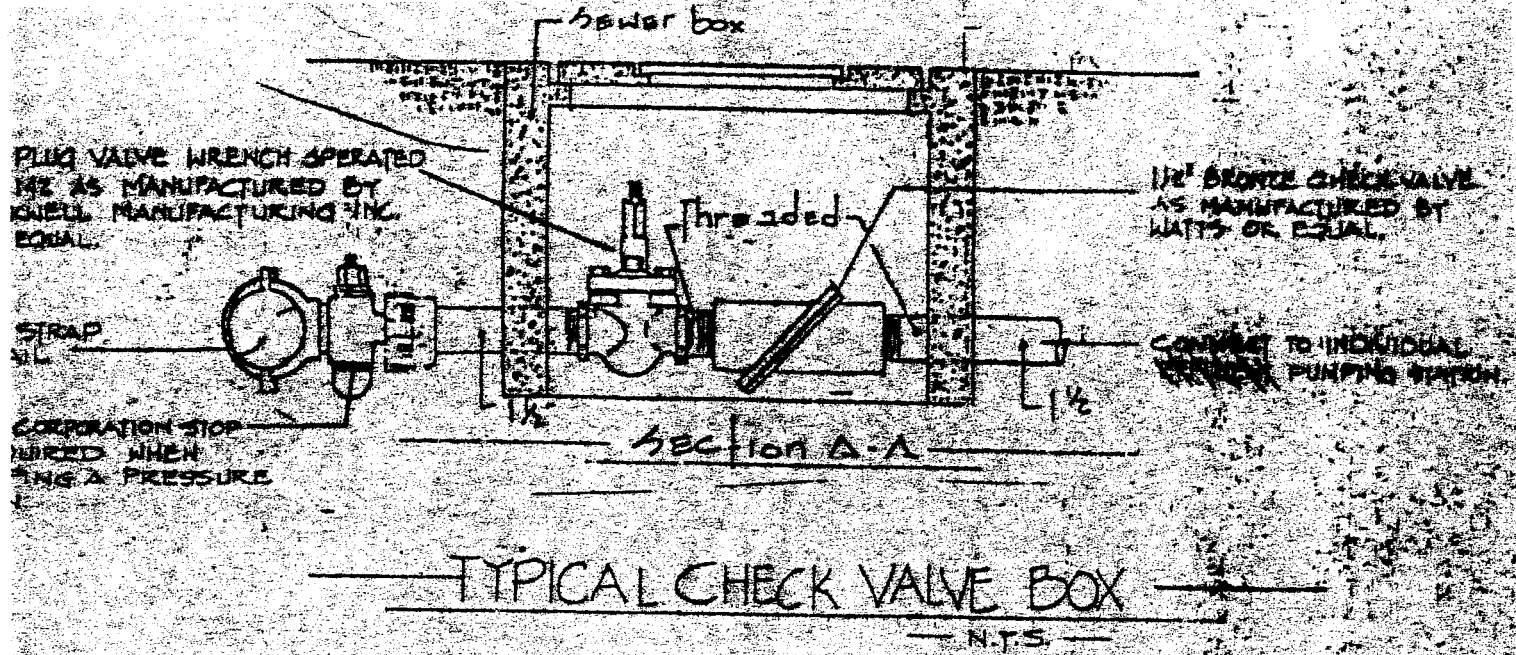


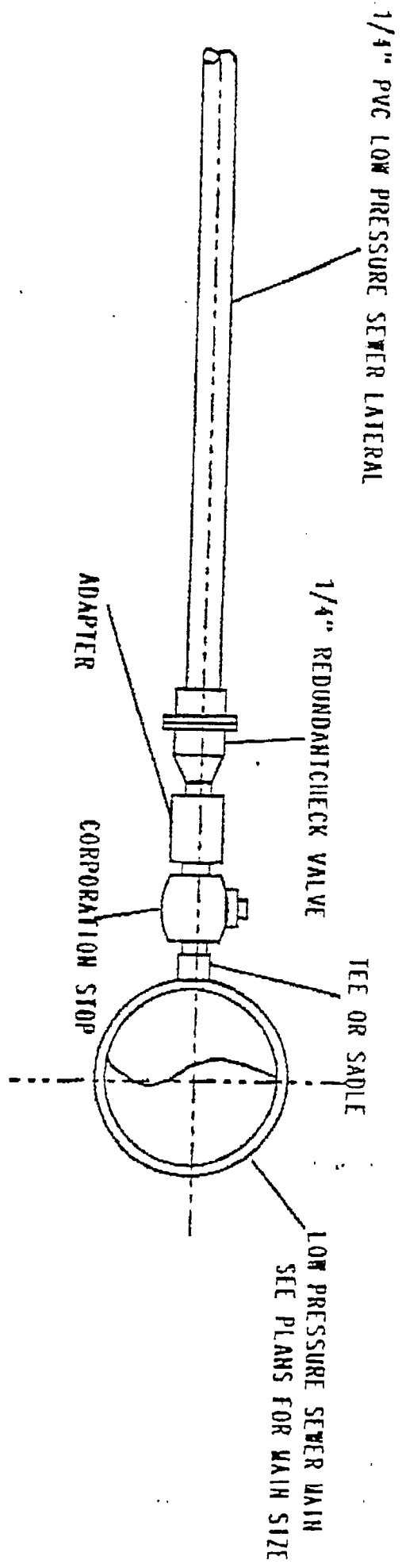
FIG. 10
RECOMMENDED DISCHARGE PIPING
TO A LOW PRESSURE SEWER MAIN

1. GRINDER PUMP DISCHARGE - 1 1/4" MPT
2. ADAPTER - 1 1/4" FPT X 1 1/2" Sweat, Copper.
3. ELBOW 90° - 1 1/4" Sweat X Sweat, Copper (NIBCO 607 or equivalent.)
4. PIPE - 1 1/4" Type K, Copper. See Note 4.
5. DISCONNECT JOINT - 1 1/4" Union or Compression Type Coupling, See Note 3.
6. VALVE - 1 1/4" Fully Ported (gate, ball valve, etc.)
7. ADAPTER - 1 1/4" MPT X Sweat, Copper (NIBCO 604 or equivalent).
8. ADAPTER 1 1/4" FPT X 1 1/4" Socket, PVC.
9. PIPE - 1 1/4" PVC (160 PSI minimum).
10. CHECK VALVE - 1 1/4" Fully Ported Swing Type.
11. CORPORATION STOP - 1 1/4" MPT X MPT, Brass.
12. TEE or TAPPING SADDLE - 1 1/4" FPT X As Required for connection into low pressure main.
13. LOW PRESSURE MAIN
14. FOUNDATION WALL
15. PIPE - 1 1/4" Polyethylene, SDR 9 (160 psi minimum).
16. ADAPTER - 1 1/4" MPT X Compression (For SDR 9 pipe, Flo Control 730-12 or equivalent).

NOTES:

1. Installation must conform to all applicable codes (building, electric, plumbing, etc.)
2. Discharge line to be below frost line or protected from freezing with insulation.
3. Disconnect joint must be beyond the outside of the Grinder Pump core and a minimum of 3' head room over the tank to allow removal of pump.
4. Plastic pipe may be used if permitted by local codes.





TYPICAL SERVICE CONNECTION TO PRESSURE MAIN

NOT TO SCALE

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SECTION VI

SPECIFICATIONS FOR: INSTALLATION OF SEWER FORCE MAINS

- 6:01 SCOPE
- 6:02 PLASTIC PIPE
- 6:03 DUCTILE IRON PIPE
- 6:04 FITTINGS
- 6:05 AIR RELEASE AND COMBINATION AIR VALVES
- 6:06 UNLOADING, HAULING, DISTRIBUTING & STORAGE OF MATERIALS
- 6:07 EXCAVATION OF TRENCHING
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- 6:14 CLEAN UP
- 6:15 EXISTING UNDERGROUND UTILITIES & OBSTRUCTIONS
- 6:16 GATE VALVES
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- 6:18 WORK ALONG OR CROSSING OF STATE HIGHWAYS
- 6:19 WORK ALONG OR CROSSING OF COUNTY HIGHWAYS
- 6:20 DRIVEWAYS AND CITY STREET CROSSINGS
- 6:21 PAYMENT

WATER WORKS AND SEWER BOARD OF THE CITY OF GUNTERSVILLE, INC

SECTION VI

SPECIFICATIONS FOR: INSTALLATION OF SEWER FORCE MAINS

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SECTION VI

DETAILED SPECIFICATIONS FOR INSTALLATION OF FORCE MAINS

6:01 SCOPE

This section includes furnishing all labor and materials and performing all operations for the complete installation of outside sewer force mains and appurtenances as called for in these specifications or shown on the drawings, or reasonably implied by either or both.

6:02 PLASTIC PIPE

The specification designates general requirements for unplasticized polyvinylchloride pipe with integral thickened wall bells used primarily for conveying wastewater under pressure. Joints shall be PVC with rubber ring type joint. Pipe joints shall be made in strict accordance with manufacturer's recommendations and shall in all respects conform to good pipelaying practice as described for other type materials. Pipe shall be SDR 21, Class 200.

All pipe shall be suitable for use at maximum hydrostatic pressures of 200 psi at 73°F. Laying lengths shall be 20' with manufacturer's option to supply up to 15% randoms (minimum length 10') with plain tapered ends and separate double bell couplings. All fittings shall be of the same joint design as pipe recommended by the manufacturer.

All pipe shall meet the minimum requirements in ASTM D-2241, made to SDR 21 dimensions. All pipe and fittings shall be made from clean virgin NSF-approved, Class 12454-A, PVC compound, in accordance with ASTM resin specifications D-1784. Clean reworked material generated from the manufacturer's own pipe production may be used.

All physical and chemical tests should be conducted at 73°F. $\pm 3.6^\circ\text{F}$.

Quick-Burst Test: The pipe shall be designed to pass, without failure, a pressure of 500 psi applied in 60 to 70 seconds when tested in accordance with ASTM D-1599, as referenced in ASTM D-2241.

Sustained Pressure Test: The pipe shall be designed to pass, without failure for 1,000 hours, a pressure of 340 psi when tested in accordance with ASTM D-1598, as referenced in ASTM D-2241.

Acetone Immersion Test: After 20 minutes immersion in a sealed container of anhydrous acetone, a 1" long sample ring shall show no visible spalling or cracking (swelling or softening is not a failure) when tested in accordance with ASTM C-2152, as referenced in ASTM D-2241.

Vise Test: Place between two flat parallel plates, a 2" long ring and compress the outside diameter 60% in 2 to 5 minutes. There shall be no evidence of splitting or shattering.

Typical Dimensions and Weights

Pipe Size (in.)	Pressure Rating, psi at 73° F.	Pipe Barrel Min. Wall Thickness (in.)	OD (in.)	Weight (lbs/ft)
1-1/2	200	0.090	1.900	.354
2	200	0.113	2.375	.543
2-1/2	200	0.137	2.875	0.798
3	200	0.167	3.50	1.155
4	200	0.214	4.50	1.913
6	200	0.316	6.625	4.167
8	200	0.410	8.625	7.069
10	200	0.511	10.750	11.035
12	200	0.606	12.750	15.599

PVC pipe shall be laid with a #TW-14 copper wire or detector tape placed on top of the pipe after the backfill has been hand-tamped to the top of the pipe. The copper wire shall be attached to the sewer main by tape or other suitable fasteners to secure the wire in place during backfill operations.

6:03 DUCTILE IRON PIPE

Ductile iron pipe shall be in accordance with ANSI A21.51, thickness Class 50. Joints shall be push-on type or mechanical joint. All ductile iron pipe shall have enamel-lined interior and bituminous coating on the outside.

Cast iron fittings shall be push-on joint fittings with body thickness and radii of curvature conforming to ANSI Std. A21.10, and joints in accordance with Section 11-2.3 of ANSI Std. A21.11; Class 250, gray iron, in sizes 3"-12". Push-on fittings in sizes 14"-16" shall be Class 150 gray iron or Class 150 ductile iron and shall meet all the requirements of ANSI Std. A21.10, with joints in conformance with Section 11-2.3 of ANSI Std. A21.11.

6:04 FITTINGS

A. Bell and spigot fittings shall be short-body cast iron fittings for 250 psi water pressure and shall conform to ANSI A21.10. The joint fittings, where indicated on plans, shall be mechanical joint, conforming to ANSI A21.11. All cast iron fittings shall have enamel-lined interior and bituminous coating outside.

B. Flanged fittings shall be short-body pattern, conforming to ANSI B16.1 for Class 125.

6:05 AIR RELEASE AND COMBINATION AIR VALVES

Sewage air release or combination air valves are to be installed at high points of the force main as shown on the drawings. Connection to be made to force main with 2" tapping saddle with 2" I.P.S. thread. Depth of pipe shall be increased to 4'-6" cover at points where release valve is to be installed. The air release valves and combination air valves shall be APCO Model 400 or 450 SARV and APCO Model Series 440 SCAV, respectively, as manufactured by Valve and Primer Corporation, Schaumburg, Illinois, or equal.

Sewage air release valves shall be designed to operate (open) while pressurized allowing entrained air in a sewage force main line, sewage pump, or waste water system to escape through the air release orifice. After entrained air escapes through the air release orifice, the valve orifice shall be closed and prevent media from escaping.

Sewage combination air valves shall be designed to allow large volumes of air to escape or enter through the air and vacuum orifice when filling or draining a pipeline. When the pipeline is filled and pressurized an air release orifice shall remain operative and open to allow small pockets of entrained air to escape. Valve shall be installed in pit/manhole as shown on the drawings.

6:06 UNLOADING, HAULING, DISTRIBUTING AND STORAGE OF MATERIALS

- A. Unloading: Equipment and facilities for unloading, hauling, distributing and storing materials shall be furnished by the Contractor and shall, at all times, be available for use in unloading materials. Delays in unloading railroad cars, unloading trucks, or hauling from freight terminals which incur demurrage, truck waiting charges or terminal charges shall be at the expense of the Contractor.
- B. Handling: Pipe, fittings and other materials shall be carefully handled so as to prevent breakage and so as to prevent damage to the cement lining in pipe and fittings. Pipe shall not be unloaded by rolling or dropping off trucks or cars, but shall be handled by carefully lifting and lowering into position, using approved slings or clamps which shall be provided for the purpose.
- C. Distributing: Materials shall be distributed and placed so as to least interfere with traffic. No street or roadway may be closed without first obtaining permission of the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights as he deems necessary for the protection of traffic along highways, streets and roadways upon which material is distributed. No distributed materials shall be placed inside drainage ditches.

D. Storage: All pipe, fittings and other materials which cannot be distributed along the route of the work shall be stored for subsequent use when needed. The Contractor shall make his own arrangements for the use of storage areas; except that he may make reasonable use of the Owner's storage yards.

6:07 EXCAVATION OF TRENCHING

The Contractor shall perform all excavation of every description and whatever substance encountered to the depths shown on the drawings or as required by the Engineer. In general, trenches for force main shall be excavated to such depth that the top of the pipe when laid shall not be less than 30" below the grade of the street or ground surface, but this depth may be varied where necessary by the Engineer. All excavated materials not required for fill or backfill shall be removed and wasted as directed by the Engineer. Banks of trenches shall be kept as nearly vertical as possible and shall be properly sheeted and braced. Trenches shall be excavated true to line so that a clear space not less than 7" in width is provided on each side of pipe. Bell holes shall be excavated to insure that the pipe rests for its entire length upon the bottom of the trench. Where, in the opinion of the Engineer, damage is liable to result from the drawing of the sheathing, the sheathing shall be left in place. Except at locations where excavation of rock from the bottom of the trenches is required, care shall be taken not to excavate below the depth specified. Where rock excavation is required, the rock shall be excavated a minimum over depth of 6" below the trench depths specified. The over-depth rock excavation and all excessive trench excavation shall be backfilled with waste limestone 3/4" and down, and thoroughly tamped.

6:08 LAYING AND JOINTING PIPE AND FITTINGS

The Contractor shall lay all pipe and fittings to accurately conform to the lines and grades established by the Engineer and as follows:

- A. Handling: Proper and suitable tools and equipment for the convenient handling and laying of pipe shall be used, and great care shall be taken to prevent the pipe coating from being damaged, particularly the cement lining on the interior of the pipe. All pipe shall be carefully examined for cracks and other defects, and no pipe or casting shall be laid which is known to be defective. If any pipe or other casting is discovered to be cracked, broken, or defective after being laid, it shall be removed and replaced with sound material, without further charge. All pipe and fittings shall be thoroughly cleaned before being laid, and shall be kept clean until accepted in the completed work.
- B. Alignment and Gradient: Pipeline alignment and gradient shall be straight or shall follow true curves as nearly as is practicable. Curvature in pipelines, where required, shall be well within the allowable laying radius, horizontal or vertical.

- C. Sequence of Work: Excavation, cleaning, jointing and backfilling shall be kept up as closely as is possible so as to progress in a uniform, workmanlike manner. In no case shall pipe be left in the trench overnight without completing jointing. The uncompleted pipeline shall not be left exposed in the trench unnecessarily and the Contractor will be required to backfill and compact the trench as soon as is possible after laying and jointing is completed. Each day at the close of work, and at all times when laying is not in progress, the exposed end of the pipeline in the trench shall be closed by the use of an approved head or barrier of wood or metal. If, at any time, it becomes necessary to cover the end of an uncompleted pipeline with backfill, the end of such pipeline shall be closed using a mechanical joint plug. When pipelaying is not in progress, the open ends of installed pipe shall be closed by approved means to prevent entrance of trench water into the line. Whenever water is excluded from the interior of the pipe, enough backfill shall be placed on the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and relaid as directed by the Engineer. No pipe shall be laid in wet trench conditions that preclude proper bedding, or on a frozen trench bottom; or when, in the opinion of the Engineer, the trench conditions or the weather are unsuitable for proper installation.
- D. Cleaning: The Contractor shall clean each joint of pipe while it is suspended before it is lowered into the trench. The Contractor shall keep exposed ends of pipe properly plugged during laying to prevent dirt and other materials entering the line, and he shall also thoroughly clean all lines before the system is accepted.
- E. Laying Pipe in Trenches: When laying pipe in trenches, care shall be taken to give the pipe solid bearing throughout its entire length.
1. Pipelines in earth trenching: Where pipes laid in earth excavated trenches outside of paved areas, the bottom of such trenches shall be fine graded by skilled workmen to a true line and shall not be laid on loose rock or other hard materials, but be bedded on fine, clean undisturbed earth. Over excavation in the bottom of the trenches shall be filled to grade with compacted crushed stone.
 2. Pipelines in rock trenches: Where pipe is laid in rock trenches, the bottom of such trenches shall be undercut and the pipe shall be bedded in at least 6" of crushed stone and the trench shall be backfilled with earth.
- F. Mechanical Jointing: Joints with mechanical joints shall be made only by experienced mechanics. Sockets and spigots shall be washed with soapy water before slipping gland and gasket over spigot. The spigot shall be inserted in the socket full depth. The gasket shall be brushed with soapy water and shall be pushed into position, making sure the gasket is evenly seated in the socket. The gland shall be slid into position for compressing gasket. All bolts and nuts shall be tightened

(finger-tight) after which bolts shall be tightened to a uniform permanent tightness, using a torque wrench for tightening. Bolts shall be tightened alternately 180° apart. Sockets, spigots, glands and bolts shall be kept clean and wet with soapy water until each joint is completed. Any joints which leak shall be remade.

G. Push-on Jointing: All foreign matter in the socket must be removed and washed with clean water so that there is no mud, sand, gravel or frozen material in socket. The gasket seal shall be thoroughly inspected to be certain it is clean. The gasket must be wiped clean with a clean cloth, flexed, and then placed correctly in socket. In-place gasket shall be inspected to see that gasket is seated evenly around the inside of the socket, with the heel of the gasket fitting snugly in the retainer seat. In sub-freezing weather, gaskets shall be kept to a temperature of 40°F., or higher, by suitable heating arrangements. A thin film of lubricant shall be applied to inside surface of gasket which will come in contact with entering plain end of pipe. The plain end of the pipe must be cleaned of all foreign matter on the outside from the plain end to the stripes. It may be desirable to apply a thin film of lubricant to the outside of the plain end for about 1" back from the end. The plain end of the pipe should be aligned and carefully entered into the socket until it makes contact with the gasket. Joint assembly shall then be completed by forcing the plain end past the gasket until it makes contact with the bottom of the socket by an approved method. If assembly is not accomplished with application of reasonable force, the plain end shall be removed to check for proper positioning of the gasket.

H. Cutting: Wherever pipe or special castings are required to be cut, the cutting shall be done by skilled workmen, using pipe cutters. The use of hammer and chisel and/or cutting torch will not be permitted. The cut end shall be beveled about 1/4" at an angle of about 30°, with the centerline of the pipe, by using a coarse file or a portable grinder.

6:09 BACKFILLING

Backfilling shall be carefully performed and the original surface restored to the full satisfaction of the Engineer.

After pipes have been tested and approved, the trenches shall be backfilled with the excavated materials, free from large clods or stones, carefully deposited in layers not to exceed 6" in thickness on both sides of the pipe and thoroughly compacted until enough fill has been placed to provide a cover of at least one foot above the pipe. The remainder of the backfill material may be thrown in, moistened and tamped to insure thorough compaction. Whenever the trenches have not been properly filled or settlement occurs, they shall be refilled, compacted, smoothed off and made to conform to the surface of the original ground. Backfill in open trenches across roadways, driveways and sidewalks which are to be repaved, and in other instances where, in the opinion of the Engineer, compacted

backfill is required, the backfill shall be deposited in layers not to exceed 6" and thoroughly compacted to a density equal to or greater than the adjacent trench bank.

6:10 BLOCKING FOR FITTINGS

The Contractor shall furnish all material and perform all labor necessary for installing concrete blocking for fittings. Concrete blocking shall be formed and poured at the back of fittings including elbows, tees, and other fittings as shown on plans or as directed by the Engineer. Blocking shall be poured against undisturbed earth. Where necessary, the Contractor shall install pipe straps as required for fittings and valves. Straps shall be standard steel collars and rods.

6:11 ROCK EXCAVATION

Rock shall be removed at least 6" below the bottom of the pipe and ditch brought to grade with crushed rock. Bedding material shall be crusher run material with a maximum size of 3/4". No separate payment will be made for rock excavation. The cost of rock excavation and all costs incidental thereto shall be included in the lump sum bid for project.

6:12 TESTS

When, in the opinion of the Engineer, a portion of pipe is adequate for testing, the line shall be blown free from air and leakage test made. The Contractor shall furnish all labor, materials and equipment for carrying out the test. Whenever conditions will permit, in the opinion of the Engineer, pipelines shall be tested before the trench is backfilled. All joints then shall be examined during open trench test and all leaks stopped entirely. The Contractor shall furnish a test pump and means for accurate measurement of the water introduced into a line during test and shall furnish and install corporation cocks at all high points on the line as required for blowing lines free from air and at the test pump location.

The Contractor shall furnish, install and remove all temporary bulkheads, flanges or plugs to permit the required pressure tests, and shall furnish all equipment and labor to properly carry out such tests and to replace defective materials. The test pressure shall be 200 psi. Leakage shall not exceed 20 gallons per inch diameter per mile per 24 hours. Should any test section fail to meet the leakage test, the Contractor shall make the necessary repairs at his own expense and repeat test until satisfactory compliance.

6:13 SEQUENCE OF WORK

Excavation, laying, backfilling and clean up shall be kept up as closely as is possible in order to progress in a uniform workmanlike manner. The complete pipeline shall not be left exposed in the trench unnecessarily and the Contractor will be required to backfill and compact the trench as soon as is possible after laying is completed. Each day at the close of work,

and at all times when laying is not in progress, the exposed end of the pipeline shall be closed with an approved head or barrier.

6:14 CLEAN UP

The Contractor shall dispose of excess material and shall clean up all rubbish and surplus materials and leave the ground in presentable shape at least comparable to the condition in which it was before the construction work began.

6:15 EXISTING UNDERGROUND UTILITIES AND OBSTRUCTIONS

Certain existing water lines, gas lines, culverts, telephone cables and cross drains are shown on drawings where such information is available. The indication of the utilities is not to imply that they represent all utilities or underground obstructions. Locations shown on plans are approximate and must be verified in the field by the Contractor. All available records do not show exact location of the utility lines and obstructions and it may be necessary to change location and depths of cover of pipelines to avoid conflicts with these utilities.

In order to avoid existing utilities, the Contractor shall furnish and have available at all times, an electronic pipe and cable finder in working order for purposes of locating existing pipelines. The electronic pipe finder shall be equal in all respects to "M-Scope Buried Pipe and Cable Finder," as manufactured by Joseph G. Pollard Co., Inc. The Contractor shall cooperate with the Engineer in locating such existing pipelines and utilities by making available to Engineer with a competent operator; and, where necessary, uncovering existing pipelines so that alignment and grades may be checked to see that pipelines avoid existing obstructions.

Where pipelines cross natural gas lines, minimum cover shall be maintained and at least 18" of clearance between pipelines maintained. Where natural gas or buried telephone cables exist, it shall be the responsibility of the Contractor to notify the gas or telephone company and inform them when work is to begin and he shall take all precautions necessary to protect existing utilities.

The Contractor shall be responsible for and shall repair any damage to utilities, services, or pipelines resulting from the work of location services or resulting from the construction operation.

6:16 GATE VALVES

Valves shall be iron body bronze mounted gate valves with double disc parallel seat. Valves shall withstand a working pressure of 200 PSI and shall be manufactured according to AWWA Spec, C-500. Valves shall have "O" ring stem seals.

Valves shall be mechanical joint or flanged joint as indicated on the plans. Valves installed in underground pipeline shall be non-rising stem with a 2" square opening nut and shall operate counter-clockwise in opening.

Valves installed above ground shall be non-rising stem with handwheel.

6:17 VALVE BOXES

All valves installed in underground pipelines shall be provided with a two-piece cast iron valve box. Valve boxes shall be heavy pattern with a 5-1/4" shaft and screw type. Drop cover shall be marked for sewer. Boxes shall cover the stuffing box and cap of the valve thoroughly and shall be set vertically and properly adjusted so that the cover is at the same elevation as finished surface of street.

6:18 WORK ALONG OR CROSSING OF STATE HIGHWAYS

Work along, or crossing of, state highways will require a permit from the Alabama State Highway Department. A performance bond of approximately 5% of the cost of the work in the highway right-of-way will be required to accompany application for permit. The bond is to indemnify the Highway Department against any damage to the highway and to insure that the work is performed in accordance with "State of Alabama Highway Department Standards for Accommodating Utilities on Highway Rights-of-Way." The permit will be obtained by the Owner.

The Contractor when executing this contract, specifically agrees to the following conditions:

1. The Contractor shall familiarize himself with "Standards for Accommodating Utilities on Highway Rights-of-Way."
2. The Contractor agrees to be responsible to the Owner for all conditions of construction enumerated in "Standards for Accommodating Utilities on Highway Rights-of-Way."

The Contractor shall make his own arrangements with the State Highway Department as to time, methods of procedure involved in making highway crossings, and work along highways. In general, crossings made on State highways shall be made by dry boring, and steel casing pipe shall be used under highway. Carrier pipe shall be plastic or ductile iron as shown on plans. In the event rock is encountered, the casing shall be installed by open cut in accordance with Highway Department requirements. The trench shall be backfilled with select material that contains at least 6% of Portland cement by volume or crushed stone as required by the Alabama Highway Department. The cement stabilized material shall be deposited in 6" layers and compacted to 100% density. Backfilling shall continue to within 2" of the roadway surface. The paving shall be cut back 9" on either side of trench bank. The trench thus formed shall be paved with 2" of hot plant mix, Type A and in accordance with Section 5:35.

6:19 WORK ALONG OR CROSSING OF COUNTY HIGHWAYS

Work along, or crossing of County highways will require a permit from the County Engineering Department. A performance bond will be required for crossing of County roads and for work along right-of-way. The permit is to be obtained by the Owner.

The Contractor shall make his own arrangement with the County Highway Department as to time, method and procedures in making highway crossings. In general force mains crossing County highways shall be of similar material as the remainder of the system, i.e., ductile iron, or P.V.C., not cased, and shall be installed by boring. In the event rock is encountered, the pipe may be installed by open cut. If by open cut, the road may not be blocked, but half of the road may be cut, pipe laid and backfilled before the other half is cut. The trench shall be backfilled with crushed stone and compacted to 100% density. The crushed stone shall be brought to the bottom of existing paving or a minimum of 2" below grade. Paving replacement shall consist of at least 2" of hot plant mix asphalt, Type A, in accordance with Section 5:35.

6:20 DRIVEWAYS AND CITY STREET CROSSINGS

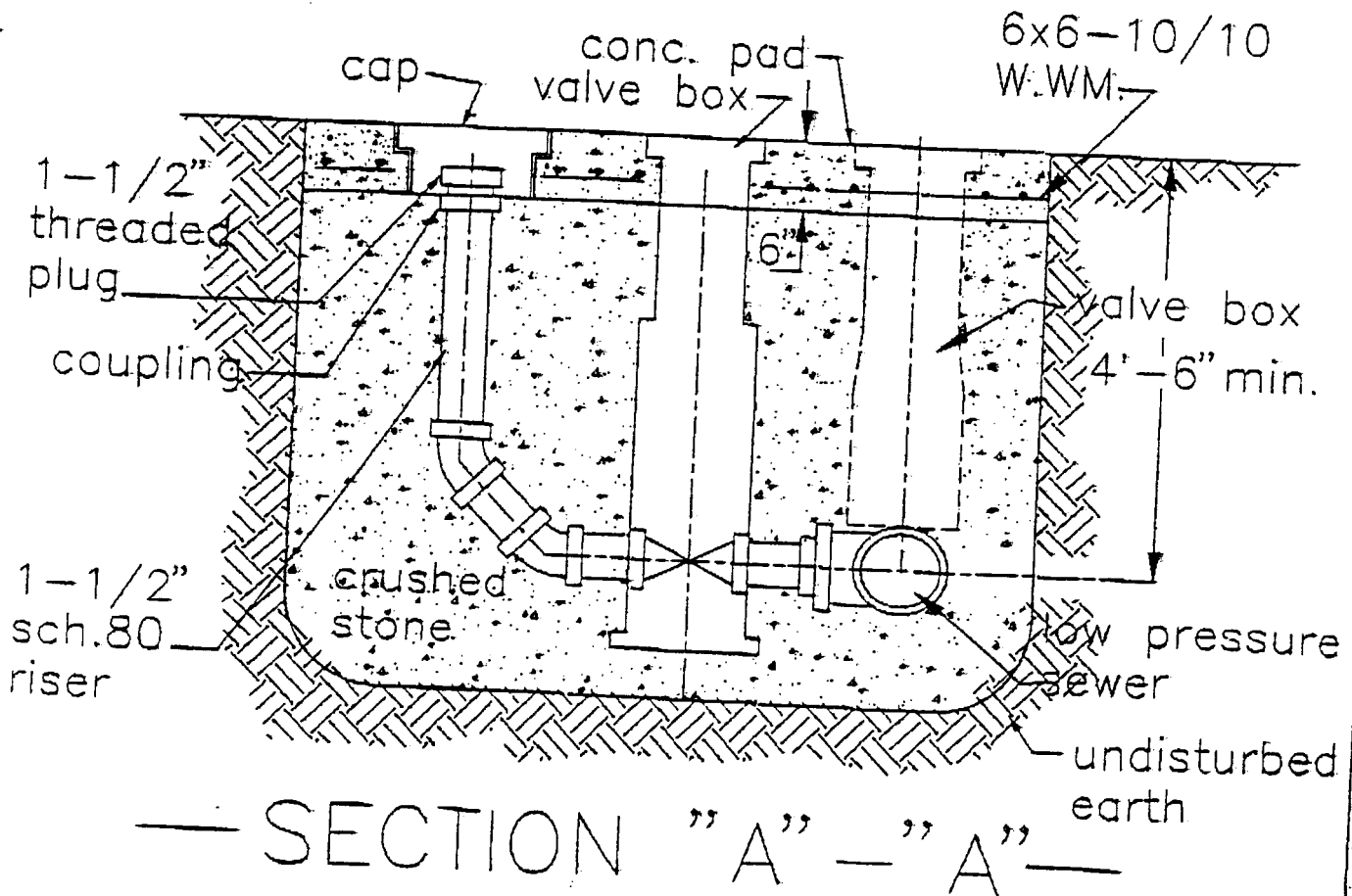
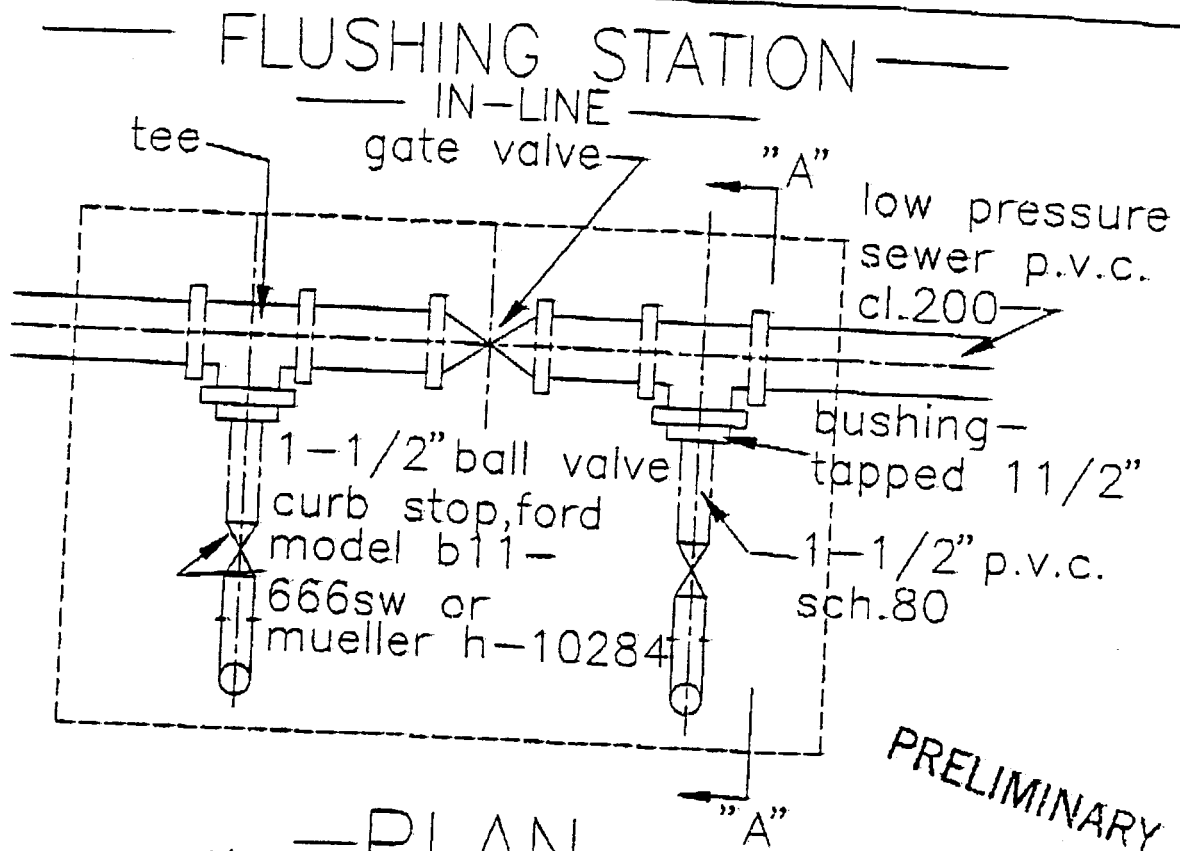
Where pipelines cross paved driveways or city streets (and/or concrete), installation shall be by boring, not cased. In the event rock is encountered, the pipe may be installed by open cut. If by open cut, the inconvenience of such work shall be kept to a minimum and backfill shall be done immediately. Driveways shall be backfilled with crushed stone and shall be compacted to 95% Standard Proctor Density. Contractor shall maintain driveways until surfaced. Driveways shall be replaced in kind and thickness.

Force mains crossing city streets required to be cut shall be backfilled with crushed stone and compacted to 95% Standard Proctor Density. The crushed stone shall be brought to the bottom of the existing paving or a minimum of 2" below grade. Paving replacement shall consist of at least 2" of hot plant mix asphalt, Type A, in accordance with Section 5:35.

No separate payment shall be made for crossings under this section, but shall be included in unit price bid for pipe.

6:21 PAYMENT

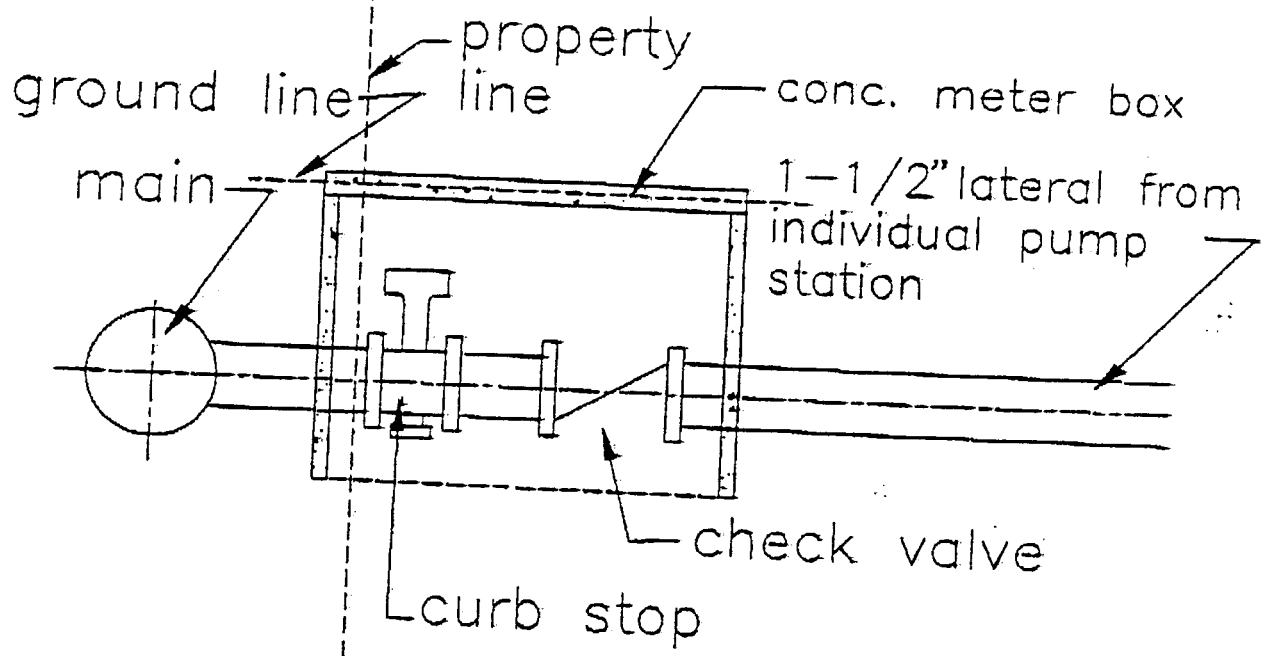
The unit price bid in the proposal shall include all cost incidental to the construction of the complete work shown on the plans and specified.



P

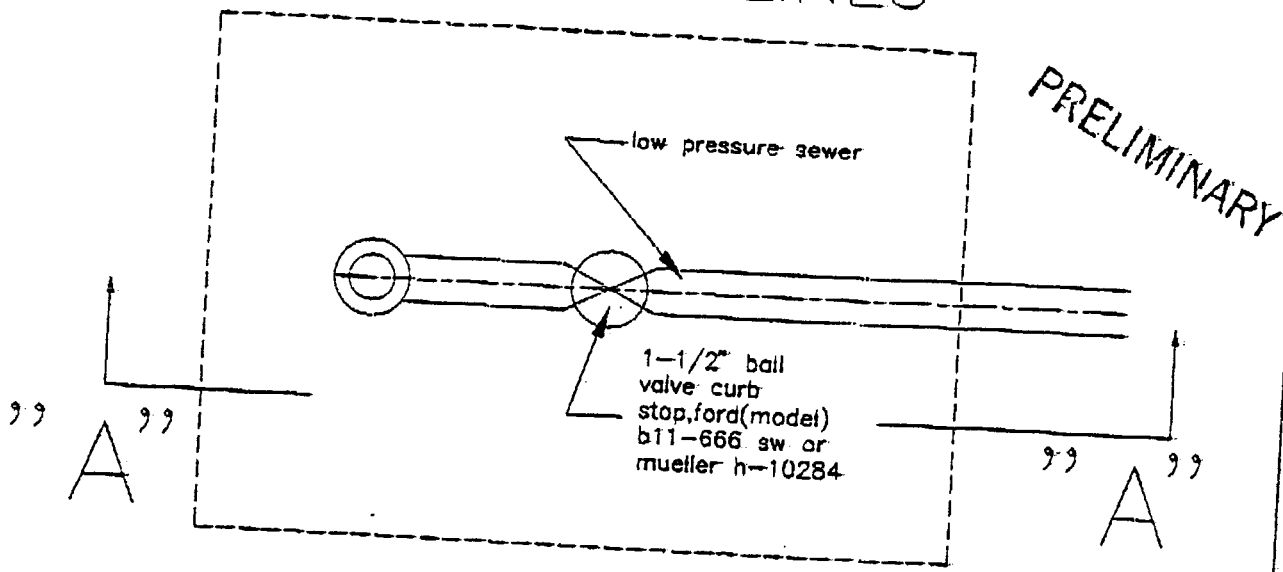
TYPICAL SERVICE LATERAL CONNECTION

PRELIMINARY

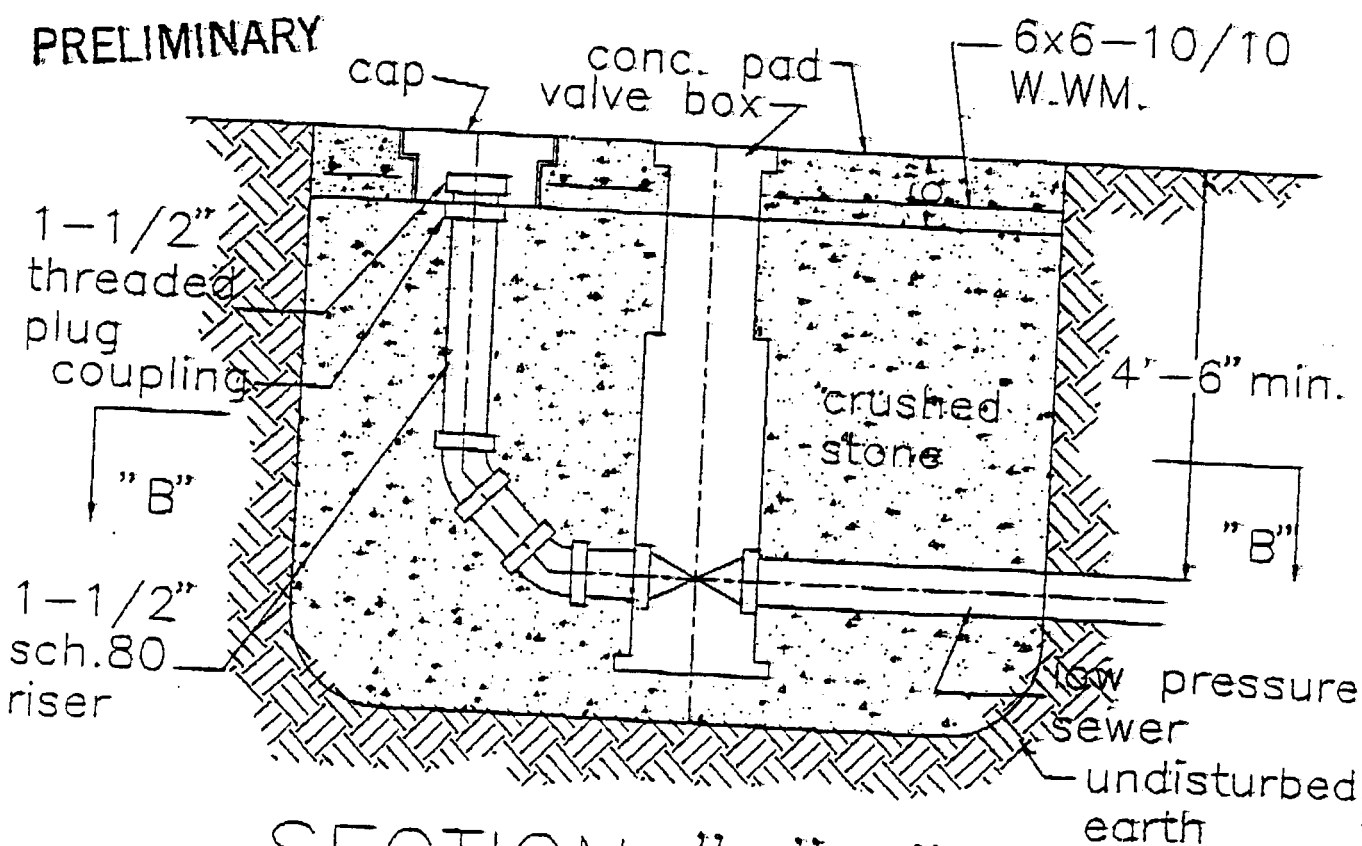


PRELIMINARY

— FLUSHING STATION —
 — DEAD-END LINES —



— SECTION "B-B"—



— SECTION "A-A"—