LIFT STATION

1. SCOPE

The work herein includes the furnishing and installation of a concrete pumping station structure, complete with pumps, interior piping, valves, controls, alarms, wiring and all necessary accessories and appurtenances as indicated, specified, and/or necessary to provide a pumping system complete and ready for operation.

2. SEWAGE LIFT STATION

A. General - The contractor shall provide duplex pumping systems with submersible GRINDER PUMPS. Level controls shall be by means of sealed mercury switches mounted in the wet well and a control box mounted on service pole. Pumps shall be designed to preform satisfactorily with a reasonable service life when operated intermittently in typical wastewater service.

B. Operation - Upon rise of water level in the basin, the "1 Pump On" switch shall energize the lead pump. When the water reaches the "Off" switch the pump shall stop. If the lead pump cannot handle the flow, or fails to operate, the level will rise to the "2 Pumps On" switch at which time the lag pump shall be energized. As the water level falls to the "Off" position, both pumps shall be deenergized. If the level continues to rise the alarm switch shall activate a signal to the alarm system specified hereinafter.

C. Pumps - Pumps shall be submersible high head effluent pump WG 30 as manufactured by Myers or equal. Pumps shall have high carbon steel shafts and double mechanical seals. Pumps shall have the following characteristics.

Capacity (gpm)	43
Total dynamic head (feet)	57
Maximum speed (rpm)	3450
Horsepower	3

D. Level Switches - Sealed float type mercury switches shall be supplied to control pump level and alarm signal. The mercury switches shall be sealed in a solid polyurethane float for corrosion and shock resistance. The support wire shall have a heavy Neoprene jacket. A weight shall be attached to cord above the float to hold switch in place. Three float switches shall be used to control level. One for pump turn-on, one for pump turn-off and one for both pumps turn-on. A fourth switch shall be provided for the alarm.

E. Control Panel - Control panel shall have a NEMA 3R weatherproof enclosure which shall contain the following:

1. Alarm autodialer (may be mounted on rear of panel in separate NEMA 3R enclosure).
2. Dead front cover.
3. Circuit breakers and magnetic contractors with NEMA rated three let overload protection.
4. Auxiliary contracts to operate both pumps in override condition.
5. Relay to alternate pumps.
6. Interlock relay to automatically reconnect control circuit in case of breaker trip on one pump.
7. H-O-A switches.
8. Run lights.
9. Terminal strip to connect alarm, heat sensors, seal failure probe and overload.
10. Transformer to reduce to 24 volts for control circuitry.
11. Circuit for alarm transmitter.

For pump failure detection the manufacturer shall furnish normally open relays which will trigger alarm contacts upon motor overload. The relays shall monitor current during pump operation. Motor failure/pump failure shall occur when overloads are disengaged causing relay to actuate alarm. The alarm panel shall consist of a battery pack for operation during power failure.

F. Pump Test - After installation of the pumping equipment the pumping system shall be tested. The well shall be filled with clear water and pumped out using the station pumps and control system. Pumps shall be tested individually as well as in combination.

G. Start-Up and Training - The services of a trained service representative of the Lift Station manufacturer shall be provided for a minimum of one (1) day to assist in startup of the equipment and train the Owner in its proper care and operation.

H. Operation and Maintenance Manual - Three (3) copies of an operation and maintenance manual shall be furnished. As a minimum the manual shall include:

1. Description of equipment.
2. Installation instructions.
3. Pump curves.
4. Operation instructions.
5. Troubleshooting guide.
6. Parts list.
7. Parts replacement instructions.
8. Wiring diagram.

I. Painting - All fabricated metal components of the pump station shall be sandblasted, primed and painted with 2 coats of a heavy duty epoxy paint at the factory. Any damage to the coating during shipment and handling shall be touched up by the contractor with the same paint.

J. A verbatim automatic dialer by "Raco Manufacturing" shall be used to provide alarm reliability for: high water, pump failure, power loss, and pump overheating.

DOPPLER ULTRASONIC FLOW METER

1. The Doppler flowmeter shall be the TN-Manning Doppler Sonic Flow Meter as manufactured by TN-Manning, Inc.
2. The transmitter shall be FM approved, and shall meet the requirements of NEMA 4X with a UL-listed corrosion resistant finish. Stainless Steel NEMA 4X and NEMA 7/9 housings shall be optionally available. The transmitter shall be capable of operation on 115 or 230 VAC + 10%, 50 or 60 Hertz at 110 VA. Optionally the transmitter shall be capable of operation as a "4-wire transmitter" on 12 or 24 VDC power.

FORCEMAIN

1. SCOPE

The work covered herein includes all pressure piping required for pump/lift stations and all piping required for forcemain (FM) together with valves and all required appurtenances.

2. PIPING

Except as otherwise shown outside above ground piping shall be ductile iron pipe as shown with mechanical joints or "slip-on" type joints, or Polyvinyl Chloride (PVC) pipe with "slip-on" joints unless otherwise indicated.

a. Flanged Pipe - Ductile iron flanged pipe shall conform to the requirements of ANSI\AWWA C115/A21.15. Flanges shall be faced and drilled according to ANSI B16.1, Class 152 templates. Unless otherwise indicated on the Plans, pipe shall be Class 50.

b. Ductile Iron Underground Pipe - Pipe shall be ductile iron mechanical joint pipe or slip type joint pipe conforming to ANSI/AWWA C151/A21.51, Class 50. Slip type joint shall be "Tyton", "Fastite", "Bell-Tite", or approved equal. Pipe shall be coated inside and outside with a bituminous paint compound.

c. Polyvinyl Chloride (PVC) Pipe - Pipe shall conform to Class 200 (SDR 21) PVC pressure pipe conforming to ASTM Specification D-2241. Joints shall be push-on or mechanical and provisions made for jointing of fittings and accessories.

d. Steel Galvanized Pipe - Steel galvanized pipe where shown or specified shall conform with Federal Specifications WW-P-404.

3. JOINT MATERIALS

a. Joint gaskets for caulked joints shall be of tubular rubber, asbestos rope, or treated paper rope and sufficient in length to encircle the pipe and lap a minimum of 3 inches. Joint gaskets for flanged pipe shall be Rainbow, Double Garlock, or approved equal, and shall be 1/8-inch thick. Rubber gaskets for PVC pipe shall conform to ASTM D1869, latest revision.

b. Flange bolts shall meet requirements of ANSI B18.2.1 and nuts the requirements of ANSI B18.2.2. Bolts and nuts for underground installation shall be high strength corrosion resistant alloy.

c. Mechanical joint materials shall be standard plain rubber molded gaskets. Bolts shall be high strength cast iron having an ultimate tensile strength of 75,000 pounds per square inch and a minimum yield point of 45,000 pounds per square inch.

d. Flanged Pipe - Gaskets shall be inserted between flanges, and bolts shall be tightened in such a manner as to distribute evenly the stresses carried by the bolts and to bring the pipe into alignment.

e. Screwed Joint Pipe - Threads shall be neatly cut with sharp tools and the jointing procedure shall conform to the best practice. After cutting, all pipe shall be reamed. All joints shall be made with an application of graphite and engine oil, or other approved joint compound, applied to the male threads only.

f. Ductile Iron Slip-On Type Pipe - The outside of the spigot and the inside of the bell pipe to be joined shall be clean and dry. Gasket shall be inserted, lubricant applied, and spigot end inserted and properly seated. Joint shall comply in every respect with manufacturer's recommendations.

g. Ductile Iron Mechanical Joint - The socket, gasket, and spigot of the pipe shall be cleaned of all foreign matter. The gland shall be slipped on the spigot end, followed by the gasket and the pipe end pushed through in the bell. The ring gasket shall be properly seated so that it is totally confined under pressure within the bell. The loose gland shall be moved into position against the face of the gasket and the nuts and bolts loosely assembled with the fingers. The joint shall be made up tight by means of suitable ratchet wrench.

h. Polyvinyl Chloride (PVC) Joint - The surface of the pipe, the bell, and the elastomeric gaskets shall be cleaned immediately before assembly and the joint made in strict conformity with the manufacturer's recommendations. Mechanical joints shall be assembled in compliance with the manufacturer's recommendations.

j. Joints between PVC and ductile iron pipe shall be mechanical joint as recommended by the manufacturer. When changing from DIP to PVC or Truss pipe a "Rigid coupling" is required.

Supplemental Note - All FM joints shall be slip-on pressure type with SCH 40 PVC pipe and fittings. All FM joints shall be primed prior to gluing. Fittings and joint material shall conform to ASTM-D-2466.

4. VALVES

a. Gate valves shall be iron body, bronze mounted, double disc in accordance with AWWA Specification C500 for working pressure of 150 pounds per square inch. Valves shall be Darling, or be approved as equal thereto and open left.

b. Flanged valves shall have flanges drilled to ANSI Class 125 Specifications. Valves shall be of standard O.S. and Y type unless otherwise indicated. Where indicated, valves shall be equipped with extension shafts and floor stands for remote operation or with angle bevel gearing.

c. Mechanical joint gate valves for installation in mechanical joint piping shall be non-rising stem suitable for direct burial.

d. Check valves shall be iron-body, bronze mounted swing check valves for horizontal mounting, Darling 175 pounds O.W.G. or approved equal. Each valve shall have extended hinges and lever with adjustable counter weight to balance the gate, such that the gate remains open with minimum resistance to flow while pump is running and positively closes when pump is cut off.

e. Valve boxes shall be cast iron extension type heavy pattern, fitted with a roadway type cover, marked "SEWER". The bottom portion shall be flared to fit over the operating mechanism of the valve.

f. Couplings shall have cast iron sleeve, high strength steel bolts, rubber gaskets, and shall be Rockwell Model 431, or approved equal.

5. INSTALLATION OF PIPE

Pipe and fittings shall be carefully inspected for cracks or defects before being lowered into the trench, and faulty pipe shall be removed from the site. Pipe runs intended to be laid straight shall be so laid. Deflection from straight line, due to horizontal or vertical curvature, may be made by pulling the joints, only when express permission is given by the Engineer. Changes in grade or alignment which cannot be made by pulling pipe joints shall be made by use of proper bends, offsets or special fittings as required. Allowable deflection in pipe shall not exceed that recommended by the manufacturer. At all times when work is not in progress the line shall be securely closed to the satisfaction of the Engineer. Pipe shall be so laid that the full strength of the barrel rests on the trench bottom, with not less than thirty-six inches (36") from the finished grade to the top of the barrel of the pipe. Bells shall be entirely free of water when the joints are made. Any defective pipe, or pipe which has been disturbed sufficiently to open a joint after laying, shall be taken up and replaced. All openings left on the line shall be closed off or stopped as directed by the Engineer.

6. ANCHORAGE OF FITTINGS

Each bend, tee, plug, and cap shall be prevented from moving by means of adequate reaction or thrust backing. Reaction backing shall consist of a concrete buttress of a 28-day compressive strength of 3,000 pounds per square inch. Buttress height shall be equal to outside pipe diameter. It shall extend from the pipe to undisturbed wall of the trench and in no instance shall cover any pipe connection. Mechanical joint retainer glands shall be furnished where shown.

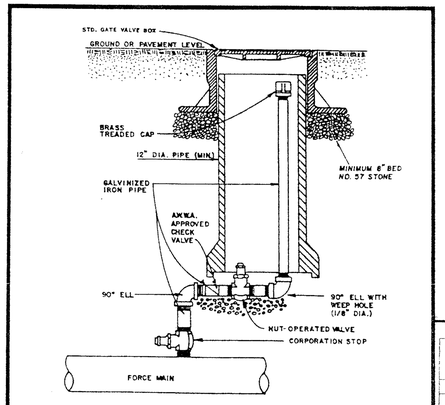
7. TESTING

All sewer forcemains shall be tested at a minimum hydrostatic pressure of at least 50% above the design operating pressure at least one hour. Leakage shall not exceed the amount given by the following formula:

$$L = \frac{sd\,(P)^{1/2}}{133200}$$

Where:
L = allowable leakage in gph
S = length of pipe in feet
d = diameter of pipe in inches
p = test pressure in psi

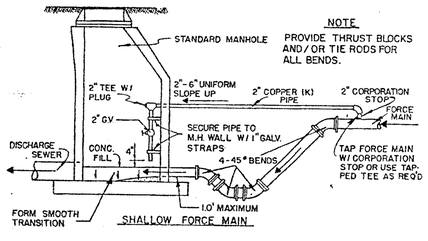
The method and equipment for conducting this test and specific pressure of the test shall be subject to the approval of the Engineer. The test pressure during the leakage test shall be measured at the highest point on the forcemain.



NOTES:
1. 2" MATERIAL TO BE USED ON ALL PIPE.
2. TAPPING SADDLES SHALL BE USED ON PVC PIPE; DUCTILE IRON PIPE MAY BE DIRECT TAPPED.

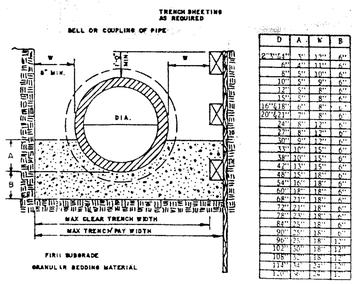
MANUAL AIR RELEASE VALVE

NOT TO SCALE



FORCE MAIN TO MANHOLE CONNECTION

NOT TO SCALE



D	A	K	B
2"-14"	5"	13"	6"
16"	5"	10"	6"
18"	5"	9"	6"
12"	5"	8"	6"
15"	5"	8"	6"
16"-18"	5"	8"	6"
20"-21"	5"	8"	6"
24"	5"	12"	6"
27"	5"	12"	6"
30"	5"	12"	6"
33"	10"	15"	6"
36"	10"	15"	6"
42"	15"	15"	6"
48"	15"	18"	6"
54"	16"	18"	6"
60"	18"	18"	6"
66"	21"	18"	6"
72"	21"	18"	6"
78"	21"	18"	6"
84"	21"	18"	6"
90"	21"	18"	6"
96"	21"	18"	12"
102"	20"	18"	12"
108"	21"	18"	12"
114"	21"	21"	12"
120"	24"	24"	12"

WHERE SPECIFICALLY REQUIRED, F'c=2000 PSI @ 28 DAYS CONCRETE AND SADDLE BLOCKS SHALL BE USED IN LIEU OF THE GRAVEL CRADLE.

THE GRANULAR MATERIALS FOR BEDDING SHALL BE (ASTM C33 6") A SHELL GRAVEL OR CRUSHED STONE FOR 90° AND SHALLOW, OR A APROVED ONSITE MATERIAL.

MINIMUM CLEAR TRENCH WIDTH SHALL BE 24" PLUS THE OUTSIDE DIAMETER OF THE PIPE.

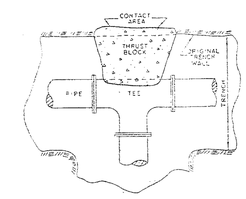
ELLIPTICAL PIPE SHALL BE BEDDED IN SAND.

BEDDING AND TRENCH WIDTHS

NOT TO SCALE

PIPE SIZE	PRESSURE CLASS				
	100	150	200	250	300
2"	1 SQ. FT.	1 SQ. FT.	1 SQ. FT.	1 SQ. FT.	1 SQ. FT.
4"	1 SQ. FT.	2 SQ. FT.	2 SQ. FT.	2 SQ. FT.	6 SQ. FT.
6"	2 SQ. FT.	3 SQ. FT.	4 SQ. FT.	5 SQ. FT.	10 SQ. FT.
8"	4 SQ. FT.	5 SQ. FT.	7 SQ. FT.	9 SQ. FT.	10 SQ. FT.
10"	5 SQ. FT.	8 SQ. FT.	11 SQ. FT.	13 SQ. FT.	16 SQ. FT.
12"	7 SQ. FT.	12 SQ. FT.	15 SQ. FT.	19 SQ. FT.	23 SQ. FT.
14"	10 SQ. FT.	16 SQ. FT.	21 SQ. FT.	26 SQ. FT.	31 SQ. FT.

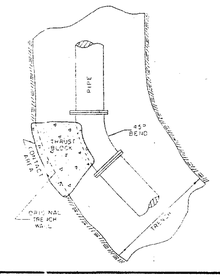
THRUST BLOCK CONTACT AREAS FOR TEES



N.T.S.

PIPE SIZE	PRESSURE CLASS				
	100	150	200	250	300
2"	1 SQ. FT.	1 SQ. FT.	1 SQ. FT.	1 SQ. FT.	1 SQ. FT.
4"	1 SQ. FT.	1 SQ. FT.	2 SQ. FT.	2 SQ. FT.	2 SQ. FT.
6"	2 SQ. FT.	2 SQ. FT.	3 SQ. FT.	4 SQ. FT.	5 SQ. FT.
8"	3 SQ. FT.	4 SQ. FT.	5 SQ. FT.	7 SQ. FT.	8 SQ. FT.
10"	4 SQ. FT.	6 SQ. FT.	8 SQ. FT.	10 SQ. FT.	12 SQ. FT.
12"	5 SQ. FT.	9 SQ. FT.	12 SQ. FT.	15 SQ. FT.	18 SQ. FT.
14"	7 SQ. FT.	15 SQ. FT.	20 SQ. FT.	24 SQ. FT.	29 SQ. FT.

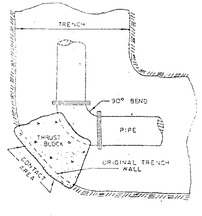
THRUST BLOCK CONTACT AREAS FOR 45° BEND



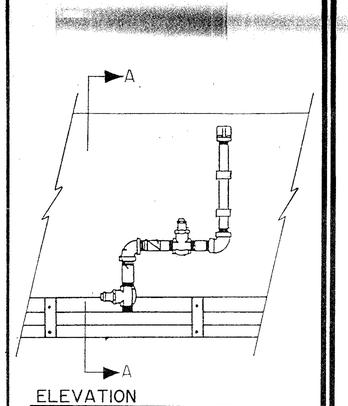
N.T.S.

PIPE SIZE	PRESSURE CLASS				
	100	150	200	250	300
2"	1 SQ. FT.	1 SQ. FT.	1 SQ. FT.	1 SQ. FT.	1 SQ. FT.
4"	2 SQ. FT.	2 SQ. FT.	3 SQ. FT.	3 SQ. FT.	4 SQ. FT.
6"	3 SQ. FT.	4 SQ. FT.	5 SQ. FT.	7 SQ. FT.	8 SQ. FT.
8"	6 SQ. FT.	7 SQ. FT.	10 SQ. FT.	12 SQ. FT.	15 SQ. FT.
10"	7 SQ. FT.	11 SQ. FT.	15 SQ. FT.	19 SQ. FT.	22 SQ. FT.
12"	9 SQ. FT.	16 SQ. FT.	21 SQ. FT.	27 SQ. FT.	32 SQ. FT.
14"	12 SQ. FT.	22 SQ. FT.	29 SQ. FT.	36 SQ. FT.	44 SQ. FT.

THRUST BLOCK CONTACT AREAS FOR 90° BEND

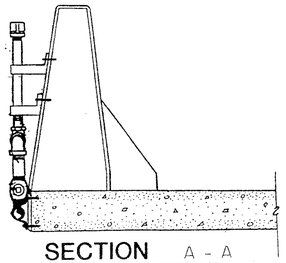


N.T.S.



ELEVATION
NTS

MANUAL AIR RELEASE VALVE ATTACHED TO THE SIDE OF THE BRIDGE



SECTION A - A
NTS

AIRRELEASE VALVE ATTACHMENT TO BRIDGE DETAIL

NOTE: CONTRACTOR SHALL PROPERLY INSTALATE AIR RELEASE VALVE TO PREVENT FREEZING.

FINAL

Rickmond Engineering, Inc.
1643-C Merrimac Trail
Williamsburg, VA 23185
(804)229-1776 or 875-1785
Civil Engineering
Environmental Engineering
Land Development Planning

Designed By:	Drawn By:	Approved By:	Scale:	Date:	Job No.:
DCR	DPB	DCR	NTS	3-31-92	91336

COMMONWEALTH OF VIRGINIA
KENNETH W. BARBUTT
No. 022657
PROFESSIONAL ENGINEER

No.	By	Revision	Date
3	RJH	REVISED PER COUNTY COMMENTS	KMB 10.14.96
2	RJH	REVISED PER VDH AND COUNTY COMMENTS	TVP 7.29.96
1	RJH	VDH AND COUNTRY ENGINEER COMMENTS	TVP 6.25.93

MANNINGS MOBILE HOME PARK

DETAILS

PRINCE GEORGE COUNTY VIRGINIA

Job Number	Sheet No.
95221	C5