SECTION 02536

LOW PRESSURE SEWER MAINS AND LATERALS

PART 1. GENERAL

1.1 The work to be performed shall consist of the installation of low pressure high density polyethylene sewer mains and laterals according to the Specifications and the standard details herein.

1.2 CONTRACTOR shall be responsible for safely storing materials needed for the work until they have been incorporated into the completed project. CONTRACTOR shall keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.

1.3 Materials will be visually inspected by OWNER at the site for conformance to the specifications. At OWNER's discretion, CONTRACTOR may be required to supply certified mill tests, samples, or other suitable form of verification that the material meets the required specifications.

PART 2. PRODUCTS

2.1 PIPE AND FITTINGS

Materials will be visually inspected by OWNER at the site for conformance to the specifications. At OWNER's discretion, CONTRACTOR may be required to supply certified mill tests, samples, or other suitable form of verification that the material meets the required specifications.

A. Polyethylene pipe (HDPE) and fittings shall be made of High Density, Extra High Molecular Weight (EHMW) polyethylene with a standard thermoplastic material designation of PE3408.

B. The pipe shall be manufactured by an OWNER approved manufacturer.

C. All pipe and fittings shall be Iron Pipe Size (IPS), manufactured in compliance with ASTM F714 and ASTM D3035. Pipe 4 inches and smaller shall be SDR 11; pipe larger than 4 inch shall be SDR 17.

D. Polyethylene pipe (HDPE) shall have a co-extruded green cover or extruded green stripes designating use for sanitary sewer. Color print lines are not an acceptable method for designation of low pressure sewer mains. Pipe with extruded green stripes shall have a minimum of three equally spaced stripes. Pipe shall have a heat indented print line containing the information required in ASTM D 3035.

E. All fittings shall be molded. Fabricated fittings are not acceptable, unless approved in writing by OWNER. Butt fusion fittings shall comply with ASTM D3261 requirements.

PART 3. EXECUTION

3.1 INSTALLATION OF LOW PRESSURE SEWER MAINS AND LATERALS

A. Sewers shall be designed with a 10-foot horizontal separation from any existing or proposed water main. If this is not practical, the sewer may be placed closer than 10 feet to a water main, provided it is laid in a separate trench and the elevation of the top of the sewer is at least 18 inches below the bottom of the water main, or as directed by OWNER.

B. Where a sewer crosses under a water main, the top of the sewer shall be at least 18 inches below the bottom of the water main. If the elevation of the sewer cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation, or the water main shall be reconstructed with ductile iron pipe for a distance of 10 feet on each side of the sewer with a full pipe section of the water main centered over the sewer, or as directed by OWNER.

C. Heat Fusion joining HDPE pipe: Pipe and fittings shall be joined by thermal butt fusion, saddle fusion or socket fusion according to manufacturer recommended procedures approved by OWNER. CONTRACTOR shall provide documentation from the manufacturer that persons making heat fusion joints have received training in the manufacturer's recommended procedure. CONTRACTOR shall maintain records of trained personnel and shall certify that training was received within 12 months of commencing construction. If required by OWNER, CONTRACTOR shall re-qualify all personnel as directed by OWNER. OWNER reserves the right to disqualify CONTRACTOR fusion personnel based on unsatisfactory performance.

D. Mechanical Joining: At the OWNER's discretion HDPE pipes and fittings may be joined together or to other materials by means of mechanical couplings designed specifically for this purpose. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restrains shall not be used in lieu of fully restrained mechanical couplings.

E. All pipe shall be joined in the exact manner specified by the manufacturer of the pipe and joining materials.

F. All pipe shall be installed with a 12-gauge solid copper wire for locating purposes. Tracer wire shall be installed in accordance with Section 15105 – Tracer Wire Installation for Non-Electrically Conductive Pipe.

G. The particle size of backfill material within 1 foot of the pipe shall not exceed ¾ inch (TDOT No. 57 crushed stone). All materials used for backfill shall be free from refuse organic material, cobbles, boulders, large rocks or stones or frozen soils greater than 3 inches in diameter.

H. Low-pressure sewer mains shall have at least 36 inches of cover and low-pressure sewer laterals shall have at least 24" of cover.

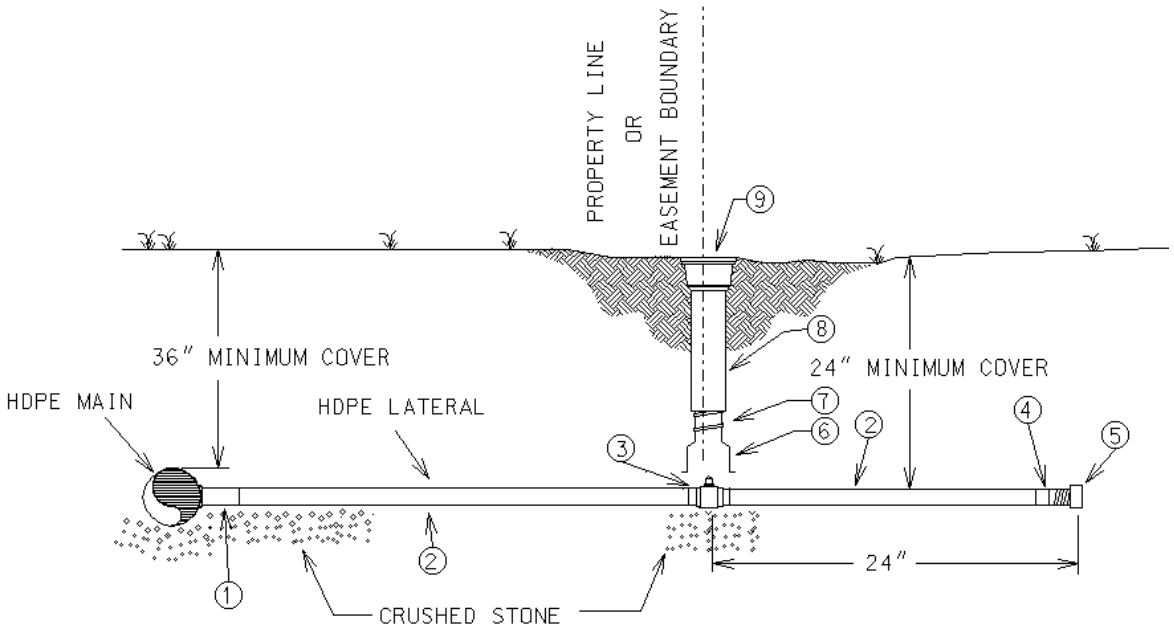

Figure 1-2536-a (Lateral Service Connection – New Main)

Notes:

I. Crushed stone used for bedding at service connections and valves shall be a minimum of 6 inches deep. Bedding material at valves may be replaced with a pre-cast concrete block.

II. Valve jacket shall not be supported by the HPDE pipe or valve. Blocks or compacted stone shall be used to support the valve jacket

III. Lateral to be tested with main unless otherwise specified in project drawings.

IV. Customer installed check valve to be installed within 24 inches of HDPE transition fitting.

V. Tracer wire must be installed with all HDPE mains and laterals, as required in 3.1 D.

Material List for Lateral Service Connection – New Main

Item	Quantity	KUB Item #	Description
1	1	800733	2x1¼" HDPE Branch Saddle
2	1	800681	1¼" HDPE Pipe
3	1	800686	1¼" Ball Valve
4	1	800729	1¼" HDPE Transition Fitting
5	1	800865	1¼" Schedule 80 PVC Cap
6	1	294074	Valve Box Base
7	1	294058	Valve Box Bottom Section
8	1	294041	Valve Box Top Section
9	1	800737	Sewer Valve Box Lid
10	N/A	383448	#12 Tracer Wire (Not Shown)

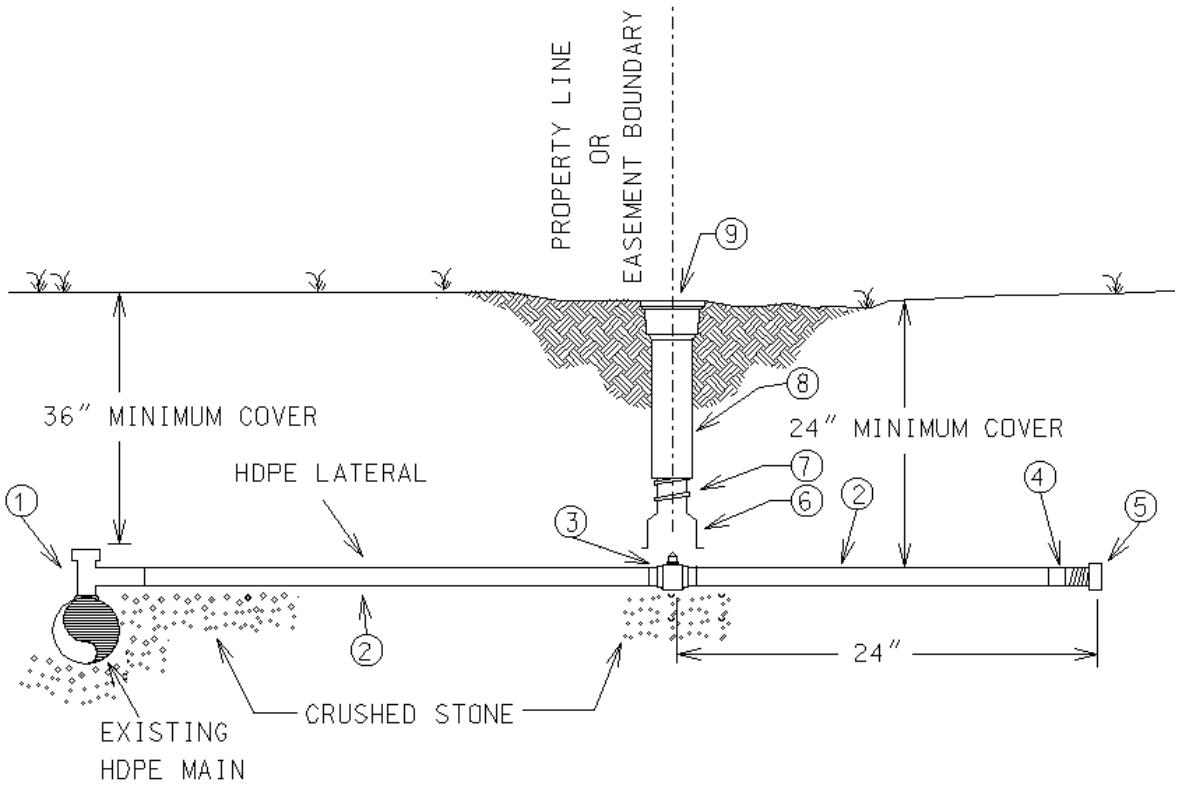

Figure 2-2536-b (Lateral Service Connection – Existing Main)

Notes:

I. HDPE tapping saddle to be used for main connection only on existing low pressure sewer mains.
II. Lateral to be pressure tested in accordance with section 3.2.
III. Customer installed check valve to be installed within 24 inches of HDPE transition fitting.

IV. For HDPE laterals on existing PVC mains, a Continental – PVC Super Fasttap Fitting (2x1½ - KUB Item # 800739; 4x1½ - KUB Item # 800740) with plastic compression outlets shall be substituted for Item 1.

V. For HDPE laterals on existing CI/DI/AC/PVC mains, the main connection shall use an approved tapping saddle with an 1½" Corporation Stop (KUB Item # 200317), an 1½' x 1 ¼" Bushing (KUB Item # 200315) and an 1¼" Transition Fitting (KUB Item # 800729).

VI. Tracer wire must be installed with all HDPE mains and laterals, as required in section 3.1 D.

Material List for Lateral Service Connection – Existing Main

Item	Quantity	KUB Item #	Description
1	1	800698	2 x 1¼" HDPE Tapping Saddle
2	1	800681	1¼" HDPE Pipe
3	1	800686	1¼" Ball Valve
4	1	800729	1¼" HDPE Transition Fitting
5	1	800865	1¼" Schedule 80 PVC
6	1	800864	1¼" PVC Schedule 80 PVC Cap
7	1	294074	Valve Box Base
8	1	294058	Valve Box Bottom Section
9	1	294041	Valve Box Top Section
10	1	800737	Sewer Valve Box Lid
11	N/A	383448	#12 Tracer Wire (Not Shown)

I. Pipes shall slope continuously between high and low points to eliminate the formation of air pockets inside the pipes whenever possible. Mains shall have a minimum of 60 inches of cover at the high points to facilitate installation of air release valves as shown on the plans or as directed by OWNER. Exceptions shall be approved by OWNER.

J. Air valves shall be located at all high points on the pipeline in accordance with the drawings, or as required by OWNER.

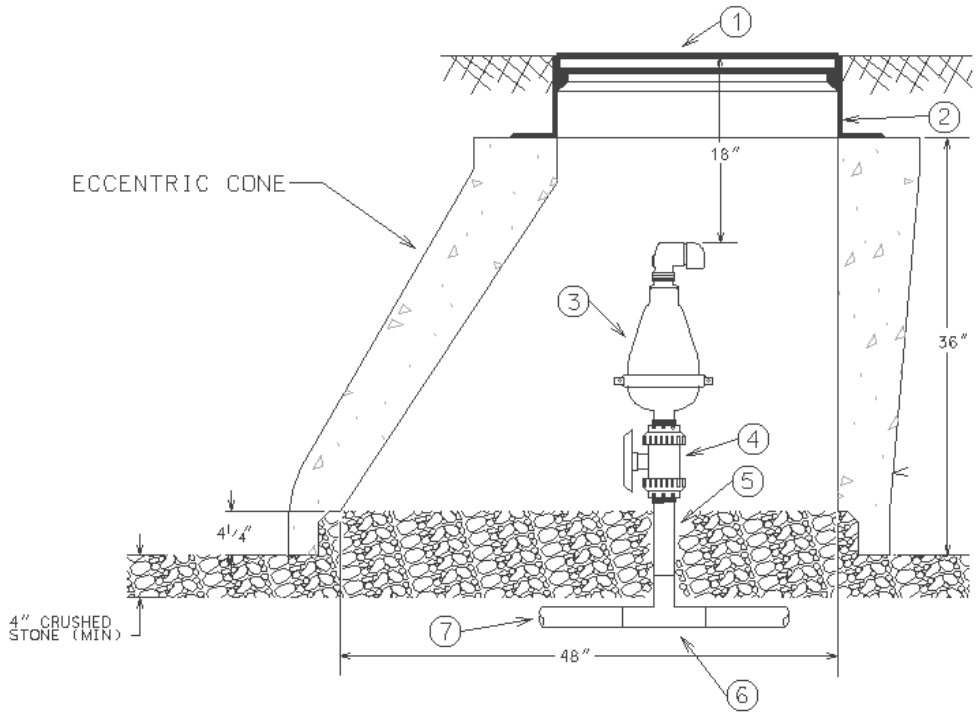

Figure 3-02536-c (Standard Air Release or Combination Air Release / Air Vacuum Valve)

Notes:

I. Manhole and appurtenances shall be per Section 2600
II. Seal pipe through manhole openings with non-shrinking grout.

Material List for Standard Air Release Valve

Item	Quantity	KUB Item #	Description
1	1	800340	Wastewater Manhole Lid
2	1	800300	Manhole Frame
3	1	800738	Air Release / Air Vacuum Valve
4	1	800872	2" PVC Valve
5	1	800731	2" Transition Fitting
6	1	800715	2" HDPE Tee
7	1	800682	2"HDPE Pipe

K. CONTRACTOR shall provide and use tools and facilities that are satisfactory to OWNER and that will allow the work to be done in a safe and convenient manner. Suitable equipment shall be used to lower all pipe and fittings into the trench. Under no circumstances shall materials be dumped or dropped.

L. Pipes and fittings shall not be lowered into the trench until they have been swabbed to remove any mud, debris, etc., that may have accumulated within them. After the pipe has been lowered, all unnecessary materials shall be removed from it.

M. Every precaution shall be taken to keep foreign material from getting into the pipe while it is being installed. No debris, tools, clothing, or other materials shall be placed in the pipe during laying operations. Wherever pipe laying is not in progress, the open ends of the pipe shall be closed either with a watertight plug or by other means approved by OWNER.

N. The bottom of the trench shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length.

O. Pipe shall be cut so that fittings can be assembled in a proper manner and without any damage to the pipe. The manufacturer's recommendations shall be followed concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis.

P. Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions, or wherever long radius curves are permitted, the amount of deflection shall not exceed the pipe manufacturer’s recommendations, and shall be approved by OWNER. Bend fittings shall only be used when the pipe deflections are inadequate, according to manufacturer's recommendations, or as directed by OWNER.

Q. No pipe shall be installed in water or when OWNER determines that trench conditions are unsuitable. If crushed stone is used to improve trench conditions or as backfill for bedding the pipe, its use is considered incidental to the project.

R. Valves shall be installed as directed by OWNER.

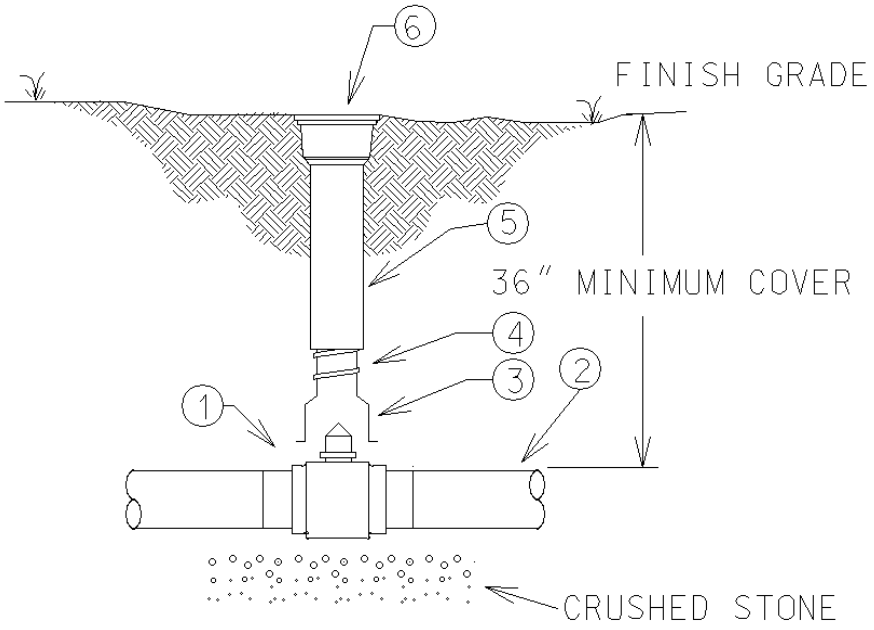

Figure 4-02536-d (Standard Valve Assembly)

Material List for Standard Valve Assembly

Item	Quantity	KUB Item #	Description
1	1	800687	2" HDPE Ball Valve
2	1	800682	2" HDPE Pipe
3	1	294074	Valve Box Base
4	1	294058	Valve Box Bottom Section
5	1	294041	Valve Box Top Section
6	1	800737	Sewer Valve Box Lid

S. Flushing assemblies shall be installed as shown on the project drawings or as directed by OWNER.

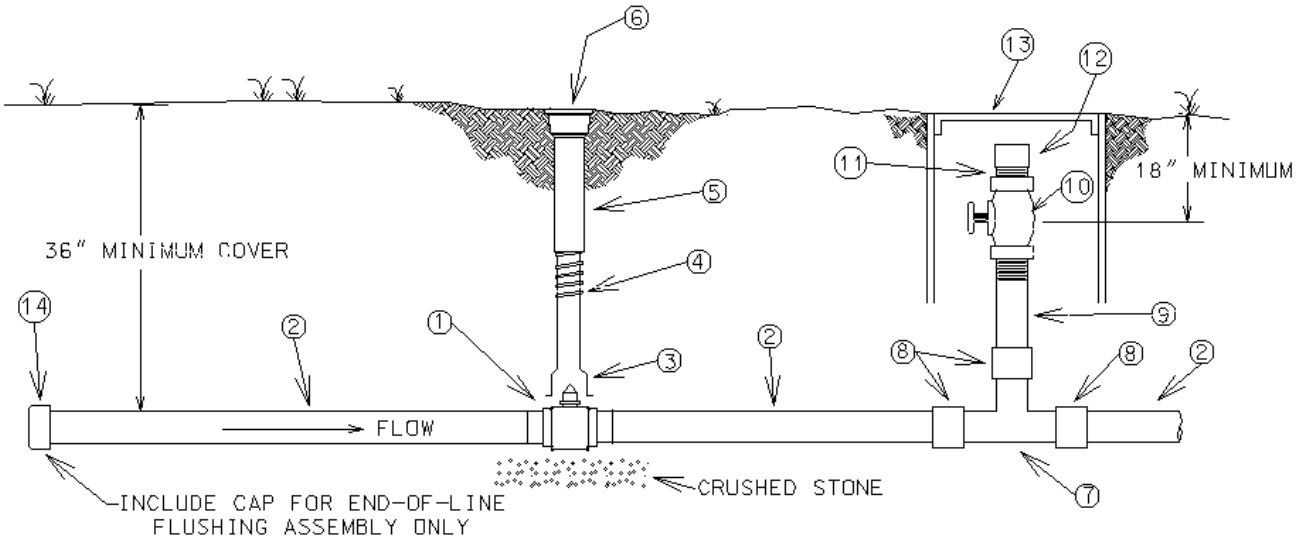

Figure 5-02536-e (Standard Flushing Assembly)

Material List for Standard Air Release Valve

Item	Quantity	KUB Item #	Description
1	1	800687	2" HDPE Ball Valve
2	1	800682	2" HDPE Sewer Pipe
3	1	294074	Valve Box Base
4	1	294058	Valve Box Bottom Section
5	1	294041	Valve Box Top Section
6	1	800737	Sewer Valve Box Lid
7	1	800715	2" HDPE Tee
8	1	800713	2" HDPE Socket Coupling
9	1	800731	2" HDPE Transition Fitting
10	1	800872	2" PVC Ball Valve
11	1	203190	2" Brass Nipple
12	1	800873	2" Schedule 80 PVC Cap
13	1	800874	MB-1 Meter Box
14	1	800695	2" HDPE Socket Fusion Cap

T. Thrust / restraint blocks shall be installed in locations shown on the plans or in accordance with the pipe manufacturer's recommendations or as required by OWNER. Thrust / restraint blocks shall be considered an integral part of the low-pressure sewer main installation. HDPE pipe shall be properly restrained in

accordance with manufacturer's recommendations to resist the longitudinal forces in the pipe due to thermal expansion. CONTRACTOR shall install any restraint devices necessary to properly secure the pipe.

U. All pipes shall be joined in the exact manner specified by the manufacturer of the pipe and joining materials.

V. Low-pressure sewer mains shall be connected to manholes as shown on the Standard Drawing herein (See Figure 6-02536-f). If the depth of the manhole is greater than 10 feet, low pressure sewer mains and laterals may be connected directly to a manhole using an internal drop as approved by OWNER.

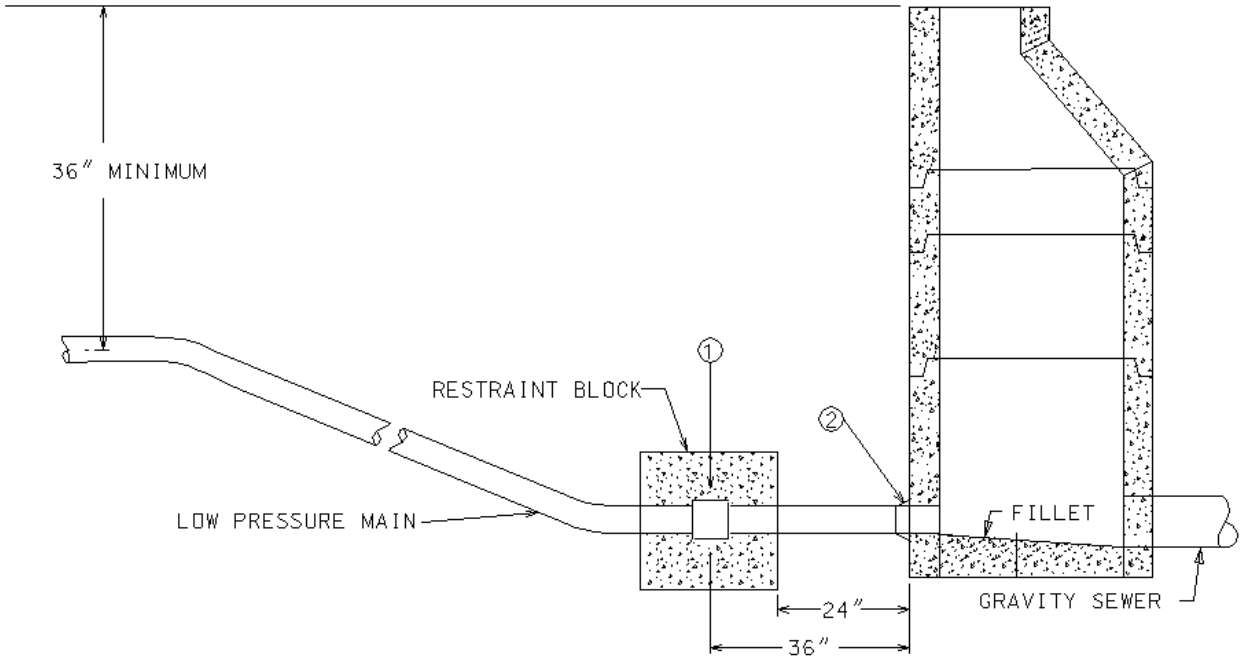

Figure 6-02536-f (Standard Detail for Connection of Low Pressure Sewer Mains to Gravity Sewer Manholes)

Notes:

I. Crown of low pressure main must be installed at the same elevation as the crown of the receiving gravity sewer.

II. Manhole invert must be formed to provide a smooth transition channel to sufficient depth to direct force main discharge with minimum turbulence.

III. Restraint block shall be 2'x 2' x 2'. HDPE pipe shall be wrapped in plastic prior to installing restraint block. Concrete shall meet the applicable requirements of Section 03303 Concrete for Utility Lines.

IV. When a sewage force main terminates into a manhole, the internal surface shall be coated with an epoxy system to prevent sewer gas corrosion to the inside of the manhole. Epoxy Coating - KUB Item # 800746.

Material List for Standard Manhole Connection

Item	Quantity	KUB Item #	Description
1	1	800713	2“ HDPE Socket Fusion Coupling
2	1	800747	Flexible Boot Connector

W. Mains shall be internally cleaned with an approved poly pig type cleaner as directed by the OWNER. Pigging shall continue with the poly pig until the line is thoroughly cleaned. Pigs are to be supplied by CONTRACTOR.

X. Final tie-ins to manholes connected to pump stations shall not be completed until the entire main is placed in-service or the main shall be plugged until placed in-service. The timing of the connection to active facilities shall be approved by OWNER.

Y. CONTRACTOR shall submit a work plan to OWNER for approval, a minimum of three workdays prior to beginning any work affecting any active facility.

3.2 LEAKAGE TEST

A. Low-pressure sewer mains and laterals shall be subjected to a pressure test with 100 psig of air after installation and backfilling have been completed. All testing shall be conducted in the presence of OWNER. The maximum pressure during testing shall be 150 psig.

B. The pipe system under test and any test equipment should be restrained against sudden uncontrolled movement from catastrophic failure of the system under test pressure.

C. CONTRACTOR shall furnish all equipment necessary for pressure testing including but not limited to pipe, fittings and gauges.

D. The pressure shall be held constant for 2 hours and shall be continuously monitored during the test period using a chart recorder and temperature gage. Any pressure changes during the test period shall not be greater than that allowed by temperature changes recorded on the temperature gage. If the pressure falls below 100 psig during the test period, the test procedure shall start again. If significant pressure drops occur during the pressure test, CONTRACTOR shall locate and repair leaks on the main and laterals prior to retesting.

E. Based on the project conditions the Resident Project Representative may require the pressure test to be conducted with water as the test medium.

F. Based on the project conditions the Resident Project Representative may allow mains and laterals to be tested separately.

G. Any cracked or defective pipes or fittings discovered in consequence of this leakage test shall be replaced with sound material in the manner specified at no cost to OWNER. The test shall be repeated until the results are satisfactory to OWNER.

H. After successful completion of the pressure testing, mains shall be flushed with water to remove air from the system and ensure system is ready for operation, as directed by OWNER.

3.3 CLEANUP

After completing each section of the main, all debris and construction materials shall be removed from the work site and disposed of in compliance with all applicable laws and regulations and with Section 02321, paragraph 3.4. Then the surface shall be graded and smoothed on both sides of the line. The entire area shall be left clean and in a condition satisfactory to OWNER. CONTRACTOR shall keep cleanup operations as close to active pipe laying activities as practical, generally following by less than 300 feet, or as approved by OWNER.

END OF SECTION