SHORT FORM SPECIFICATION

SANITARY SEWER CONSTRUCTION

KLH ENGINEERS, INC

FTMA Water & Sewer Authority

Ref. No. 544-31

FINDLAY TOWNSHIP MUNICIPAL AUTHORITY

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TABLE OF CONTENTS

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Section 1.0 - Scope

These Specifications have been developed as a guide to assist Developers, Designers and Contractors involved in planning, designing and constructing sanitary sewerage facilities under the jurisdiction of the Findlay Township Municipal Authority. It should be understood that these Specifications are general in nature and are not intended to address all conditions or needs of a particular project. Special circumstances which are peculiar to individual projects may require special design considerations. Developers and Designers of proposed sanitary sewerage facilities are encouraged to consult with the Municipal Authority and/or KLH Engineers, Inc. regarding specific problems or unusual circumstances which may arise in the planning, design or construction of such facilities.

Section 2.0 - General

Pipes and joints for the various types of sewer line shall be of the materials indicated herein. Pipe shall be laid true to the grades shown on the approved Drawings and without vertical or horizontal deviation. Sags and low points in the pipe line that are found to hold standing water shall be re-excavated and re-laid. Internal pipe lamping shall result in "full moon" observations. All sewer mains shall be installed by utilizing laser equipment designed for the intended purpose. Laser equipment shall be checked for accuracy of grade and calibrated as required by the Authority or KLH Engineers, Inc. Each section of pipe shall rest upon the pipe bed for the full length of its barrel, with recesses to accommodate bells and joints. Any pipe that is disturbed after laying shall be taken up and re-laid. The interior of all pipe shall be thoroughly cleaned before being lowered into the trench and shall be kept clean during laying operation. Any section of pipe already laid and found to be defective shall be removed and replaced with new pipe.

Section 3.0 - Quality Assurance (Submittals and Shop Drawings)

To ensure that the specified products are furnished and installed, submittals, including manufacturer's certificates, shop drawings, brochures, product samples and catalog cuts for all products and materials to be used in connection with the

project shall be submitted to the Authority or KLH Engineers, Inc. All submittals shall be submitted in quadruplicate and shall be submitted sufficiently in advance of the purchase of such materials to permit review of the submittals by the Authority or KLH Engineers, Inc. No substitution of materials or equipment will be permitted without resubmission and approval of the shop drawings.

Section 4.0 - Trenching and Pipe Bedding

The side walls of the trench shall be kept as vertical as possible in the pipe zone area. Trenches shall be excavated true to line and grade so that a clear space of not less than four (4) inches and not more than eight (8) inches is provided on either side of the barrel of the pipe. Trench shoring and bracing shall conform to OSHA regulations.

All pipe trench excavation shall be made to a minimum depth of four (4) inches beneath the designed pipe invert elevation. The pipe shall then be bedded in PADOT No. 57 Coarse Aggregate limestone or gravel in accordance with the requirements for Class B, First Class Bedding material in accordance with ASTM Designation C-12 latest edition, and conforming with the applicable Standard Detail Drawings.

Where rock excavation is required, the rock shall be excavated a minimum of six (6) inches below the designed pipe invert elevation. The overdepth rock excavation and all excessive trench excavation shall be bedded with PADOT No. 57 Coarse Aggregate.

Where quicksand, muck or other such conditions exist, which results in an unstable trench bottom, over-excavation and backfilling with PADOT No 57 Coarse Aggregate shall be required. The type and extent of methods employed to stabilize the trench bottom shall be approved by the Authority or KLH Engineers, Inc.

Accumulations of water in the trench excavations shall be removed and disposed of in accordance with the regulations of all jurisdictional agencies. Ground or surface water that enters the trench shall be prevented from entering the sewer line. Pipe installation will not be permitted unless the trench bottom is free of accumulated water.

Section 5.0 - Temporary Erosion and Sediment Control

The CONTRACTORS shall conduct their activities and shall program trenching and restoration operations in compliance with the Commonwealth of Pennsylvania, Title 25 (Clean Stream Law)Chapter 102 (Erosion and Sediment Control Rules & Regulations) and any rules and regulations by Federal, State, County and/or Municipal law or organization in such a manner as to minimize pollution of the creeks from erosion of the freshly excavated and/or backfilled materials during periods of excavation and surface water runoff. CONTRACTORS shall reduce the area and duration of exposure of all erodible soils by the greatest extent practicable and to that end, hydromulching, reseeding and other specified surface restoration shall be required to closely follow backfilling operations. Where the Erosion and Sedimentation Pollution Control Plan calls for runoff devices or the OWNER's Representative so directs additional installation of controls in the field, such as silt fence, filter fabric socks, waterbars, sediment traps, and/or other means to retard runoff rates shall be installed as specified. Installation of a Pumped Discharge Sediment Trap ("filter bag") or other approved sediment trap arrangements shall also be required to be installed at the discharge of dewatering pumps as detailed on the Erosion and Sedimentation Pollution Control Plan. Stream crossings must be approved by the appropriate agencies involved. Specific details related to each crossing are shown upon the Erosion and Sedimentation Pollution Control Plan for this project. Additional crossings, movement of the location and/or changing of the construction details are not permitted without approval from the appropriate agency. Discretion shall be exercised in encroachments during the construction both in and along the creeks such that a minimum of stream disturbance and erosion pollution results. The Soil Erosion and Sediment Pollution Controls deemed as adequate or as approved by the County Soils Conservation Service and the Pennsylvania Department of Environmental Protection are identified in the contract drawings. The CONTRACTOR shall be responsible for all fines, fees, penalties, and subsequent obligations related to violations, etc. imposed upon the OWNER as a result of the CONTRACTOR's construction activities, methods/procedures and/or the lack of construction activities methods/procedures.

Section 6.0 - Utility Pipe Line / Commissioning

6.1 Work Included

A. The CONTRACTOR shall provide, complete and ready for use, all of the pipe line system and appurtenances and shall perform such operations and tests, all as specified herein and as indicated on the drawings.

B. All pipe lines shall be installed by skilled mechanical erection labor in accordance with manufacturer's instructions.

6.2 Inspection and Tests

A. Tests shall be performed on all piping, equipment and complete systems. The CONTRACTOR shall provide labor, materials, tools, air, water, power and supplies of any kind required for testing and adjusting of equipment and systems.

B. Material and/or equipment damaged or shown to be defective shall be repaired or replaced to the satisfaction of the OWNER.

C. All tests shall be made only after notification to and in the presence of the OWNER.

D. Records shall be kept for each test showing the date, system and/or equipment was tested, method of test, test results and approval signature of the OWNER. Three copies of the test records, along with any certificates of final inspection or approval issued by the authorities having jurisdiction, shall be furnished to the OWNER at the successful completion of each test.

6.3 Commissioning

A. Pipe lines shall be put in operation upon successful testing and upon authorization by the OWNER's Representative.

6.4 Final Clean Up; Site Rehabilitation

A. Before finally leaving the site, the CONTRACTOR shall wash and clean all exposed surfaces which have become soiled or marked. CONTRACTOR shall remove from the site of the

work all accumulated debris and surplus materials of any kind which result from his operations, including construction equipment, tools, sheds, sanitary enclosures, etc. CONTRACTOR shall leave all equipment, fixtures and work, which he has installed, in a clean condition. The completed project shall be turned over to the OWNER in a neat and orderly condition.

B. The CONTRACTOR shall completely rehabilitate the site to a condition and appearance equal or superior to that which existed just prior to construction.

6.5 Final Inspection

A. Final cleaning and repairing shall be so arranged as to be finished upon completion of the construction work.

B. The ENGINEER will make his final inspection of the work during the progress of final cleaning and repairing, and any portion of the work finally inspected and accepted by the ENGINEER shall be kept clean by the CONTRACTORs, until the final acceptance of the entire work.

C. When the CONTRACTORs have finally cleaned and repaired the whole, or any portion of the work, they shall notify the ENGINEER that they are ready for final inspection of the whole or a portion of the work, and the ENGINEER will thereupon inspect the work. If the work is not found satisfactory, the ENGINEER will order further cleaning, repairs or replacement.

D. When such further cleaning or repairing is completed, the ENGINEER, upon further notice, will again inspect the work. The "Final Payments" will not be processed until the CONTRACTOR has complied with the requirements set forth and the ENGINEER has made his final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily constructed.

Section 7.0 - Rights-of-Way

The proposed construction activities and appurtenances shall be installed along rights-of-way under the jurisdiction of the Findlay Township Municipal Authority. The OWNER has, or will have, acquired the necessary rights-of-way for construction of the proposed facilities, however, if the CONTRACTOR desires ingress or egress to the construction site over private

properties or land for which the OWNER obtained no such rights-of-way, the CONTRACTOR shall make all necessary arrangements. Information regarding rights-of-way obtained from private property owners is available from the OWNER. Identification of property owners and the location of the respective property lines were obtained from various sources as noted on the plans, and may not be accurately or currently represented. The OWNER has acquired, in most cases, a temporary construction easement suitable for construction of the proposed facilities and a 20' wide permanent easement. The CONTRACTOR is cautioned to work only within the granted easements and to minimize the area of disturbance of his activities. A copy of all individual easement exhibits is available for the contractors so that they have knowledge of all easements and how they affect the work area.

The proposed construction activities may also encroach upon rights-of-way owned and occupied by the utility companies listed on the plans. Existing utility lines are indicated on the Drawings at locations which have been determined from either field markers or from records on file in the respective utility offices. CONTRACTORS shall conduct the construction work very carefully to avoid disturbance of those utility lines and shall advise his personnel (and those of any subcontractor) the hazards inherent in working near underground gas lines and/or overhead high voltage electric lines. Any and all damages caused to existing utility lines, or resulting from the exposure of, and contact with said lines or from other construction activities, shall be rectified by that CONTRACTOR which is responsible for same.

Section 8.0 - Cleanup of Work Site

Immediately after all construction operations have been completed on any section, the CONTRACTOR shall thoroughly clean the area of all excess materials, debris, plant and equipment for which he is responsible. The OWNER's Project Representative will designate and fix the limits of each "section" of construction area in the field, under each contract for clean-up purposes. While it is intended to cooperate with the CONTRATOR in establishing such section limits, it shall be required that clean-up activities reasonably progress with construction progress. The determination of what is reasonable shall be made by the ENGINEER. The CONTRACTOR shall also restore to its original condition and to the satisfaction of the OWNER's Project Representative, all grounds, fences, lawns, driveways, streets, roadways, banks, ditches, and all other areas and shall leave the premises in a neat and operable condition.

All sewer lines and manholes shall be thoroughly flushed and cleaned and all dirt, construction materials, sediment and other materials shall be completely removed from the system prior to connection of all services and operation of the sewers.

Section 9.0 - Utility Substantial Completion

The interpretation for Substantial Completion is a point where the whole of the work for all items specified have reached a point whereby the OWNER recognizes that all parts of the specified work have progressed for utilization for the purposes which it is intended. The intention of this specification is the newly constructed facilities function for their intended purpose for the OWNER and all areas of construction are restored back to use for their intended purpose for the Government Body and Property Owners who have granted rights of way to permit this project to go forward.

Section 10.0 - Bypassing Sewage

The CONTRACTOR shall provide all plant, supervision, labor and materials to bypass sewage around the existing manhole section that the new sewer line connects into. Pumps and bypass lines shall be of adequate capacity to handle the sewage flow plus additional flow that may occur during a rainstorm. The CONTRACTOR is cautioned that the estimated flows do not include contributions from any infiltration or inflow that may exist at the time of the work. The existing flows include those from upstream collection components that contribute to the subject sanitary sewer mains or manhole facilities.

By-pass pumping shall consist of flow diversion as necessary to prevent back-ups creating damage or nuisance and where the testing and/or sewer replacement is in progress. By-pass shall be performed by pumping the existing flow from upstream to downstream of the stretch of sanitary sewer involved in the particular operation, after obtaining approval from the ENGINEER. The CONTRACTOR shall provide and operate all pumps, hoses, and other conduits of adequate capacity which are necessary to prevent back-up. By-pass pumping, when required, shall continue until the particular item or work which is being performed in the section of Sewer involved has been completed.

In no case will by-pass pumping be permitted at times other than and during hours of investigation and rehabilitation.

Raw sewage spillage caused by equipment malfunction shall be

cleaned and disinfected by the CONTRACTOR using disinfectants approved by the ENGINEER. Under no circumstances shall the CONTRACTOR allow the discharge of sewage into the existing storm drain system waterways or onto the ground.

The CONTRACTOR shall be liable for all damages which result from sewage flows not properly maintained during the progress of the work, including all damages to private property which occur as a direct or indirect result of inadequate control of the sewage flow while the bypass operation is ongoing.

In the event of a sewage backup or spillage, the CONTRACTOR will be responsible for any and all fines which may be incurred from but not limited to the Department of Environmental Protection.

Section 11.0 - Piped Wastewater Sewer

11.1 Small Diameter Pressure Sewer Service Connection

A. Wyes or Tee: Make connection to Pressure Sewer using wye or tee fitting of the same material and joint configuration as the sewer at planned point of branch connection having a minimum 2 inch diameter branch connection.

B. Install wye followed by curb stop with valve box and a check valve and 1½ inch diameter service connection.

C. Extend service line to the right of way line or property line.

D. Curb stop shall be installed with a valve box at the property line or right of way line. Curb Stop shall be 2 inch diameter similar or equal to Mueller 110 Oriseal (round port).

E. Check Valve shall be 2 inch diameter. Valmatic swing flex full body check valve with domed access cover or approved equal.

F. Valve box shall be Tyler Series 6850, 5 ¼ inch shaft, screw type, No. 664-5 having an extension range 36 inches to 60 inches. "Sewer" shall be cast in lid.

Section 12.0 - Small Diameter Pressure Sewer Clean Out

At location identified in the contract drawing small diameter pressure sewers shall have installed an end of line or in line cleanout port. The clean out shall be installed in a precast concrete manhole vault as specific in Section 02732.

All pipe and fittings within the vault shall be red brass, with a 2-inch check valve and 2-inch ball valve. A vertical pipe shall extend two feet from a 2-inch elbow at end of line or 2 inch tee from inline cleanout. Riser Pipe shall be anchored to the inside of the vault. All anchoring materials shall be a 316 stainless steel. The vertical pipe shall be capped with a 2-inch quick disconnect coupling. The horizontal pipe shall be supported on concrete blocks cast-in-place and secured to the concrete with stainless steel clamps.

Section 13.0 - Pipe

13.1 Polyvinyl Chloride (PVC) Pipe

PVC Pipe and fittings shall be new, bell and spigot type gasketed, or glued joint, free from defects and shall conform in all respects to ASTM Designation D-3034-SDR-35, SDR-26, and SDR-21.

Pipe gaskets made of nitrile rubber shall be required if chemical resistant applications are deemed necessary by the Authority or KLH Engineers, Inc.

Pipe gaskets made of Viton rubber shall be required if coal is found to be prevalent in the sanitary sewer lien excavations.

13.2 Ductile Iron Pipe

Ductile Iron Pipe shall be AWWA C151 special thickness Class 52, bell and spigot type, Tyton joint or restrained joint free from defects and shall conform in all respects to AWWA C150 and C151. The pipe shall be lined with a ceramic epoxy lining and asphalt coated on the outside in accordance with AWWA C104. All Ductile Iron Pipe shall be not less than special thickness Class 52, except where a higher pressure class may be required by the Authority or KLH Engineers, Inc.

Pipe gaskets made of nitrile rubber shall be required if chemical resistant applications are deemed necessary by the Authority or KLH Engineers, Inc.

Pipe gaskets made of Viton rubber shall be required if coal is found to be prevalent in the sanitary sewer line excavations.

13.3 High Density Polyethylene (HDPE) Pipe and Fitting for Pressure Sewers

Installed pipe shall meet the requirements of ASTM F-174. Installed fittings shall meet the requirements of ASTM D-3261.

Material used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high density ethylene/exene copolymer PE3408 polyethylene resin.

Pipe supplied under this specification shall have a nominal IPS (iron pipe size) OD unless otherwise specified. The SDR (standard dimension ratio), and the pressure rating of the pipe supplied shall be approved by the Engineer.

The pipe shall contain no recycled compounds except those generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogenous throughout and free of visible cracks, holes, voids, foreign inclusions, or other deleterious defects, and shall be identical in color, density, melt index, and other physical properties throughout.

Sections of polyethylene pipe shall be joined into continuous lengths on the job site above ground. The joining method shall be the butt fusion method, and shall be performed in strict accordance with the pipe manufacturer's recommendations. Butt fusion joining shall be 100% efficient, offering a joint weld equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used. Extrusion welding or hot gas welding of the HDPE pipe shall not be used. Flanges, union, grooved couplers, transition fittings, and some mechanical couplers may be used to mechanically connect HDPE pipe without butt fusion, but only strictly according to manufacturer's recommendations.

Any HDPE pipe manufacturer that produces PE pipe and fitting in compliance with the above specifications may submit its date sheet, test designations, and test results to the Authority's Engineer for review and evaluation. Consideration of the documentation will be used to qualify and approve vendors and/or manufacturers. The Contractor shall allow a minimum of one (1) week of time for the Engineer to review the submittal. Pipe installed without the Engineer's approval shall be subject to

inspection and removal at no cost to the Authority or KLH Engineers, Inc.

13.4 Steel Casing Pipe

Steel casing pipe shall be welded steel pipe, manufactured and tested in accordance with ASTM A53/A53M, Grade B, with a minimum yield strength of 35,000 psi. The pipe shall be new, visibly sound and round. Minimum casing wall thickness shall be as follows:

NOMINAL DIAMETER OF CASING PIPE IN INCHES	WALL THICKNESS
Under 14	0.251"
14 and 16	0.282"
18	0.313"
20	0.344"
22	0.375"
24	0.407"
26	0.438"
28 and 30	0.469"
32	0.501"
34 and 36	0.532"

Section 14.0 - Polyethylene Encasement of Ductile Iron Pipe

Where the Authority or KLH Engineers, Inc. requires the use of ductile iron pipe for reasons of depth of cover, high external loading, steep slopes or other physical circumstances, the ductile iron pipe shall be encased in polyethylene film in accordance with AWWA Standard C105 "Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids."

Section 15.0 - Joint Restraint

Where sewer lines are installed on steep slopes, the Authority or KLH Engineers, Inc. may require, in addition to pipe anchors, the use of joint restraint mechanisms which may include but are not limited to field locating gaskets for ductile iron pipe or PVC pipe. Mechanical Joint restraining glands secured to the barrel of the pipe and embedded in concrete encasement and/or concrete anchors may also be required.

Section 16.0 - Casing Spacers

Where sewer lines are installed by boring, the sewer pipe shall be placed in a steel casing pipe and shall be supported by casing spacers constructed of high molecular weight polymer

runners secured to a stainless steel shell, as manufactured by Cascade Water Works Mfg. Co. of Yorkville, IL. Not less than three (3) spacers shall be used on each pipe length.

Section 17.0 - Casing End Seals

Casing pipe end seals of the required size shall consist of a rubber seal and two (2) T-304 stainless steel bands, as manufactured by Cascade Water Works Mfg. Co. of Yorkville, IL.

Section 18.0 - Precast Sectional Reinforced Concrete Manholes and Precast Manhole Bases

All manholes sections shall be precast concrete with Xypex crystalline waterproofing added to the mix at the ratio recommended by the manufacturer and shall conform to ASTM Designation C-478C, latest revision. Manhole joints shall be sealed with two (2) rings of butyl rubber sealant to insure water tightness conforming to ASTM Designation C-990. Manholes shall provide a watertight pipe to manhole connection. The pipe to manhole connection shall consist of either:

1. A molded neoprene blended compound boot conforming to ASTM Designation C-923, latest revision. The boot shall be secured to the pipe with a stainless steel band.

2. A-LOK gasket conforming with ASTM Rubber Gasket Specification C-923, latest revision. The lock gasket shall be cast integrally in the manhole wall. The gasket shall be designed to meet the performance requirements of ASTM Pipe Joint Specification C-425.

3. Pipe to manhole connectors made of nitrile rubber shall be required if chemical resistant applications are necessary.

All manholes shall be watertight and infiltration proof as possible. Defects or openings through the manhole walls shall be plugged with A. C. Horn "Waterplug" or approved equal. Any noticeable ground water leakage into the manhole shall be repaired in a manner satisfactory to the Authority or KLH Engineers, Inc. Precast manhole components deemed un-repairable by the Authority or KLH Engineers, Inc. shall be replaced with new components in good condition. Manhole flow line channels shall be "full pipe depth" and precasted into the manhole base with an interior form. Hand finished flow lines are not permitted. Flow lines that are deemed too rough will be ground smooth with an abrasive wheel grinder. The invert shall hold no

ponded water and drain fully. The concrete flow line shall not obstruct the free passage of a 5% deflection mandrel through the manhole. The elevation difference between manhole pipe invert shall conform to the approved design profiles, but the minimum elevation difference between influent and effluent pipe inverts shall not be less than 0.20 Vertical Feet. Concrete used for this purpose shall meet the Pennsylvania Department of Transportation, Form 408 Specifications for Class A concrete.

Pipes projecting into manholes shall not project more than two inches (2") beyond the interior wall surface of the manhole. Concrete seal (dog houses) around pipes that enter the manhole shall consist of three parts sand mix and one part hydraulic cement and shall fully encompass the pipe.

Section 19.0 - Manhole Steps

Manhole steps shall be placed on twelve (12) inch centers. The steps shall be placed along the vertically straight side of the manhole and shall be properly aligned. The steps shall be reinforced polypropylene plastic, as manufactured by M.A. Industries, Inc., be 14" wide and Type PS-4 or equal and shall conform in all respects to ASTM 2146-68 Type H Grade 49108.

Section 20.0 - Manhole Frames and Covers

Casting frame and covers shall be heavy duty and manufactured from Class 35B grey iron and conform to ASTM-A-48. For Severe load bearing conditions ductile iron grade 80-55-06 conforming to ASTM A536 may be required. Mating surfaces between the frame and cover shall be machined smooth and true and produce a uniform joint. Frames and covers that "rock" when wheel loads are applied shall be deemed defective and replaced. Casting frames shall be anchored to the cone in four locations with 3/4" bolts, two rings of butyl sealant shall be installed around the perimeter of the casting frame flange.

Covers shall fit the frames in any position and shall conform to the attached standard detail.

Locations where surface water flooding, or sewer system surcharging is possible "water tight" frames and covers shall be required. Water tight casting frames and covers shall conform to the attached standard detail.

Section 21.0 - Manhole Inserts (Sewer Guards)

Where manholes are located in paved areas for any reason may be subject to inflow of surface water, a watertight manhole insert shall be provided and installed to prevent inflow of such surface water into the manhole through the manhole cover. Manhole inserts shall be Sewer Guard Model MEC-4 Watertight Manhole Inserts, as manufactured by Methods Engineering Corp., Wilmington DE, or equal.

Section 22.0 - Underground Early Warning Detection Tape

The CONTRACTOR shall furnish and install magnetic detectable marking tape. Marking tape shall be detectable with conventional location equipment and therefore shall be encased in aluminum foil or other similar material.

The marking tape shall be minimum three (3) inch width.

Marking tape shall be vividly colored in accordance with standard industry color standards. Tape shall be marked "Gravity Sewer Line" at gravity sewers, "Intermittent Pressure Sewer" at force mains and "Waterline" at water lines, "storm sewer", "gas", or "electric" above those buried lines.

Marking tape shall be "Sentry Line" as manufactured by the Terra Tape or an approved equal.

Marking tape shall be installed two (2) feet above the pipe and along the entire installed alignment.

Section 23.0 - Cement Concrete and Ready-Mixed Cement Concrete

Cement concrete and ready-mixed cement concrete shall be Class A conforming to Section 704 of the Pennsylvania Department of Transportation Specifications, Form 408.

Section 24.0 - Stream Crossings and Concrete Encasement

Pipeline stream crossings shall be constructed in accordance with the following Specifications, and in accordance with all Pennsylvania DEP and Allegheny County Conservation District requirements.

Provide concrete encased Pipe of the type shown on the approved construction plans, backfilled with #1 AASHTO limestone to the level of the stream bed, between the limits of the stream crossing.

Stream crossing concrete encasement shall extend at least 5 feet beyond the edges of the creek on either side.

Concrete encasement shall be constructed according to the Standard Detail.

Section 25.0 - Backfilling

Backfilling shall commence immediately after the proper installation of pipe bedding material is completed. Stumps, tree limbs and other wood materials as well as large boulders in excess of 1.5 feet shall be segregated and disposed of properly elsewhere. Backfill material that is too wet to compact shall be sufficiently dried prior to backfilling. Excavated materials deemed unsuitable by the Authority or KLH Engineers, Inc. shall not be permitted for use as backfill material. Foreign borrow or select premium backfill material may be required. Backfill material shall not contain ice, snow or frozen material. Backfill material shall be placed into the trench with care and in uniform level layers and compacted thoroughly with vibratory compaction equipment to a minimum of 95% of maximum dry weight density. Backfilling in roadways shall conform to the road requirements of PADOT, Allegheny County or Findlay Township depending the jurisdiction of the roadway.

Section 26.0 - Pipe Connections to Existing Manholes

Pipe connections to existing manholes shall be made by coring a neat circular hole in the manhole wall at a location and elevation acceptable to the Authority or KLH Engineers, Inc. Installation of a flexible pipe to manhole connector into the cored opening shall produce a water tight seal. A nitrile rubber pipe to manhole connector may be required if chemical resistant applications are necessary. Flexible pipe to manhole connectors shall meet or exceed the requirements of ASTM C-923.

Section 27.0 - Pipe Testing

The Contractor shall provide a minimum of 48 hours advance notice to the Authority or KLH Engineers, Inc. of the Contractor's pipe testing schedule. All pipe testing must be observed by the Authority or KLH Engineers, Inc.

27.1 Low Pressure Air Testing of Gravity Sanitary Sewers

After a segment of sanitary sewer has been completely installed including service line extensions and backfilled for a minimum of ten days perform low pressure air test as described herein.

All gravity sewer lines shall be tested by inducing low pressure air, internally, into the pipe. Air shall be slowly introduced into the test segment, until the air pressure is raised to 5.0 psi. Allow the pressure to stabilize for two minutes without loss. Then slowly reduce the pressure to 4.0 psig. The pressure shall be maintained without loss greater than 0.5 psig for the time periods shown in Table 1, in the event a pressure drop of 0.5 psig or more occurs before the time indicated in Table 1, the test shall be deemed a failure and repairs or replacement of the pipeline will be required. Repaired or replaced pipe segments will be subjected to the same test requirements until satisfactory results are achieved.

In areas where the water table elevation is known to be above the pipe elevation the minimum test pressure shall be increased by 1.0 psig for each increment of 2.31 feet the water table is above the pipe. At no time should the test pressure exceed 9.0 psig. All air testing equipment shall be approved by the Authority or KLH Engineers, Inc. before use.

Table 1
Minimum Specified Time Requirements for a 0.5 psig Pressure Drop for Size and Length of Pipe

Pipe Diameter in.	Minimum Time min:s	Length (L) for Minimum Time ft.	Time for Longer Length S/L	Specification Time for Length (L) Shown, min:s							
				100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.	450 ft.
4	1:53	597	0.190/L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	0.427/L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	0.760/L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187/L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709/L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671/L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846/L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235/L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837/L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.563/L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683/L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926/L	21:23	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384/L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23

27.2 Deflection Test for PVC Pipe

All newly constructed sanitary sewer lines shall be subjected to a deflection test not less than thirty (30) days after construction. A 5% deflection mandrel will be used for this purpose. The following table summarizes the required dimensions of the mandrel for various sizes and standard diameter ratios. The mandrel tests should be performed following pipe line flushing.

		SDR35/PS46			SDR26/PS115	
		5% Deflection	7 ½% Deflection		5% Deflection	7 ½% Deflection
Nominal Size	Base ID	Mandrel Size	Mandrel Size	Base ID	Mandrel Size	Mandrel Size
4	3.895	3.70	3.60	3.811	3.62	3.53
6	5.742	5.45	5.31	5.612	5.33	5.19
8	7.665	7.28	7.09	7.488	7.11	6.93
10	9.563	9.08	8.85	9.342	8.87	8.64
12	11.361	10.79	10.51	11.102	10.55	10.27
15	13.898	13.20	12.86	13.575	12.90	12.56
18	16.976	16.13	15.70	16.586	15.76	15.34
21	20.004	19.00	18.50	19.545	18.57	18.08
24	22.48	21.36	20.79	21.964	20.87	20.32
27	25.327	24.06	23.43	24.744	23.51	22.89
30	29.132	27.68	26.95	28.461	27.04	26.33
36	34.869	33.13	32.25	34.120	32.41	31.56

27.3 Hydrostatic Testing of HDPE Pipe

The Contractor shall provide temporary thrust restraint at the ends of the force main to prevent pipe or joint damage, separation, or movement resulting from the internal pipe pressure developed during hydrostatic testing. Heat fusion joints must be properly cooled before testing. Mechanical connections must be completely installed and tightened per manufacturer's instructions. The Contractor shall provide the water required for testing, and shall take all necessary measures to remove same from the sewer lines after testing has been performed.

The maximum permissible test pressure is measured at the lowest elevation in the test section, and shall be 150% of the system design operating pressure when the test section is all polyethylene pressure piping. If the system contains non-polyethylene components, the maximum permissible test pressure is the pressure rating of the lowest pressure rated, non-polyethylene component in the system.

The recommended test fluid is water. The test fluid should meet the appropriate industry standards for safety and quality so that the environment, system and test equipment are not adversely affected by the testing and disposal (if necessary).

The hydrostatic leak test procedure consists of filling, an initial expansion phase, a test phase, and depressurizing and disposal. There are two alternatives for the test phase as described below.

- When testing at pressures above system design pressure up to 150% of the system design pressure, the maximum test duration is eight (8) hours including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize the test section. If the test is not completed due to leakage, equipment failure, or for any other reason, depressurize the test section completely, and allow it to relax for at least eight (8) hours before pressurizing the test section again.

- When testing at system design pressure or less, test duration including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize should be limited to a practical time period given that the test section is not to be left unsupervised at any time during leak testing.

Fill the restrained test section completely with the test liquid. Ensure there is no trapped air in the test section.

Gradually pressurize the test section to test pressure, and maintain test pressure for three (3) hours. During the initial expansion phase, polyethylene pipe will expand slightly. Additional test liquid will be required to maintain pressure. It is not necessary to monitor the amount of test liquid added during the initial expansion phase.

Immediately following the initial expansion phase, reduce test pressure by 10 psi, and stop adding test liquid. If test pressure remains steady (within 5% of target value) for one (1) hour, no leakage is indicated.

When test pressure is 150% of the system design pressure, the following procedure should be utilized immediately after the initial expansion phase. Monitor the amount of make-up liquid required to maintain test pressure for one (1), or two (2), or three (3) hours. If the amount of make-up liquid needed to maintain test pressure does not exceed the amounts are shown in the following table, no leakage is indicated.

At the conclusion of the test, carefully depressurize the test section by the controlled release of the test liquid.

MAKE-UP WATER ALLOWANCE FOR TEST PHASE
(U.S. GALLONS / 100 FEET OF PIPE)

Nominal Pipe Size (inches)	1-Hour Test	2-Hour Test	3-Hour Test
1 ¼	0.06	0.10	0.16
1 ½	0.07	0.10	0.17
2	0.07	0.11	0.19
3	0.10	0.15	0.25
4	0.13	0.25	0.40
5	0.21	0.41	0.62
6	0.30	0.60	0.90
7 ⅞	0.40	0.70	1.00
8	0.50	1.00	1.50
10	0.80	1.30	2.10
12	1.10	2.30	3.40
13 ⅜	1.20	2.50	3.70
14	1.40	2.80	4.20
16	1.70	3.30	5.00
18	2.00	4.30	6.50
20	2.80	5.50	8.00
22	3.50	7.00	10.50
24	4.50	8.90	13.30

Section 28.0 - Vacuum Testing of Manholes

Manholes shall be vacuum tested in accordance with the following procedure:

Install inflatable pipe plugs in pipe openings; inflate the pipe plugs to the manufacturer's recommendation. Securely brace the pipe plugs off the manhole walls. Place the vacuum plate either over or inside the casting frame depending the type of the vacuum plate. Connect the vacuum pump to the outlet port of the vacuum plate with the valve open. Draw a vacuum of ten inches (10") of mercury (Hg); close the outlet valve. Begin the vacuum test and maintain for two (2) minutes. If the vacuum drop is equal to or more than 1.0 inches the test shall be deemed a failure. The Contractor shall permanently repair the leak(s) by means acceptable to the Authority. Accumulations of water greater than one pint found in the manhole invert after the vacuum test will result in a test failure regardless of the vacuum pressure drop observed.

Accumulated water found in the manhole invert after the vacuum test likely entered through the pipe to manhole connections. These leaks shall be sealed by injecting a water activated hydrophilic foam sealant such as Avanti International V-202 multi-grout. Applications of water activated foam sealant will be performed until no infiltration is observed.

Section 29.0 - Inspection and Punch Listing of Work

All materials and workmanship shall be subject to inspection, examination, or test by the Authority or KLH Engineers, Inc. at any and all times during construction and at any and all places where such construction is carried on. The Authority or KLH Engineers, Inc. shall have the right to reject defective material and workmanship or require its correction. Unacceptable workmanship shall be satisfactorily corrected. Rejected material shall be promptly segregated and removed from the construction site and replaced with material of specified quality.

The Authority or KLH Engineers, Inc. and governmental agencies with jurisdictional interests will have access to the work at reasonable times for their observation, inspection and testing. The Contractor shall provide proper and safe conditions for such access.

29.1 Post Construction Internal Pipe Video

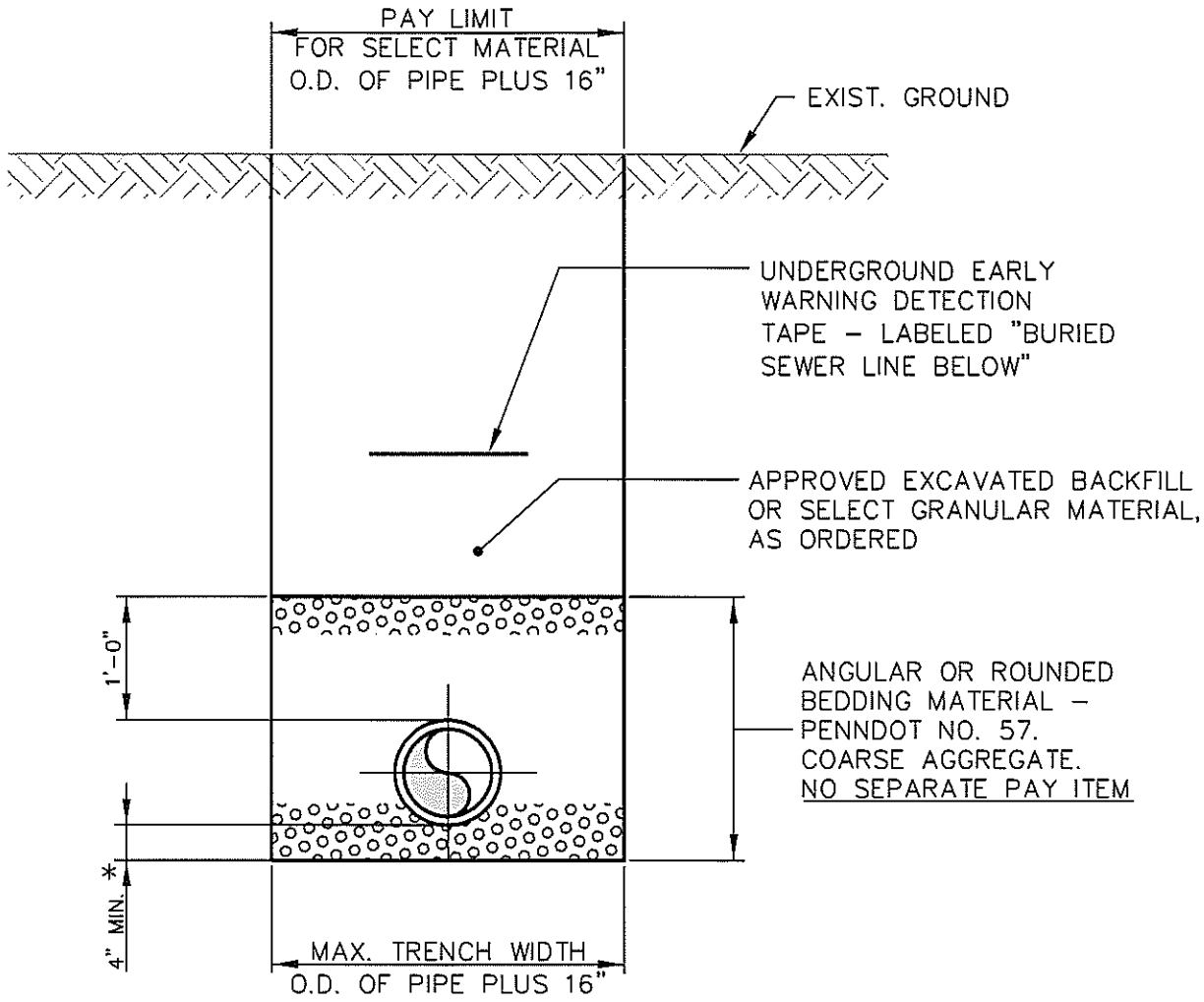
After construction of the Sanitary Sewer System is complete, a thorough cleaning/flushing of the sanitary sewer shall be performed after which an internal video inspection of the pipe will be performed by an established videographer who regularly engages in internal pipe video work with equipment that is manufactured for this application. The video will identify all manholes, as numerically designated on the Construction plans, the station of all service line connections as measured from the center line of the nearest downstream manhole, the position of wye, the direction of flow, the stations of sags or low points that hold standing water more than 3/8 of an inch deep and any other abnormality observed during the camera work. The videographer shall be required to provide two (2) identical DVDs and written reports to the Authority.

Section 30.0 - As-Built Drawings

At the completion of the project and prior to the final acceptance of any facilities by the Authority, accurate as-built drawings, including plans and profiles shall be provided to the Authority. As-built drawings shall be reproducible mylars AND an acceptable electronic file and shall include the field surveyed horizontal distances between the centerline of each successive manhole. All distances shall be recorded to the nearest one hundredth of a foot. Deflection angles between influent and effluent pipes at the manholes shall be shown to the nearest second. The size and type of the pipe for each section of the sewer line shall be clearly noted. The laying grade of the pipe section between each manhole shall be noted. The profiles shall include each manhole top, flow line-in and flow line-out elevation, the size and type of the pipe section between manholes, and the laying grade of the pipe section between manholes. All elevations shall be based on and tied to the United States Coast and Geodetic Survey Datum of 1929.

The as-built plans shall accurately demonstrate the location of all wyes and service connections including the length of extension from the wye and an invert elevation of the temporary end of the service line. The as-built stationing of all wyes shall be recorded on the plan and may be included in a summary table format which identifies the location (left or right) and the station of each wye, as measured from the centerline of the sanitary manhole located immediately downstream of the wye. The plans shall also include the stationing and perpendicular offset, indicating whether left or right, for the end of all

service lines. The size, type and depth at the end of each service line shall also be indicated. The relative location, depth and approximately clearance of other underground utilities and/or structures in close proximity of the sewer lines and manholes shall be included on the as-built drawing. The as-built drawings shall be submitted to the Authority. Any revisions or additional information, which may be required, shall be subsequently provided by the Contractor or the plan designer.

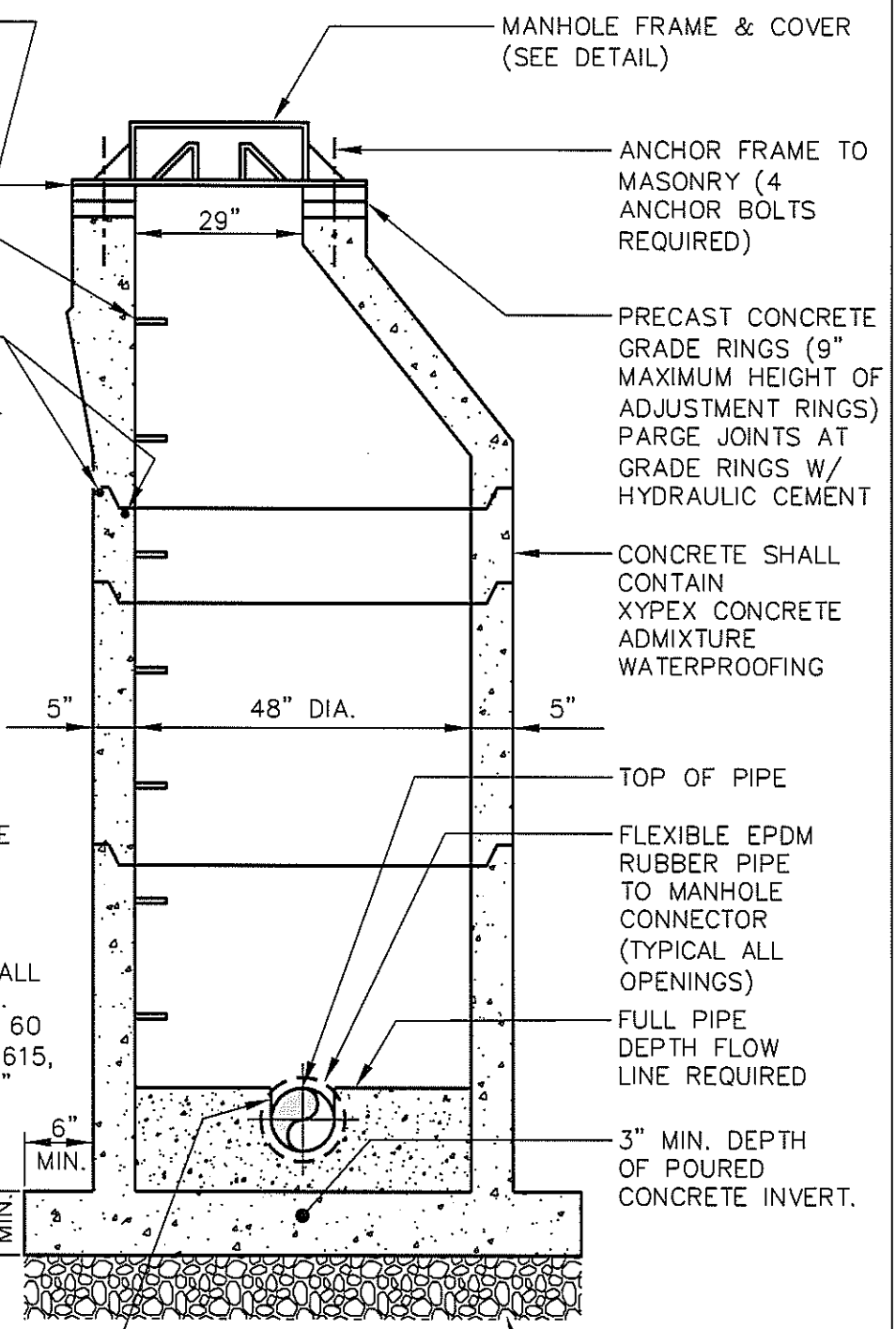


* 6" IN ROCK OR UNSUITABLE MATERIAL

SANITARY SEWER
STANDARD TRENCH EXCAVATION
DETAIL SECTION

NOTE
WHEN DUCTILE IRON PIPE IS INSTALLED, BEDDING AND BACKFILL SHALL CONSIST OF CLASS 'B' CRUSHED LIMESTONE FIRST CLASS BEDDING MATERIAL

KLH ENGINEERS, INC. **5173 Campbells Run Road** **Pittsburgh, PA 15205**	**FINDLAY TOWNSHIP MUNICIPAL AUTHORITY** **STANDARD TRENCH EXCAVATION SANITARY SEWER DETAIL**
Not to scale | **AUGUST 2016**	**Standard Detail SD-01**



NOTES:

1. INCREASE MANHOLE DIA. TO 5'-0" FOR PIPE SIZES 30" DIA. & LARGER.
2. MANHOLE COVERS TO BE STAMPED AS "FTMA SANITARY".
3. PRECAST CONCRETE MANHOLES TO CONFORM TO A.S.T.M. C-478
4. MANHOLE STEPS SHALL BE STEEL, ENCASED IN POLYPROPYLENE PLASTIC, STEPS SHALL MEET REQUIREMENTS, ASTM D4101-82. THE STEEL SHALL BE A DEFORMED 1/2" DIA. REINFORCING ROD, GRADE 60 CONFORMING TO ASTM A-615, STEPS SHALL BE 15 7/16" WIDE.
5. MANHOLE DEPTHS IN EXCESS OF 22.0 FEET REQUIRE A 5 FOOT I.D. MANHOLE WITH A SAFETY PLATFORM AT MID HEIGHT, SEE STD. DETAIL SD-13.

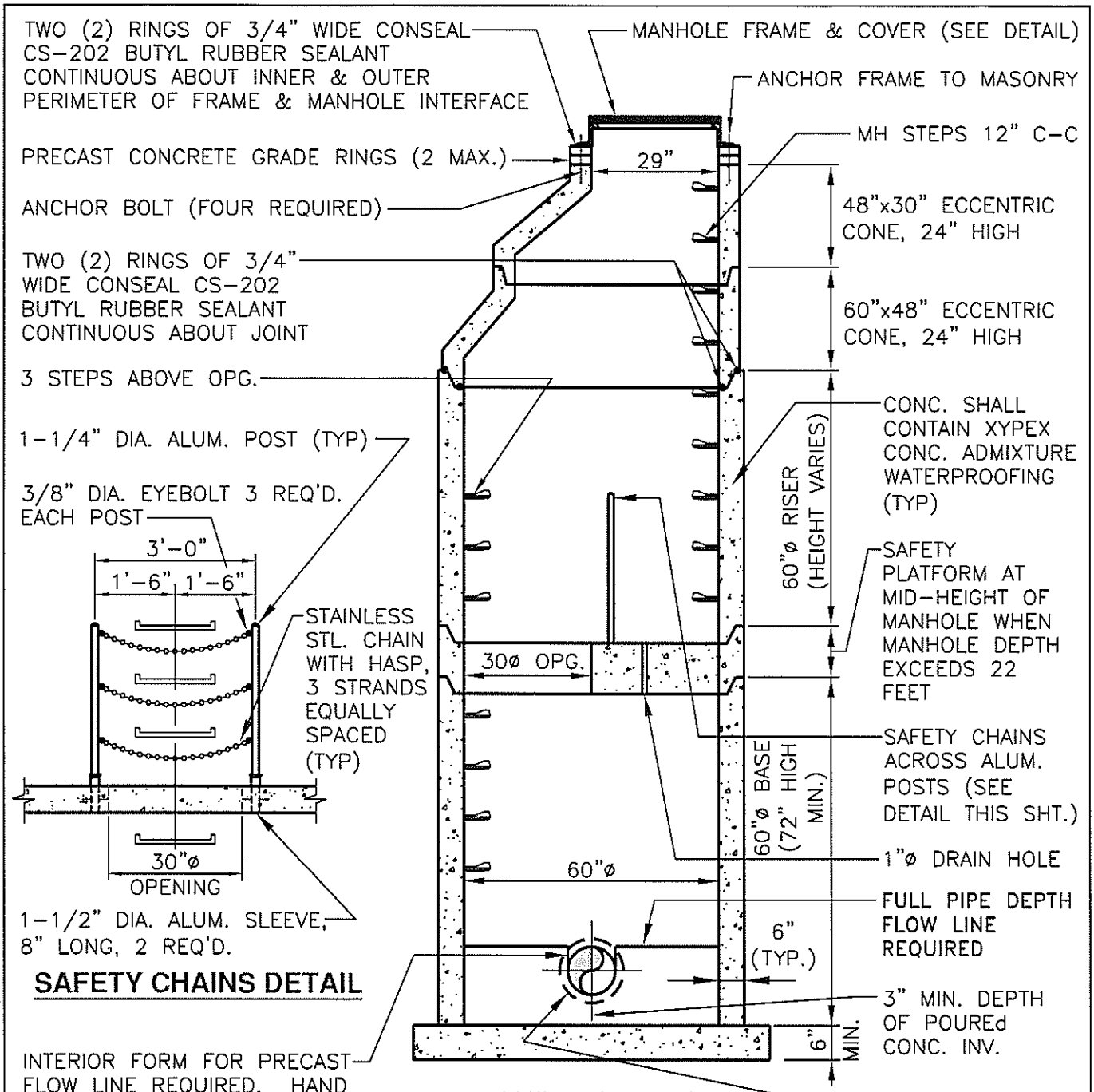
SANITARY SEWER 48" PRECAST MANHOLE DETAIL SECTION

KLH ENGINEERS, INC.
5173 Campbells Run Road
Pittsburgh, PA 15205

FINDLAY TOWNSHIP MUNICIPAL AUTHORITY

48" PRECAST MANHOLE

Not to scale	AUGUST 2016	Standard Detail SD-02



SAFETY CHAINS DETAIL

SANITARY SEWER 60" PRECAST MANHOLE DETAIL SECTIONS

NOTES:

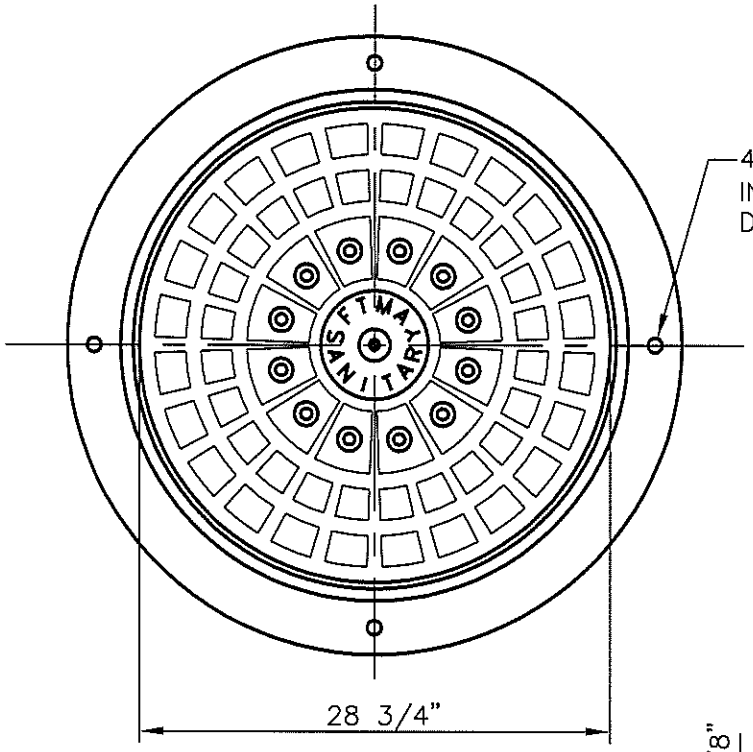
1. PRECAST CONCRETE MANHOLES TO CONFORM TO A.S.T.M. C-478.
2. MANHOLE STEPS SHALL BE STEEL, ENCASED IN POLYPROPYLENE PLASTIC, STEPS SHALL MEET REQUIREMENTS, ASTM D4101-82. THE STEEL SHALL BE A DEFORMED 1/2" DIA. REINFORCING ROD, GRADE 60 CONFORMING TO ASTM A-615, STEPS SHALL BE 15 7/16" WIDE.

KLH ENGINEERS, INC.
5173 Campbells Run Road
Pittsburgh, PA 15205

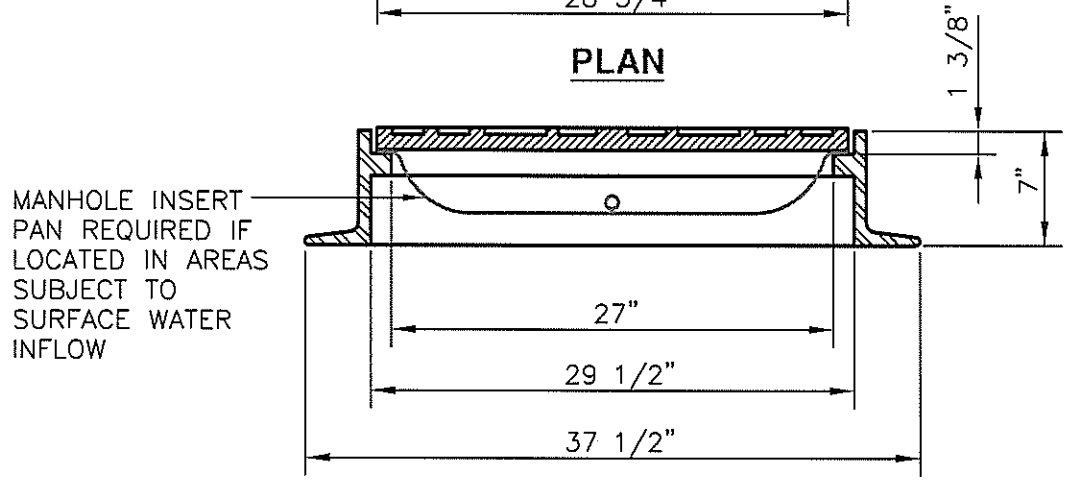
FINDLAY TOWNSHIP MUNICIPAL AUTHORITY

60" PRECAST MANHOLE

Not to scale	AUGUST 2016	Standard Detail SD-02A



PLAN



SECTION

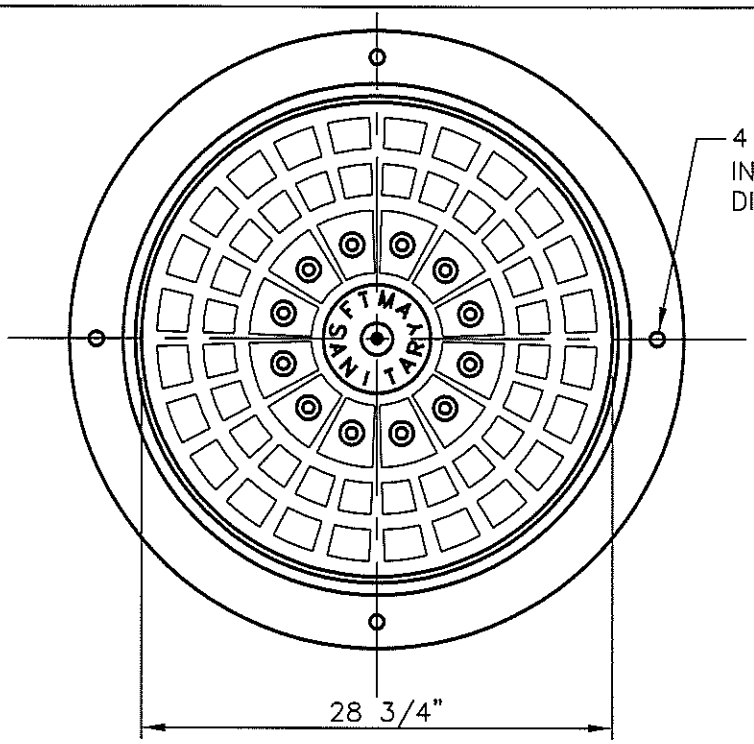
STANDARD MANHOLE FRAME AND COVER

NOTES:

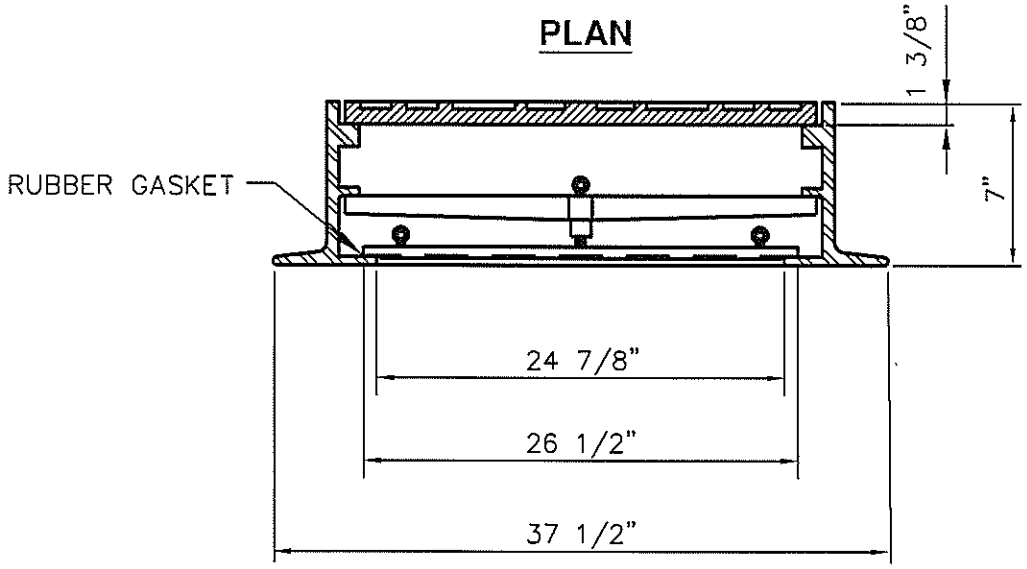
1. MANHOLE FRAME AND COVER SHALL BE EAST JORDAN IRON WORKS, FRAME NO. 1891Z, LID NO. 1890A1, NEENAH FOUNDRY R–1753–A, SYRACUSE PATTERN NO. 1045, OR APPROVED EQUAL. LID SHALL BE SOLID WITH NO VENT HOLES. LID SHALL BE FURNISHED W/ SELF–SEALING RUBBER GASKET.

2. COVER SHALL BE STAMPED AS SHOWN IN PLAN VIEW.

KLH ENGINEERS, INC. 5173 Campbells Run Road Pittsburgh, PA 15205		FINDLAY TOWNSHIP MUNICIPAL AUTHORITY STANDARD MANHOLE FRAME AND COVER
Not to scale	AUGUST 2016	Standard Detail SD-03



PLAN



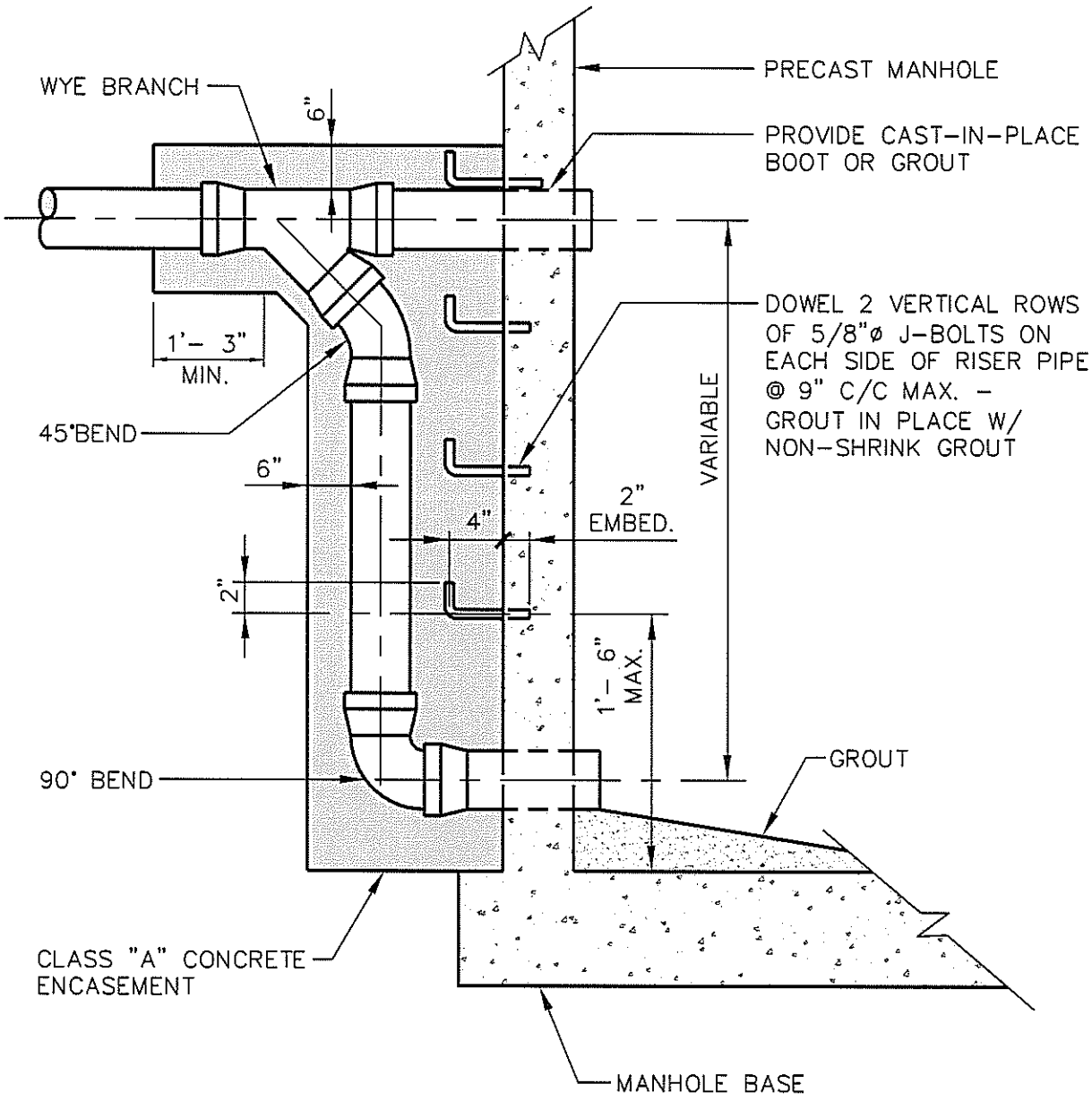
SECTION

WATER TIGHT MANHOLE FRAME AND COVER

NOTES:

1. MANHOLE FRAME AND COVER SHALL BE NEENAH FOUNDRY R-1755-F2 OR EAST JORDAN IRON WORKS V-2150-3
2. COVER SHALL BE STAMPED AS SHOWN IN PLAN VIEW.

KLH ENGINEERS, INC. **5173 Campbells Run Road** **Pittsburgh, PA 15205**	**FINDLAY TOWNSHIP MUNICIPAL AUTHORITY** **WATER TIGHT MANHOLE FRAME AND COVER**
Not to scale / **AUGUST 2016**	**Standard Detail SD-04**

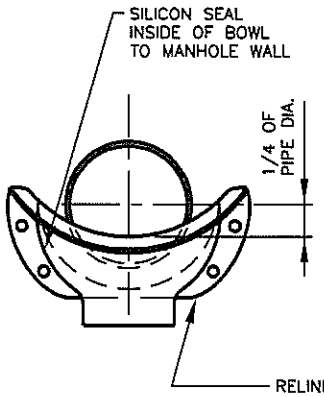


OUTSIDE DROP MANHOLE CONNECTION DETAIL SECTION

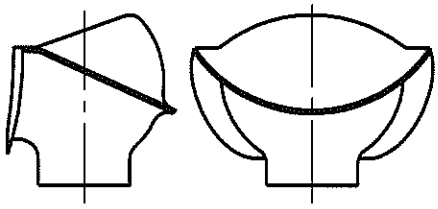
NOTE:

PIPE MATERIAL & SIZE SHALL BE EQUAL TO THAT OF THE MAIN LINE SEWER.

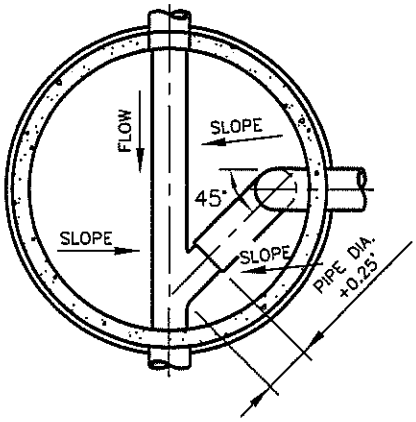
KLH ENGINEERS, INC. **5173 Campbells Run Road** **Pittsburgh, PA 15205**		**FINDLAY TOWNSHIP MUNICIPAL AUTHORITY** **OUTSIDE DROP MANHOLE CONNECTION DETAIL**
Not to scale	**AUGUST 2016**	**Standard Detail SD-05**



DROP BOWL MOUNTING POSITION



FORCE LINE HOOD



INSIDE DROP PLAN

NOTES:

1. ALL INSIDE DROP CONNECTIONS FOR SERVICES AND COLLECTOR SEWERS SHALL USE THE DROP BOWL AS PRODUCED BY:
   RELINER-DURAN, INC.
   53 MT. ARCHER RD,
   LYME, CT 06371
   (860)434-0277 FAX: (860)434-3195 OR EQUAL.

2. DROP BOWL MODEL "A-4" SHALL BE USED FOR ALL LINES UP THROUGH FULL 6" INLETS. DROP BOWL MODEL "A-6" SHALL BE USED FOR ALL 8" INLETS. DROP BOWLS MODEL "B-8" SHALL BE USED FOR ALL 10" INLETS. LINES LARGER THAN 10 SHALL BE AS DIRECTED BY THE DIRECTOR.

3. THE FORCE LINE HOOD SHALL BE ATTACHED ON MODELS "A-4" & "A-6" WHEN THE INCOMING LINE IS FROM A FORCE MAIN OR THE SLOPE IS S=0.03 OR GREATER.

   SECURE DROP PIPE TO MANHOLE WALL WITH RELINER-DURAN, INC STAINLESS STEEL ADJUSTABLE CLAMPING BRACKETS OR EQUAL (SEE DETAIL 7-3A).

   ATTACH THE DROP BOWL & EACH CLAMPING BRACKET TO THE MANHOLE WALL WITH 3/8" X 3 3/4" RAMSET/RED HEAD BOLTS HELD INPLACE WITH 2 STAGE EPOXY PASTE. EPOXY SHALL MEET THE FOLLOWING REQUIREMENTS:

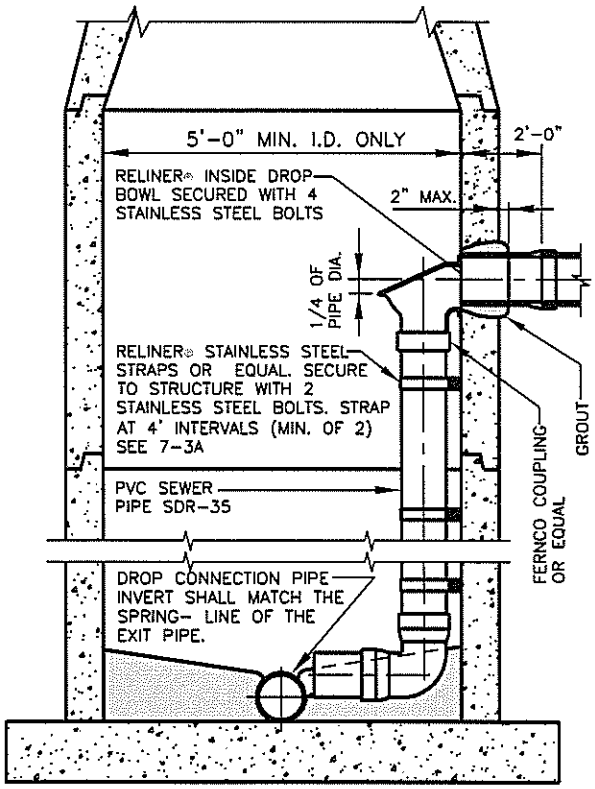
   EPOXY PASTE SHALL BE A TWO COMPONENT, 100% SOLID SYSTEM. EPOXY SHALL BE SIKADUR 31 HI-MOD GEL BY SIKA CORPORATION (PHONE 592/941-0231) OR EQUAL.

   THE EPOXY PASTE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI IN 28 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM D695 AT 73 DEGREES.

   THE EPOXY PASTE SHALL DEVELOP A MINIMUM TENSILE STRENGTH OF 3,000 PSI IN 14 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM D638.

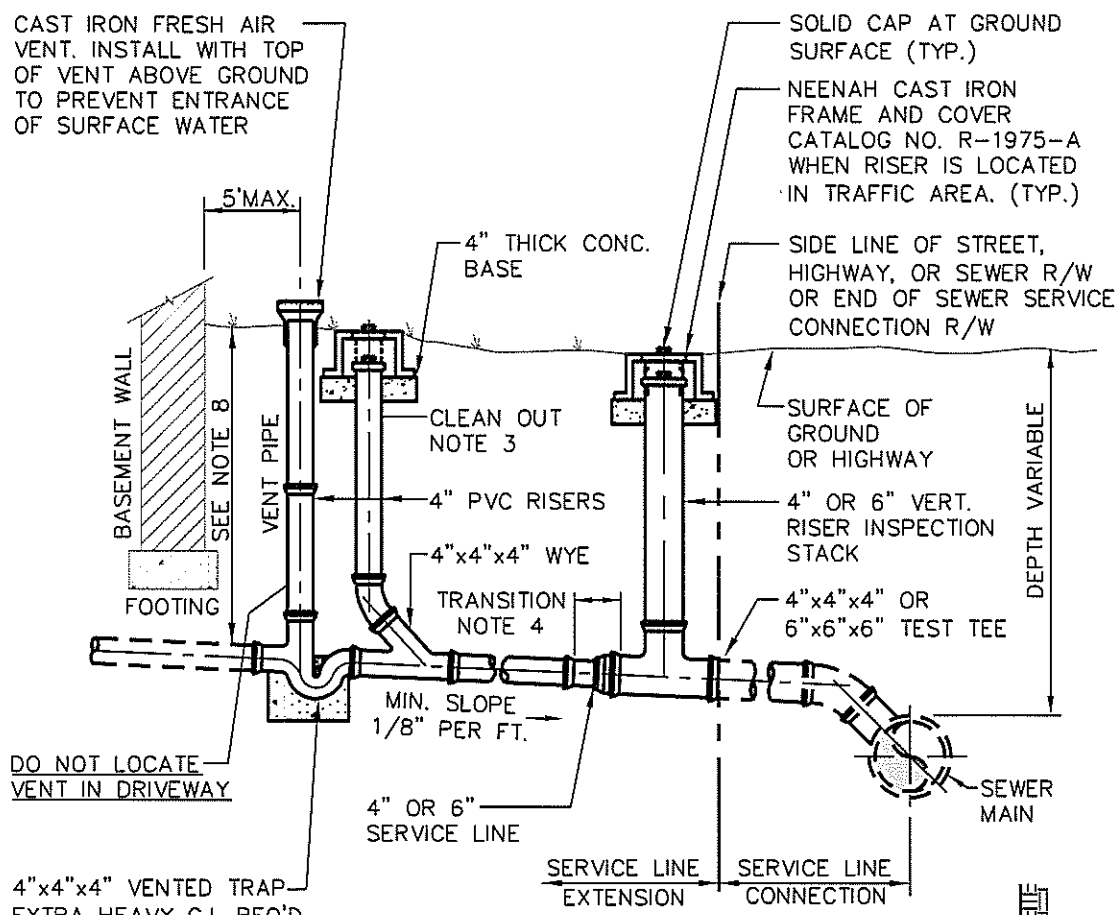
   THE EPOXY PASTE SHALL DEVELOP A MINIMUM BOND STRENGTH OF 2,000 PSI IN 2 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM C882 (HARDENED CONCRETE TO HARDENED CONCRETE).

   MANUFACTURER'S INSTRUCTIONS SHALL BE PRINTED ON EACH CONTAINER IN WHICH THE MATERIALS ARE PACKAGED.

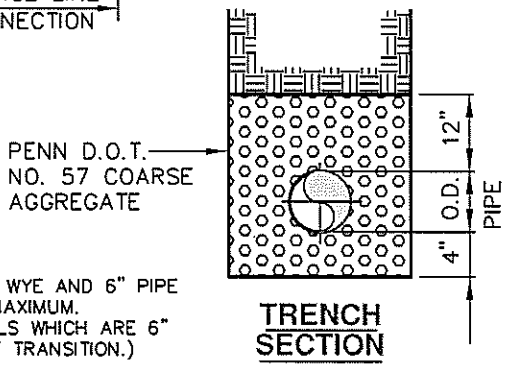


INSIDE DROP CONNECTION (USE MUST BE APPROVED)

KLH ENGINEERS, INC. 5173 Campbells Run Road Pittsburgh, PA 15205	FINDLAY TOWNSHIP MUNICIPAL AUTHORITY
	INSIDE DROP MANHOLE CONNECTOR
Not to scale — AUGUST 2016	Standard Detail SD-05A



SANITARY SEWER LATERAL CONNECTION (EXTERIOR TRAP)



TRENCH SECTION

NOTES:

1. THE ENTIRE INSTALLATION MUST BE INSPECTED AND APPROVED BY THE FTMA REPRESENTATIVE AND THE ALLEGHENY COUNTY COUNTY HEALTH DEPT.
2. ALL MATERIALS MUST BE INSTALLED IN ACCORDANCE WITH THE ALLEGHENY COUNTY PLUMBING CODE AND IN ACCORDANCE WITH THE FTMA RULES AND REGULATIONS.
3. BEFORE WORK IS STARTED A PLAN MUST BE FILED WITH THE ALLEGHENY COUNTY HEALTH DEPT. PLUMBING DIVISION AND AN APPLICATION MUST BE FILED WITH FTMA
4. CLEAN OUTS SHALL BE INSTALLED AT 50' MAXIMUM INTERVALS FOR 4" LINES OR 100' MAXIMUM INTERVALS FOR 6" LINES AND AT CHANGES OF DIRECTION GREATER THAN 45°.
5. TRANSITION BETWEEN 4" WYE AND 6" PIPE MUST BE MADE IN 18" MAXIMUM. (APPLICABLE TO LATERALS WHICH ARE 6" IN SIZE DOWNSTREAM OF TRANSITION.)
6. VERTICAL RISER INSTALLED AS REQUIRED BY THE FTMA RULES AND REGULATIONS.
7. ALL PIPING AND FITTINGS SHALL BE SDR 35 PVC, SCH. 40 PVC OR SCH. 40 ABS.
8. THIS DETAIL IS APPLICABLE TO NEW BUILDING CONSTRUCTION WHERE LATERAL IS LESS THAN 6' DEPTH AND CONNECTIONS TO ALL EXISTING BUILDINGS.
9. ANY LINES INSTALLED IMPROPERLY OR COVERED WITHOUT INSPECTION MUST BE REMOVED OR UNCOVERED AT THE PROPERTY OWNER'S EXPENSE.

KLH ENGINEERS, INC. 5173 Campbells Run Road Pittsburgh, PA 15205	FINDLAY TOWNSHIP MUNICIPAL AUTHORITY SANITARY SEWER LATERAL CONNECTION (EXTERIOR TRAP)	
Not to scale	AUGUST 2016	Standard Detail SD-06

KLH ENGINEERS, INC.
5173 Campbells Run Road
Pittsburgh, PA 15205

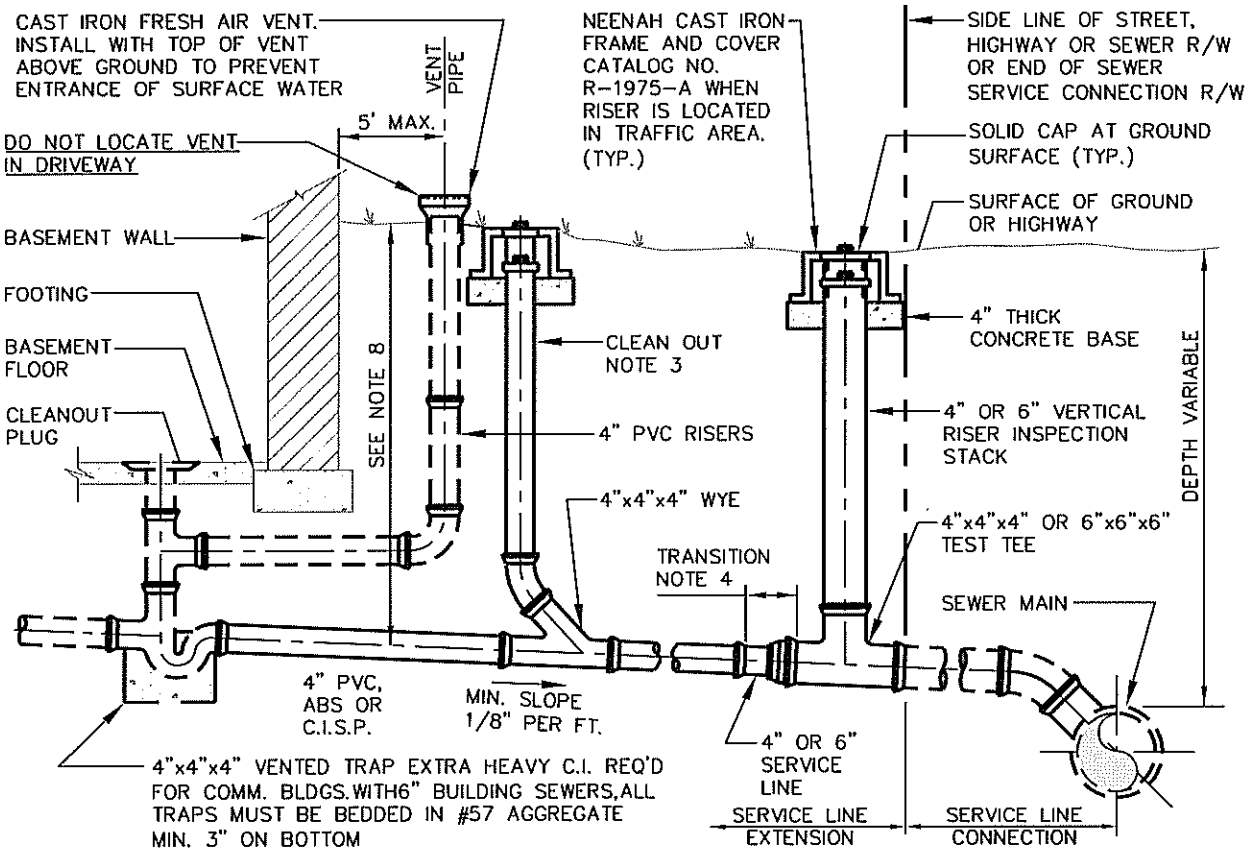
Not to scale

AUGUST 2016

Standard Detail SD-06A

FINDLAY TOWNSHIP MUNICIPAL AUTHORITY

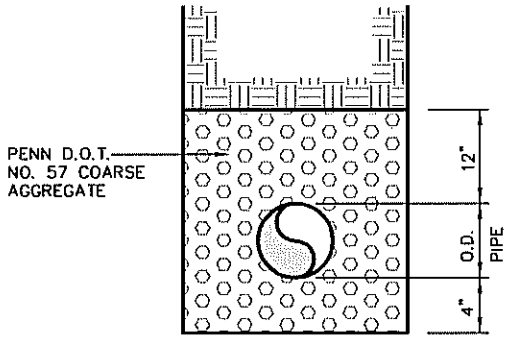
SANITARY SEWER LATERAL CONNECTION (INTERIOR TRAP)



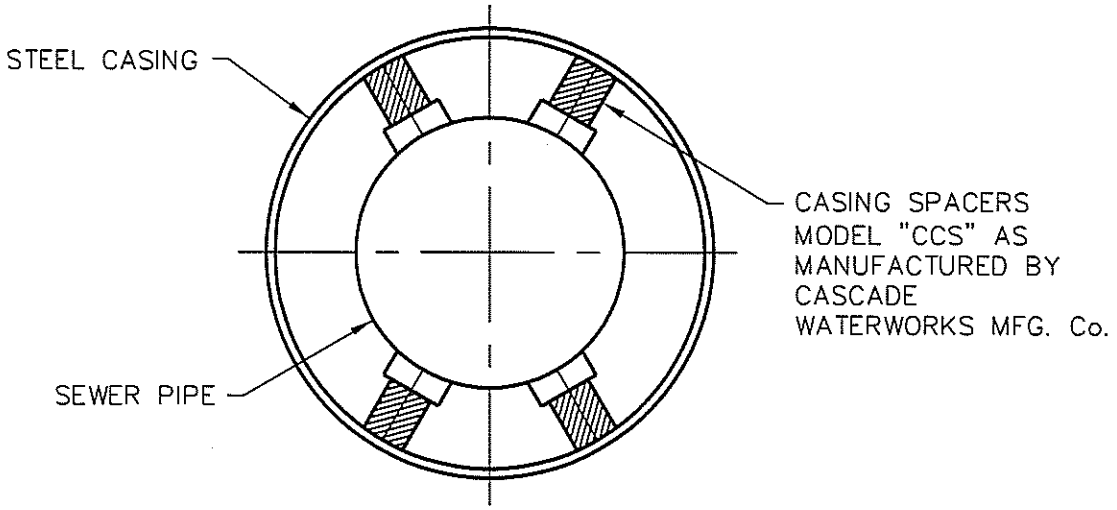
SANITARY SEWERLATERAL CONNECTION (INTERIOR TRAP)

NOTES:

1. THE ENTIRE INSTALLATION MUST BE INSPECTED AND APPROVED BY THE FTMA REPRESENTATIVE AND THE ALLEGHENY COUNTY COUNTY HEALTH DEPT.
2. ALL MATERIALS MUST BE INSTALLED IN ACCORDANCE WITH THE ALLEGHENY COUNTY PLUMBING CODE AND IN ACCORDANCE WITH THE FTMA RULES AND REGULATIONS
3. BEFORE WORK IS STARTED A PLAN MUST BE FILED WITH THE ALLEGHENY COUNTY HEALTH DEPT. PLUMBING DIVISION AND AN APPLICATION MUST BE FILED WITH FTMA
4. CLEAN OUTS SHALL BE INSTALLED AT 50' MAXIMUM INTERVALS FOR 4" LINES OR 100' MAXIMUM INTERVALS FOR 6" LINES AND AT CHANGES OF DIRECTION GREATER THAN 45°.
5. TRANSITION BETWEEN 4" WYE AND 6" PIPE MUST BE MADE IN 18" MAXIMUM. (APPLICABLE TO LATERALS WHICH ARE 6" IN SIZE DOWNSTREAM OF TRANSITION.)
6. VERTICAL RISER INSTALLED AS REQUIRED BY THE FTMA RULES AND REGULATIONS.
7. ALL PIPING AND FITTINGS SHALL BE SDR 35 PVC, SCH. 40 PVC OR SCH. 40 ABS.
8. THIS DETAIL IS APPLICABLE TO NEW BUILDING CONSTRUCTION WHERE THE LATERAL IS GREATER THAN 6' DEPTH.
9. ANY LINES INSTALLED IMPROPERLY OR COVERED WITHOUT INSPECTION MUST BE REMOVED OR UNCOVERED AT THE PROPERTY OWNER'S EXPENSE.

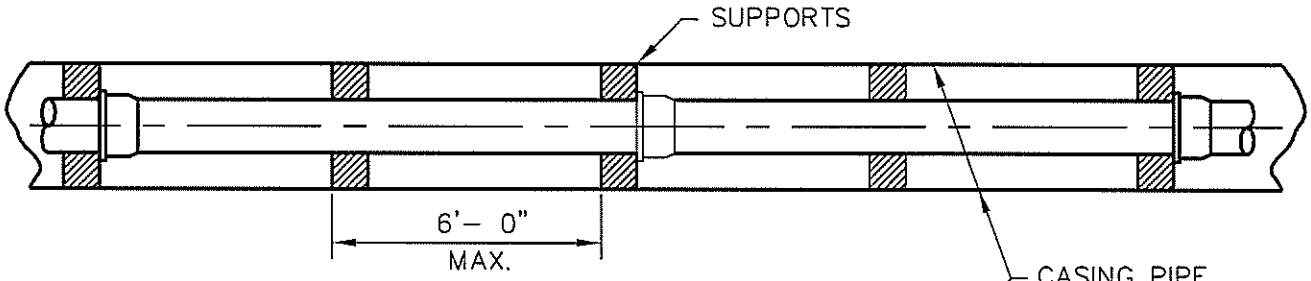


TRENCH SECTION

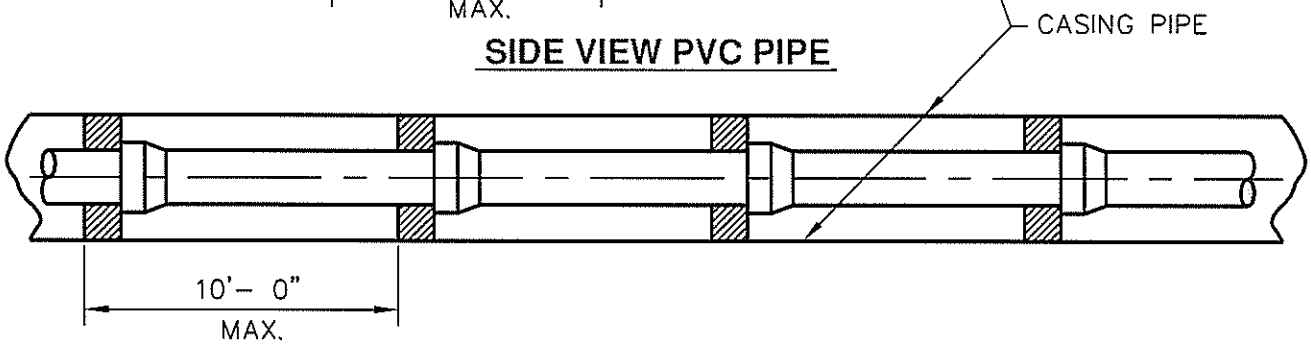


END VIEW

SEWER SIZE	6"	8"	10"	12"	15"	18"	21"	24"	27"	30"	42"
CASING SIZE	14"	16"	18"	20"	24"	28"	30"	34"	38"	42"	52"



SIDE VIEW PVC PIPE

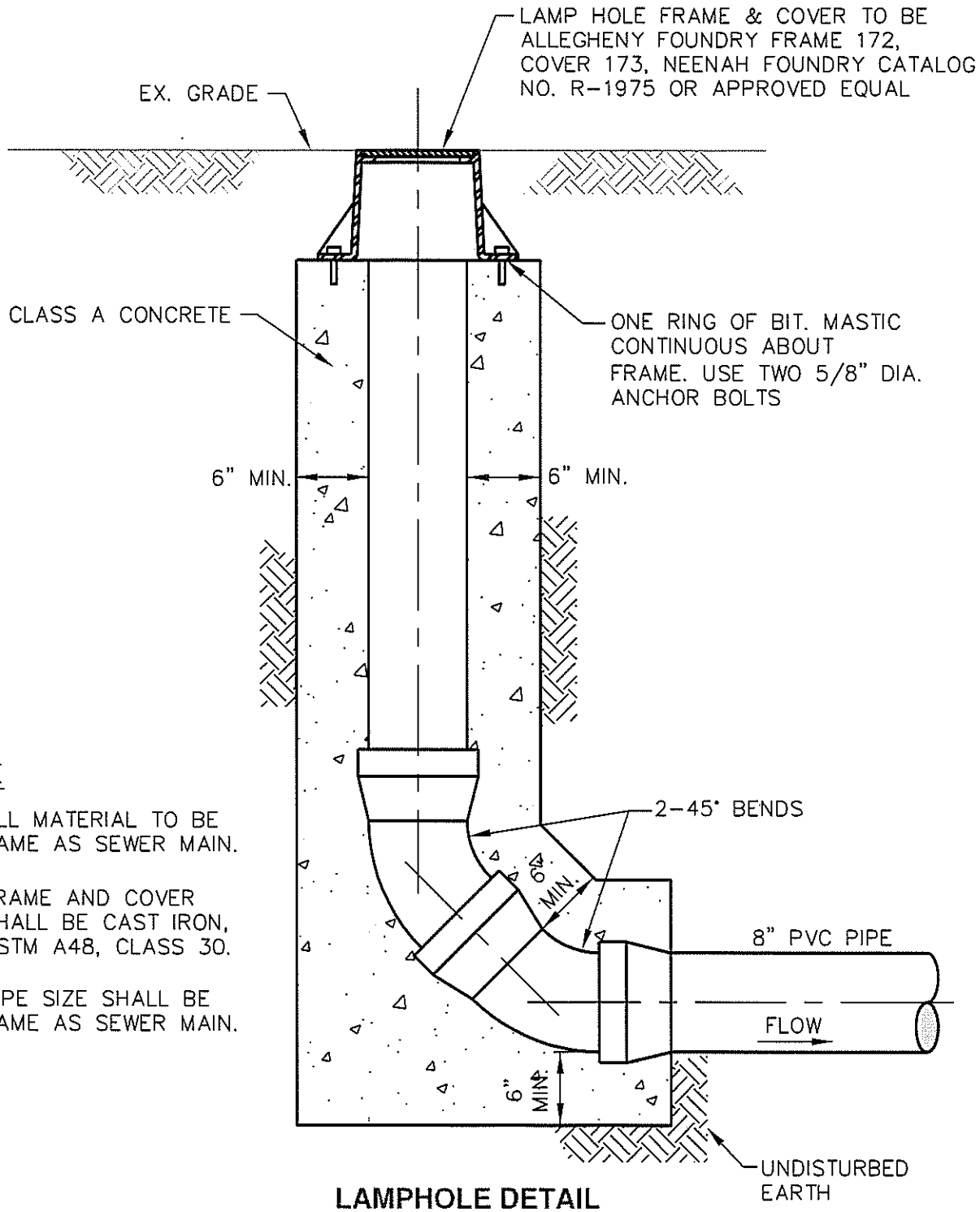


SIDE VIEW DUCTILE IRON PIPE

NOTE:

BOTH ENDS OF CASING SHALL BE CAPPED WITH CASCADE MODEL "CCES" END SEALS

KLH ENGINEERS, INC. 5173 Campbells Run Road Pittsburgh, PA 15205		FINDLAY TOWNSHIP MUNICIPAL AUTHORITY SEWER CASING AND SUPPORT DETAIL
Not to scale	AUGUST 2016	Standard Detail SD-07

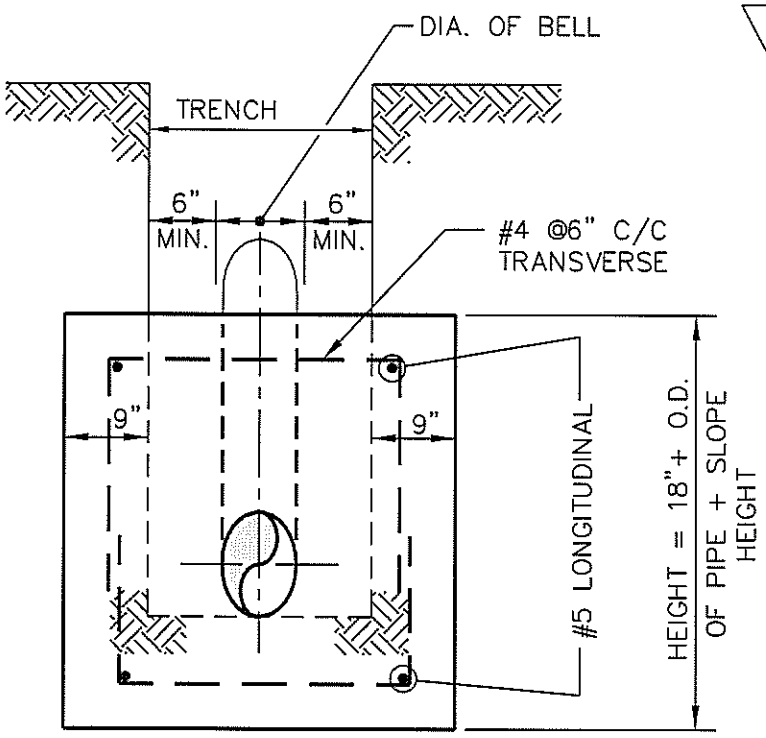


NOTE

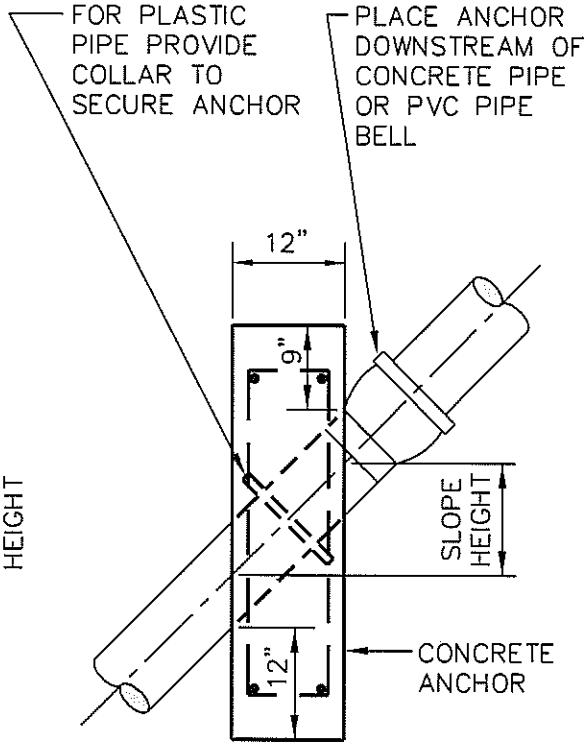
1. ALL MATERIAL TO BE SAME AS SEWER MAIN.
2. FRAME AND COVER SHALL BE CAST IRON, ASTM A48, CLASS 30.
3. PIPE SIZE SHALL BE SAME AS SEWER MAIN.

LAMPHOLE DETAIL SECTION

KLH ENGINEERS, INC. **5173 Campbells Run Road** **Pittsburgh, PA 15205**		**FINDLAY TOWNSHIP MUNICIPAL AUTHORITY** **LAMPHOLE DETAIL**
Not to scale	**AUGUST 2016**	**Standard Detail SD-08**



END VIEW



SIDE VIEW

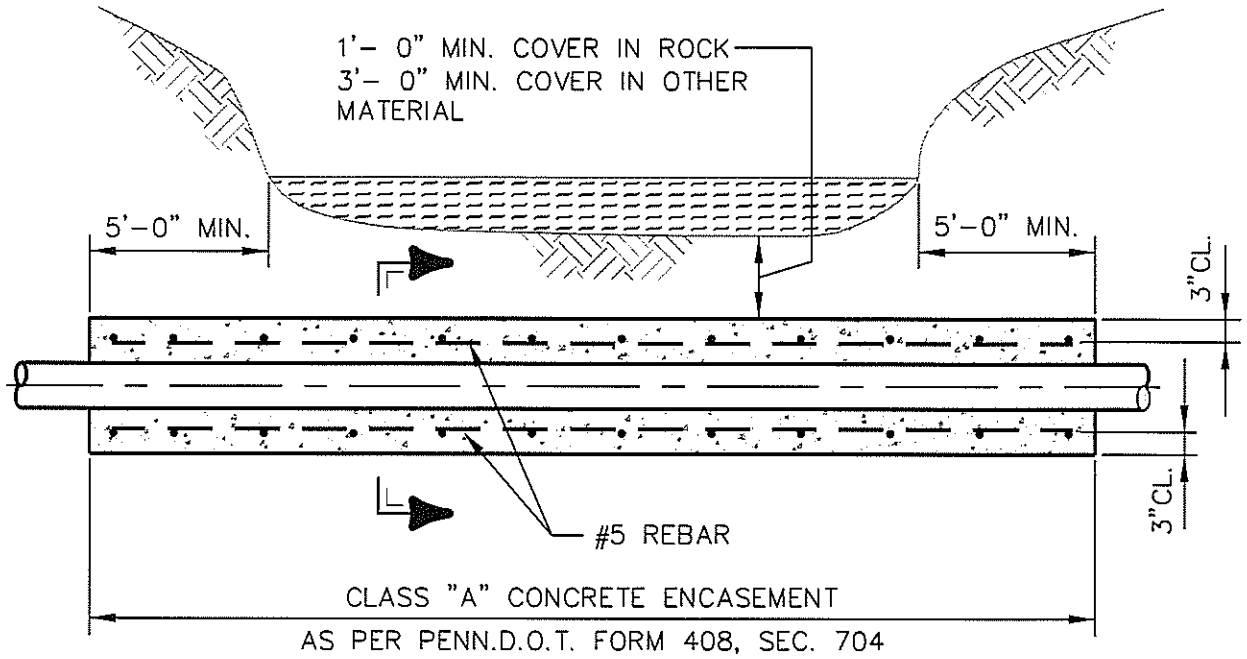
CONCRETE PIPE ANCHOR DETAIL

NOTES:

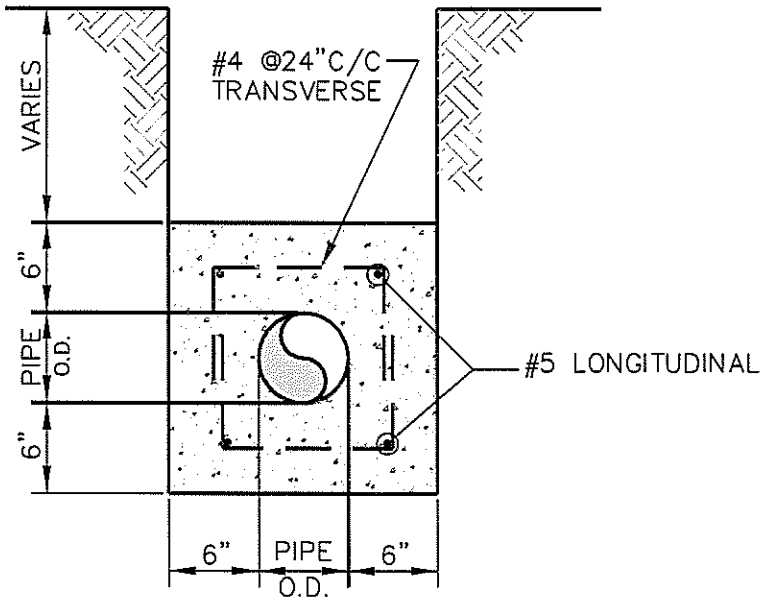
1. ANCHORS TO BE SPACED AS SPECIFIED.
2. ALL CONCRETE TO BE CLASS "A" IF CONCRETE IS NOT FORMED, CONCRETE DIMENSIONS SHALL BE MINIMUM.

PIPE ANCHOR SPACING	
SLOPE	C–C SPACING
20% – 35%	36'– 0" MAX.
35% – 50%	24'– 0" MAX.
50% – >	16'– 0" MAX.

KLH ENGINEERS, INC. 5173 Campbells Run Road Pittsburgh, PA 15205		FINDLAY TOWNSHIP MUNICIPAL AUTHORITY
		CONCRETE PIPE ANCHOR DETAIL
Not to scale	AUGUST 2016	Standard Detail SD-09



SANITARY SEWER CONCRETE ENCASEMENT DETAIL

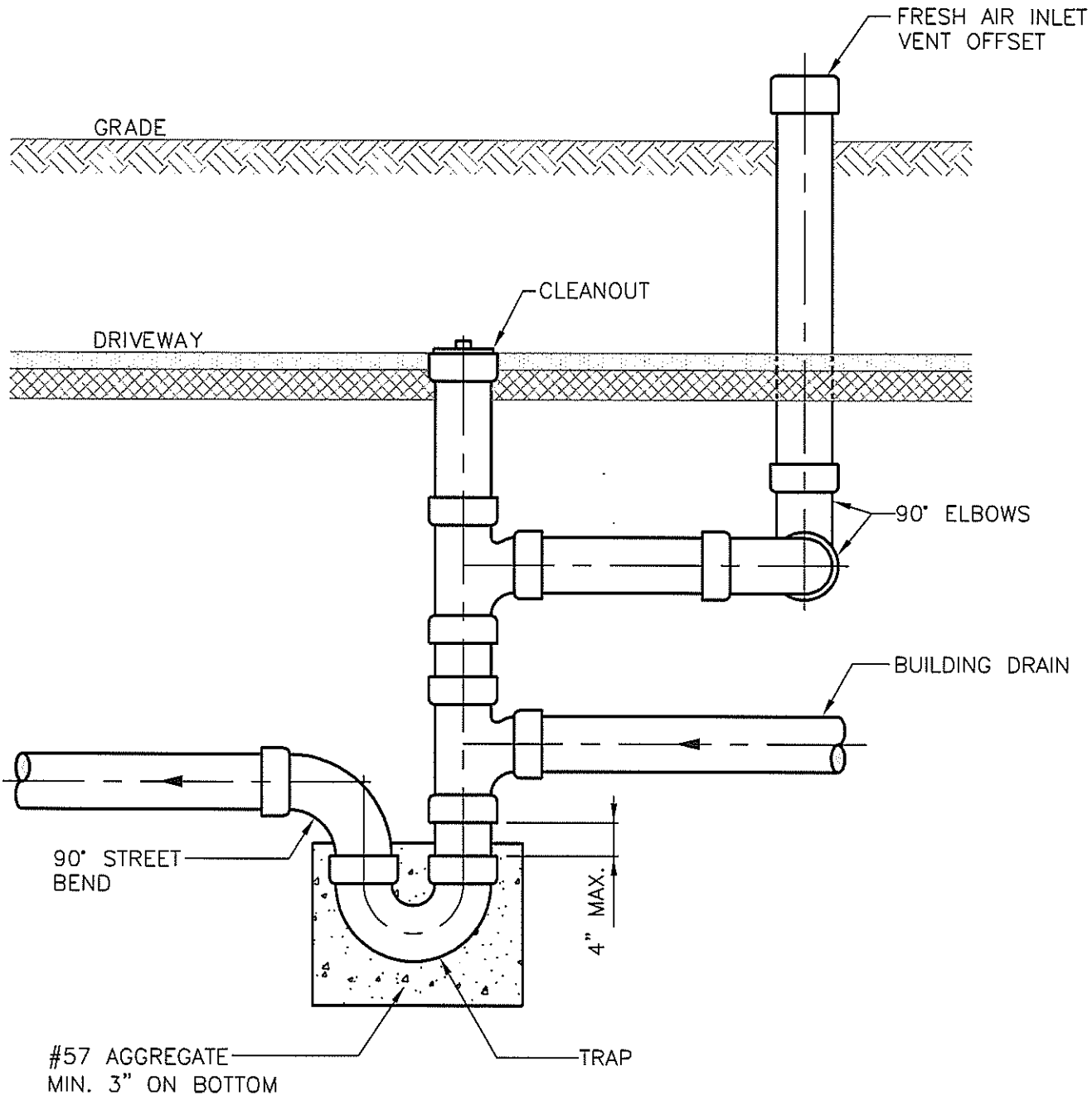


SECTION

PIPE SIZE	PAYMENT QUANTITY (C.F./L.F)
6"	2.1
8"	2.5
10"	2.9
12"	3.3
15"	3.8
18"	4.6
21"	5.4

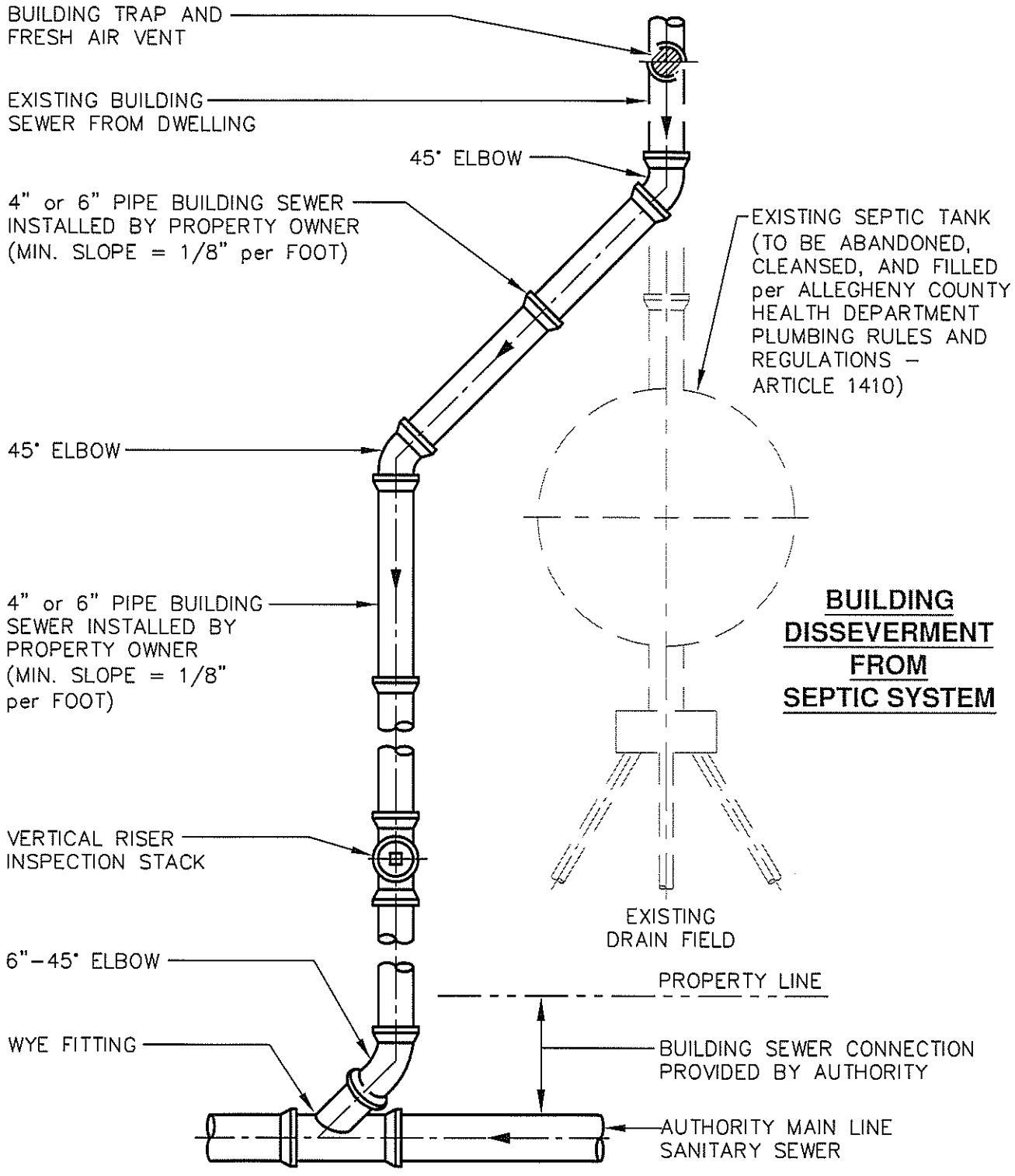
NOTE:
PAYMENT FOR CONCRETE ENCASEMENT SHALL BE IN ACCORDANCE WITH SCHEDULE SHOWN. ADDITIONAL CONCRETE USED WILL BE AT THE CONTRACTOR'S EXPENSE.

KLH ENGINEERS, INC. 5173 Campbells Run Road Pittsburgh, PA 15205		FINDLAY TOWNSHIP MUNICIPAL AUTHORITY CONCRETE ENCASEMENT DETAIL
Not to scale	AUGUST 2016	Standard Detail SD-10

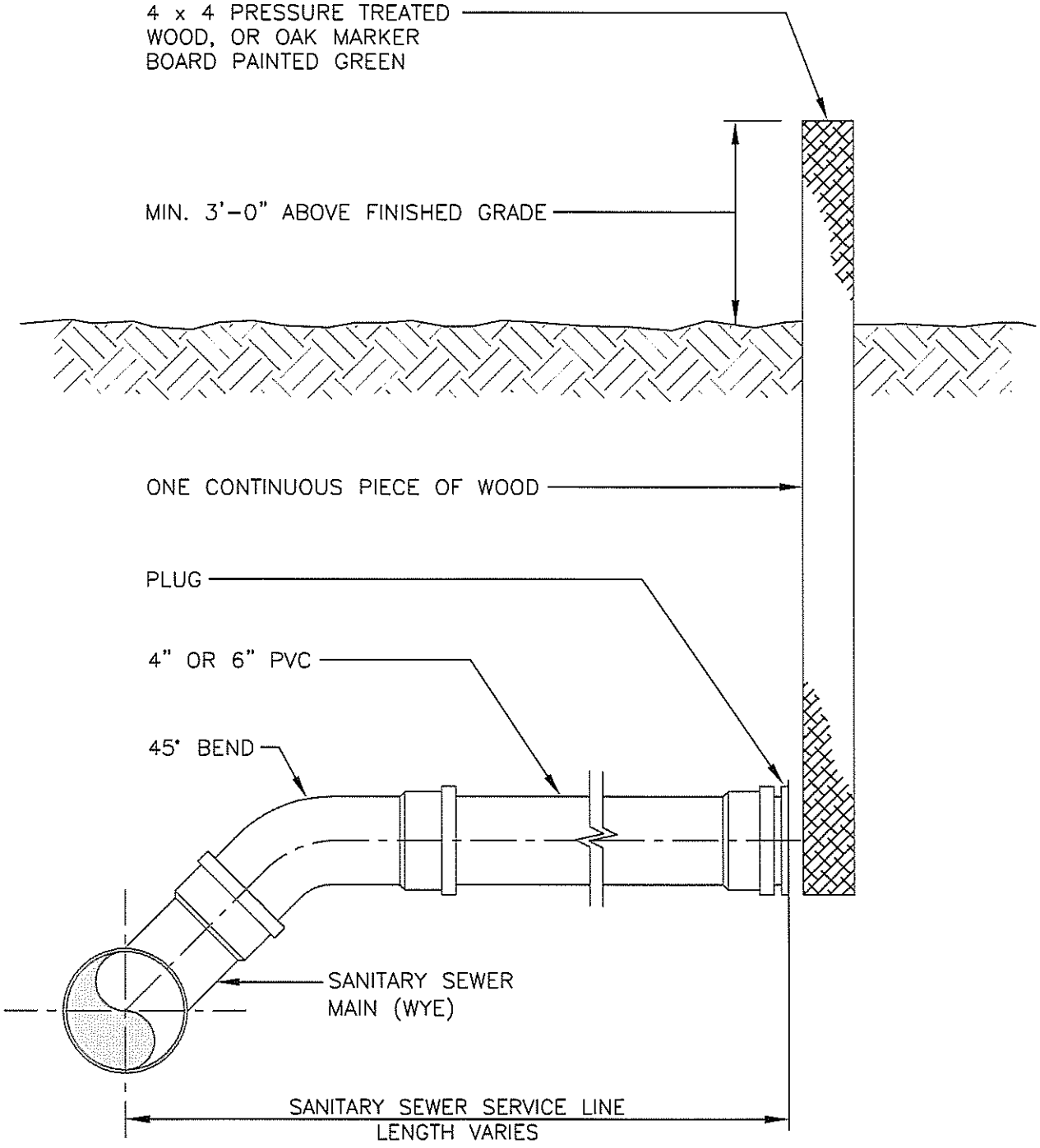


FRESH AIR VENT ON ELEVATED GRADE AT DRIVEWAY

KLH ENGINEERS, INC. **5173 Campbells Run Road** **Pittsburgh, PA 15205**	**FINDLAY TOWNSHIP MUNICIPAL AUTHORITY** **FRESH AIR VENT ON ELEVATED GRADE AT DRIVEWAY**
Not to scale / **AUGUST 2016**	**Standard Detail SD-11**

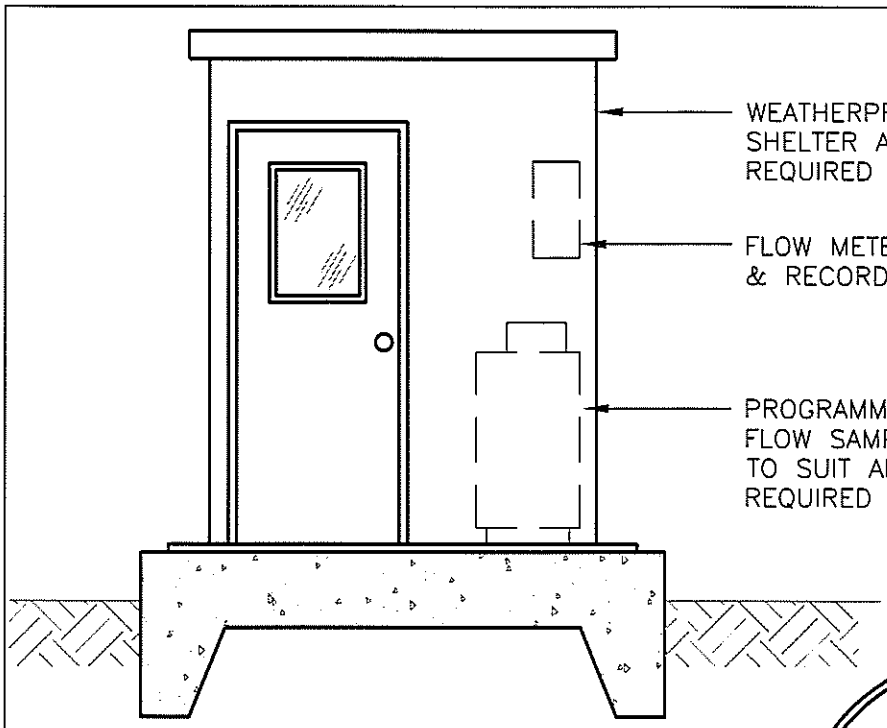


KLH ENGINEERS, INC. **5173 Campbells Run Road** **Pittsburgh, PA 15205**	**FINDLAY TOWNSHIP WATER AUTHORITY** **BUILDING DISSEVERMENT FROM SEPTIC SYSTEM**
Not to scale | **AUGUST 2016**	**Standard Detail SD-12**

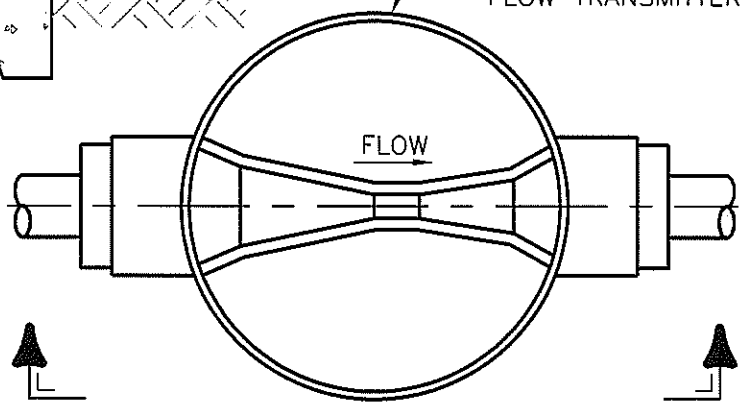


SANITARY SEWER SERVICE LINE MARKER BOARD

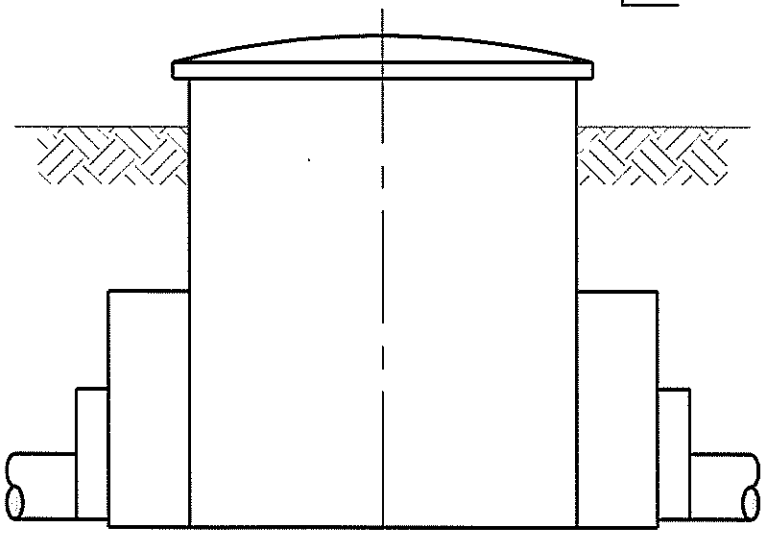
KLH ENGINEERS, INC. **5173 Campbells Run Road** **Pittsburgh, PA 15205**		**FINDLAY TOWNSHIP MUNICIPAL AUTHORITY** **SANITARY SEWER SERVICE LINE MARKER BOARD**
Not to scale	**AUGUST 2016**	**Standard Detail SD-13**



SHELTER ELEVATION



FLOW METERING MANHOLE PLAN



FLOW METERING MANHOLE SECTION

KLH ENGINEERS, INC. 5173 Campbells Run Road Pittsburgh, PA 15205		FINDLAY TOWNSHIP MUNICIPAL AUTHORITY FLOW METERING MANHOLE
Not to scale	AUGUST 2016	Standard Detail SD-14

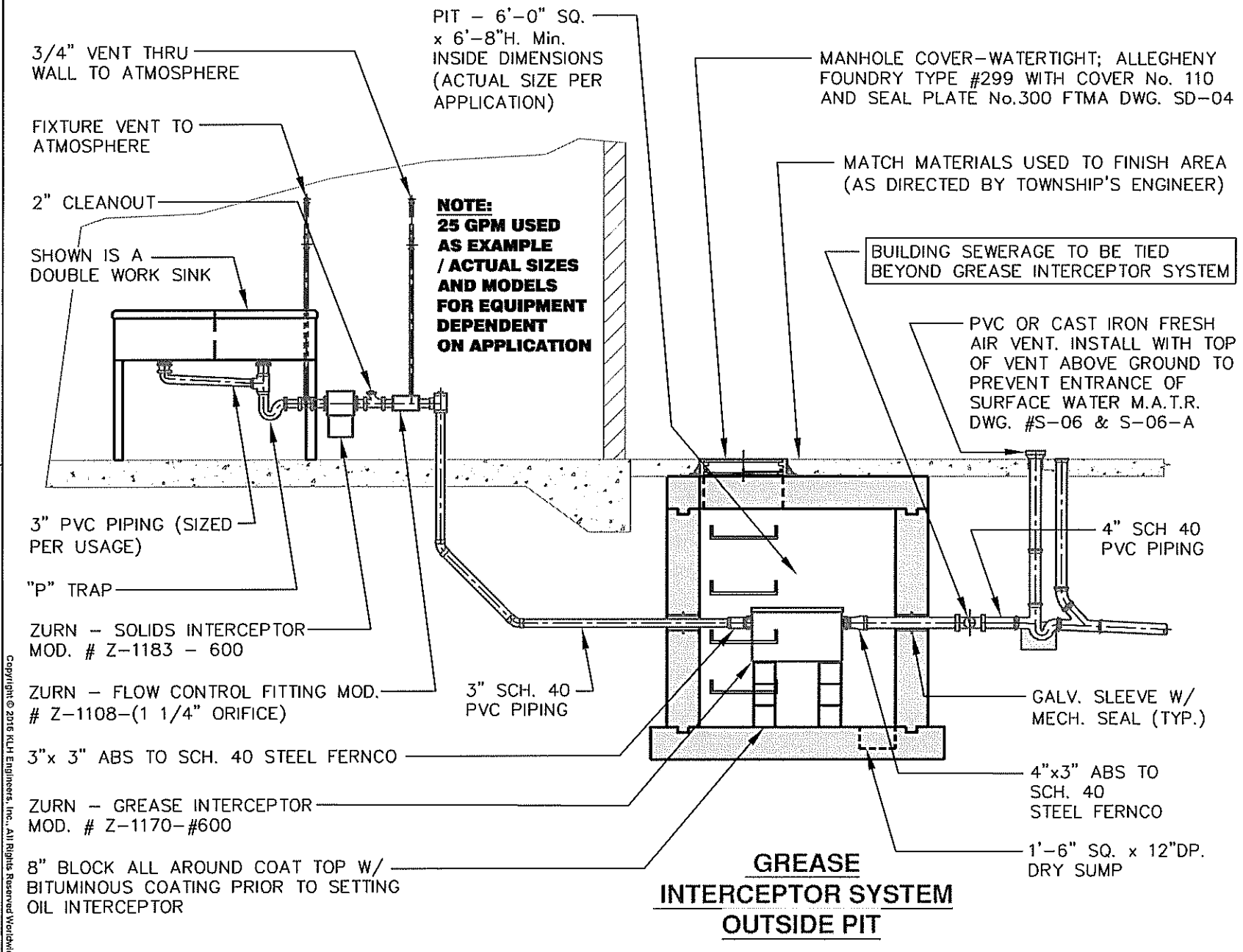
Not to scale

AUGUST 2016

Standard Detail SD-15

KLH ENGINEERS, INC.
5173 Campbells Run Road
Pittsburgh, PA 15205

FINDLAY TOWNSHIP
MUNICIPAL AUTHORITY
GREASE INTERCEPTOR SYSTEM
(OUTSIDE PIT)



GREASE INTERCEPTOR SYSTEM OUTSIDE PIT