

**FINDLAY TOWNSHIP
MUNICIPAL AUTHORITY**

Short Form Specification

Sanitary Sewer Construction

NIRA File No. 30-21-94

THESE SHORT FORM SPECIFICATIONS ARE NOT INTENDED TO INCLUDE ALL
NECESSARY REQUIREMENTS FOR YOUR PROJECT

THE FINDLAY TOWNSHIP MUNICIPAL AUTHORITY
SHORT FORM SPECIFICATION
FOR SANITARY SEWER CONSTRUCTION
(Revised September 2012)

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THE FINDLAY TOWNSHIP MUNICIPAL AUTHORITY

SHORT FORM SPECIFICATION

FOR SANITARY SEWER CONSTRUCTION

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 its Authorized Representatives regarding specific problems or unusual circumstances which may arise in the planning, design or construction of such facilities.

2.0 GENERAL

Pipes and joints for the various types of sewer lines 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 the Authority's Authorized Representative. 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.

3.0 QUALITY ASSURANCE (SUBMITTALS AND SHOP DRAWNGS)

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 the Authority's Authorized Representative. 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 the Authority's Authorized Representative. No substitution of materials or equipment will be permitted without resubmission and approval of the shop drawings.

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 (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, overexcavation 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 the Authority's Authorized Representative.

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.

5.0 PIPE

5.01 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 its Authorized Representative.

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

5.02 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 the Authority's Authorized Representative.

Pipe gaskets made of nitrile rubber shall be required if chemical resistant applications are deemed necessary by the Authority or its Authorized Representative.

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

5.03 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 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 data 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 its Authorized Representatives.

5.04 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:

<u>NOMINAL DIAMETER OF CASING PIPE IN INCHES</u>	<u>WALL THICKNESS</u>
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"

6.0 POLYETHYLENE ENCASEMENT OF DUCTILE IRON PIPE

Where the Authority or its Authorized Representative 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."

7.0 JOINT RESTRAINT

Where sewer lines are installed on steep slopes, the Authority or the Authority's Authorized Representative may require, in addition to pipe anchors, the use of joint restraint mechanisms which may include but are not limited to field locking 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.

8.0 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.

9.0 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.

10.0 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 the Authority's Authorized Representative. Precast manhole components deemed unrepairable by the Authority or its Authorized Representative 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 inverts 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.

11.0 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.

12.0 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 $\frac{3}{4}$ " 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.

13.0 MANHOLE INSERTS (SEWER GUARDS)

Where manholes are located in paved areas or 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.

14.0 UNDERGROUND EARLY WARNING DETECTION TAPE

Install underground early warning detection tape as shown on the applicable Standard Detail.

The tape shall be manufactured by LineTec Inc., St. Charles, IL (or equal). Minimum width shall be three inches (3"). Weight shall be five pounds per one thousand feet (5 lb/1000'). Tape shall be two sheets of poly material (acid and alkali resistant) each reverse printed ("Buried Sewer Line Below"), and laminated to a 1-mil continuous layer of foil. Tape shall be green in accordance with American Public Water Works Association requirements.

15.0 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.

16.0 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.

17.0 BACKFILLING

Back filling 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 their authorized representative 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 requirements of PADOT, Allegheny County or Findlay Township depending the jurisdiction of the roadway.

18.0 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 its authorized representative. 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.

19.0 PIPE TESTING

The Contractor shall provide a minimum of 48 hours advance notice to the Authority or its Authorized Representative of the Contractor's pipe testing schedule. All pipe testing must be observed by the Authority or the authorized representative.

19.01 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 it's authorized representative 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

19.02 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	7½% Deflection	5% Deflection	7½% 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

19.03 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 as 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
1-1/4	0.06	0.10	0.16
1-1/2	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
7-1/8	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
13-3/8	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

20.0 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 on 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 10" (10 inches) 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 AV-202 multi-grout. Applications of water activated foam sealant will be performed until no infiltration is observed.

21.0 INSPECTION AND PUNCH LISTING OF WORK

All materials and workmanship shall be subject to inspection, examination, or test by the Authority or the Authority's Authorized Representative at any and all times during construction and at any and all places where such construction is carried on. The Authority or the Authority's Authorized Representative 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 the Authority's Authorized Representative 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.

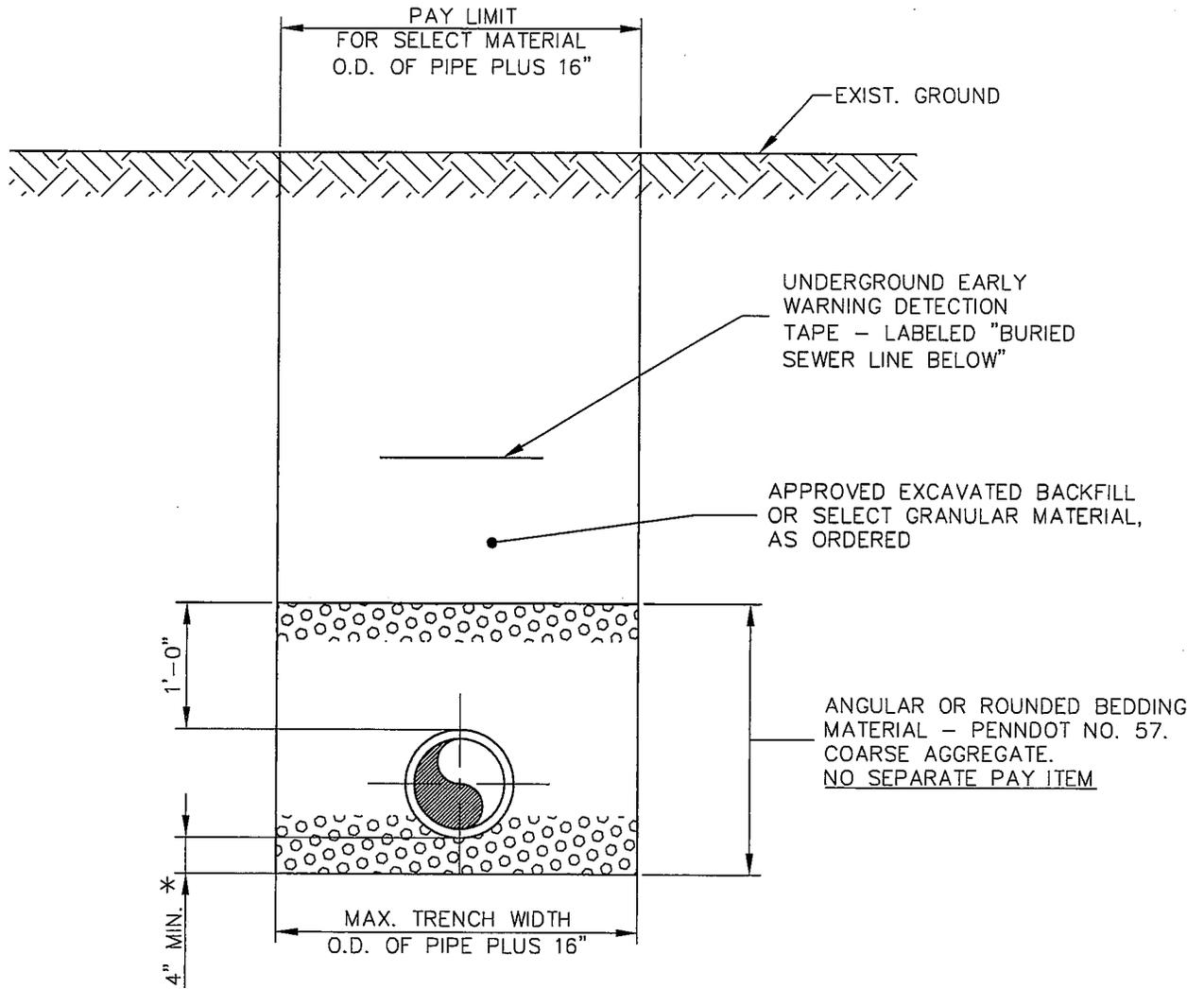
21.1 POST CONSTRUCTION INTERNAL PIPE VIDEO

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.

22.0 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 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 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 approximate clearance of other underground utilities and/or structures in close proximity of the sewer lines and manholes shall be included on the As-built Drawings. 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

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

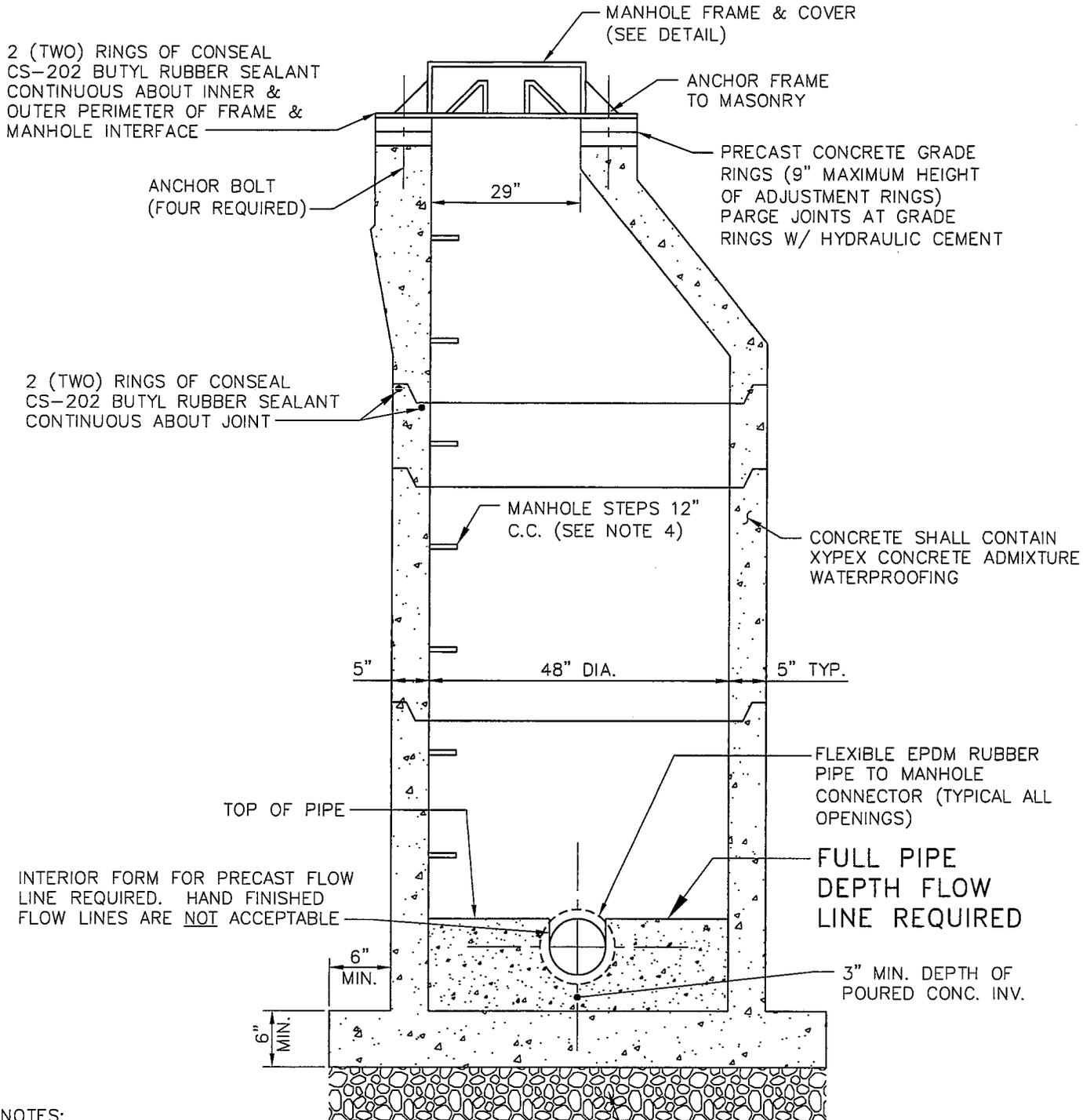
**FINDLAY TOWNSHIP
 MUNICIPAL AUTHORITY**

**STANDARD TRENCH EXCAVATION
 SANITARY SEWER DETAIL**

NIRA Consulting Engineers, Inc.

DATE: SEPT. 2003

FILE: FTMA SD-01

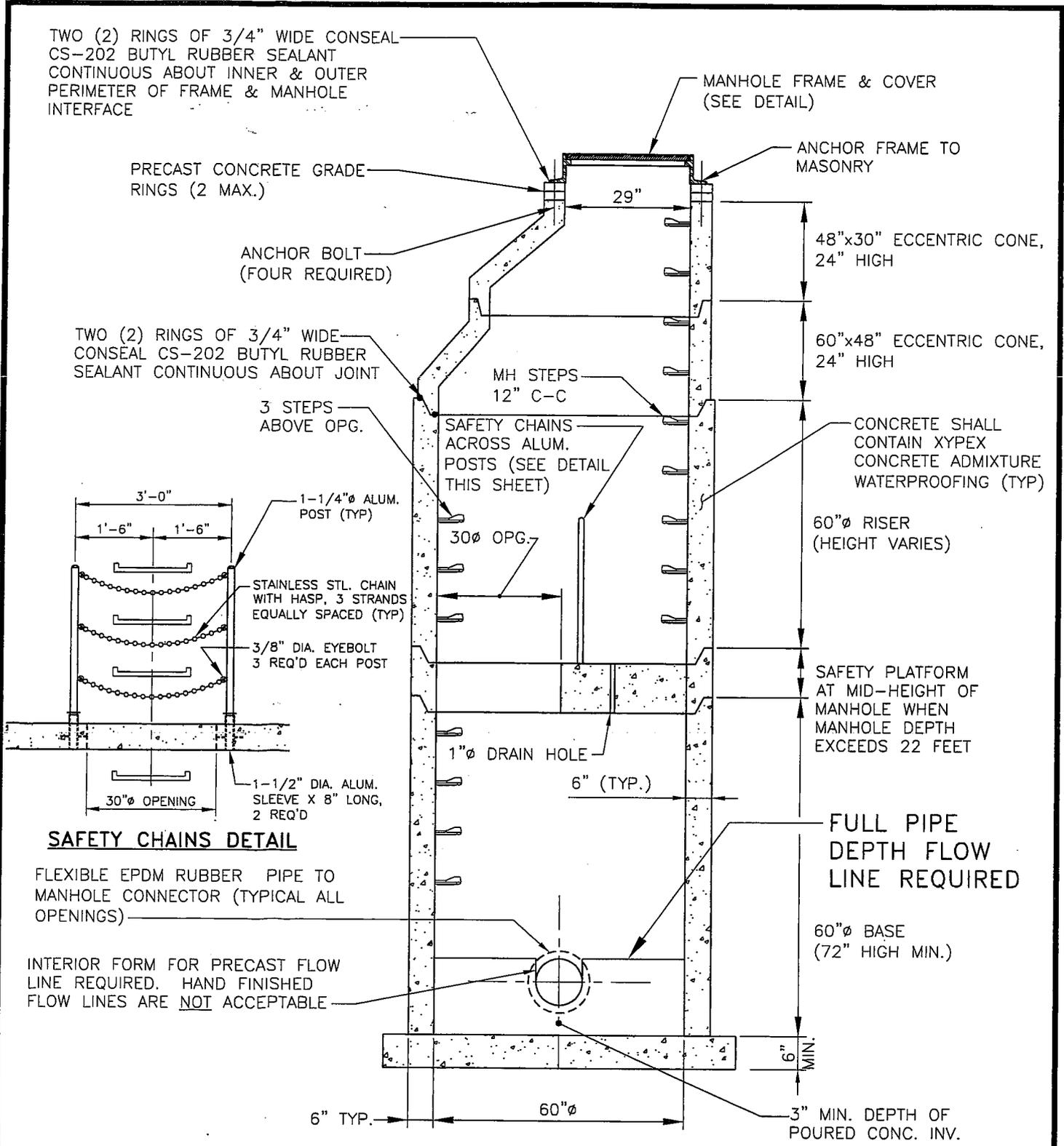


NOTES:

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

MINIMUM 4" #57 COURSE AGGREGATE FOR LEVELING ON FIRM SUBSTRATE - OVERDIG & PLACE ADDITIONAL STONE IF NECESSARY

FINDLAY TOWNSHIP MUNICIPAL AUTHORITY	
48" PRECAST MANHOLE	
NIRA Consulting Engineers, Inc.	
DATE: APRIL, 2012	FILE: FTMA SD-02



TWO (2) RINGS OF 3/4" WIDE CONSEAL CS-202 BUTYL RUBBER SEALANT CONTINUOUS ABOUT INNER & OUTER PERIMETER OF FRAME & MANHOLE INTERFACE

MANHOLE FRAME & COVER (SEE DETAIL)

PRECAST CONCRETE GRADE RINGS (2 MAX.)

ANCHOR FRAME TO MASONRY

ANCHOR BOLT (FOUR REQUIRED)

48"x30" ECCENTRIC CONE, 24" HIGH

TWO (2) RINGS OF 3/4" WIDE CONSEAL CS-202 BUTYL RUBBER SEALANT CONTINUOUS ABOUT JOINT

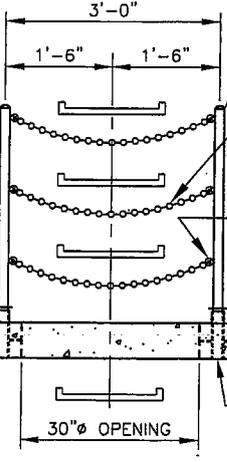
MH STEPS 12" C-C

60"x48" ECCENTRIC CONE, 24" HIGH

3 STEPS ABOVE OPG.

SAFETY CHAINS ACROSS ALUM. POSTS (SEE DETAIL THIS SHEET)

CONCRETE SHALL CONTAIN XYPEX CONCRETE ADMIXTURE WATERPROOFING (TYP)



SAFETY CHAINS DETAIL

60"Ø RISER (HEIGHT VARIES)

FLEXIBLE EPDM RUBBER PIPE TO MANHOLE CONNECTOR (TYPICAL ALL OPENINGS)

SAFETY PLATFORM AT MID-HEIGHT OF MANHOLE WHEN MANHOLE DEPTH EXCEEDS 22 FEET

INTERIOR FORM FOR PRECAST FLOW LINE REQUIRED. HAND FINISHED FLOW LINES ARE NOT ACCEPTABLE

FULL PIPE DEPTH FLOW LINE REQUIRED

60"Ø BASE (72" HIGH MIN.)

6" TYP.

60"Ø

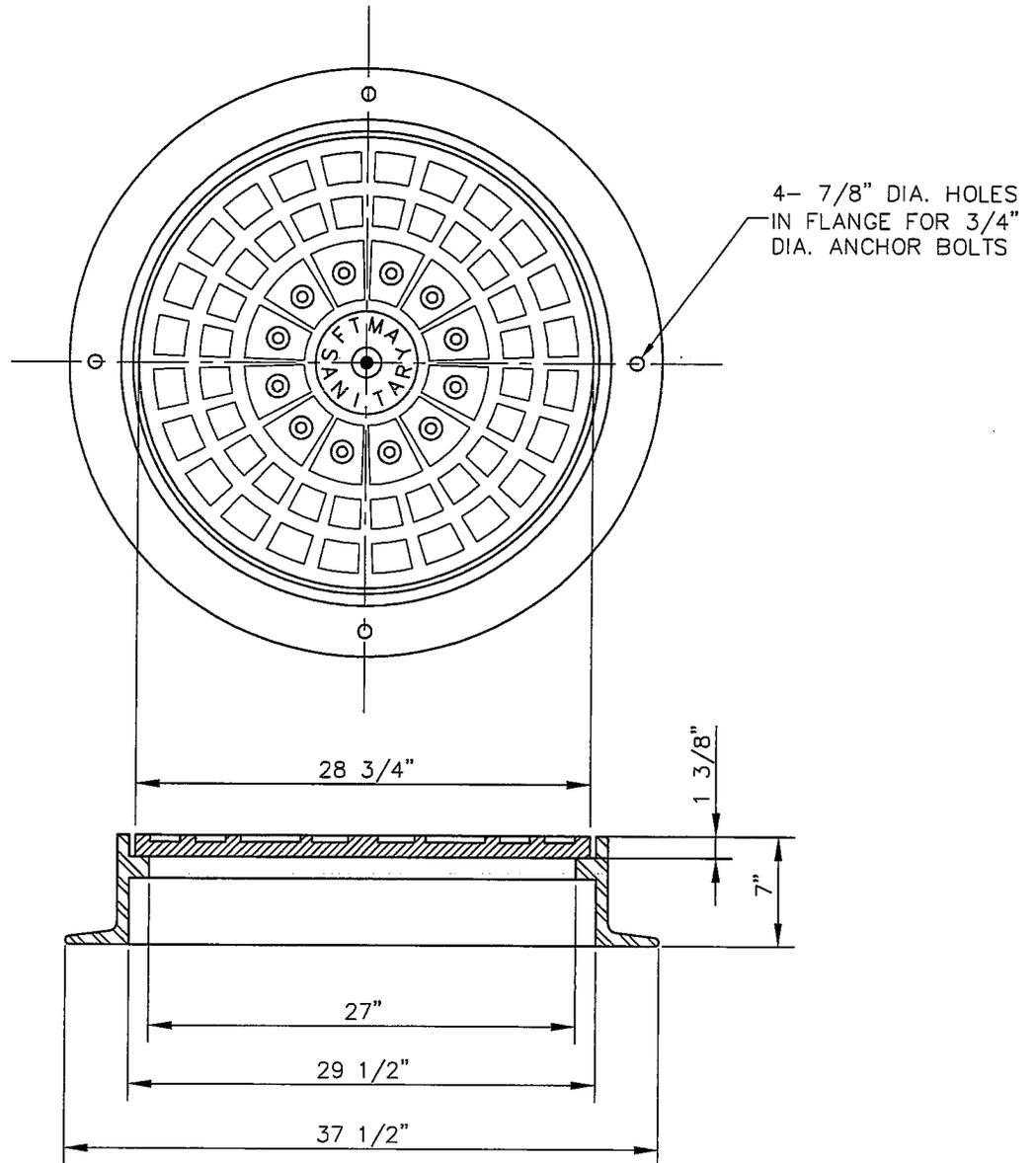
6" MIN.

3" MIN. DEPTH OF POURED CONC. INV.

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.

FINDLAY TOWNSHIP MUNICIPAL AUTHORITY	
60" PRECAST MANHOLE	
NIRA Consulting Engineers, Inc.	
DATE: APRIL, 2012	FILE: FTMA SD-02A



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.

FINDLAY TOWNSHIP
MUNICIPAL AUTHORITY

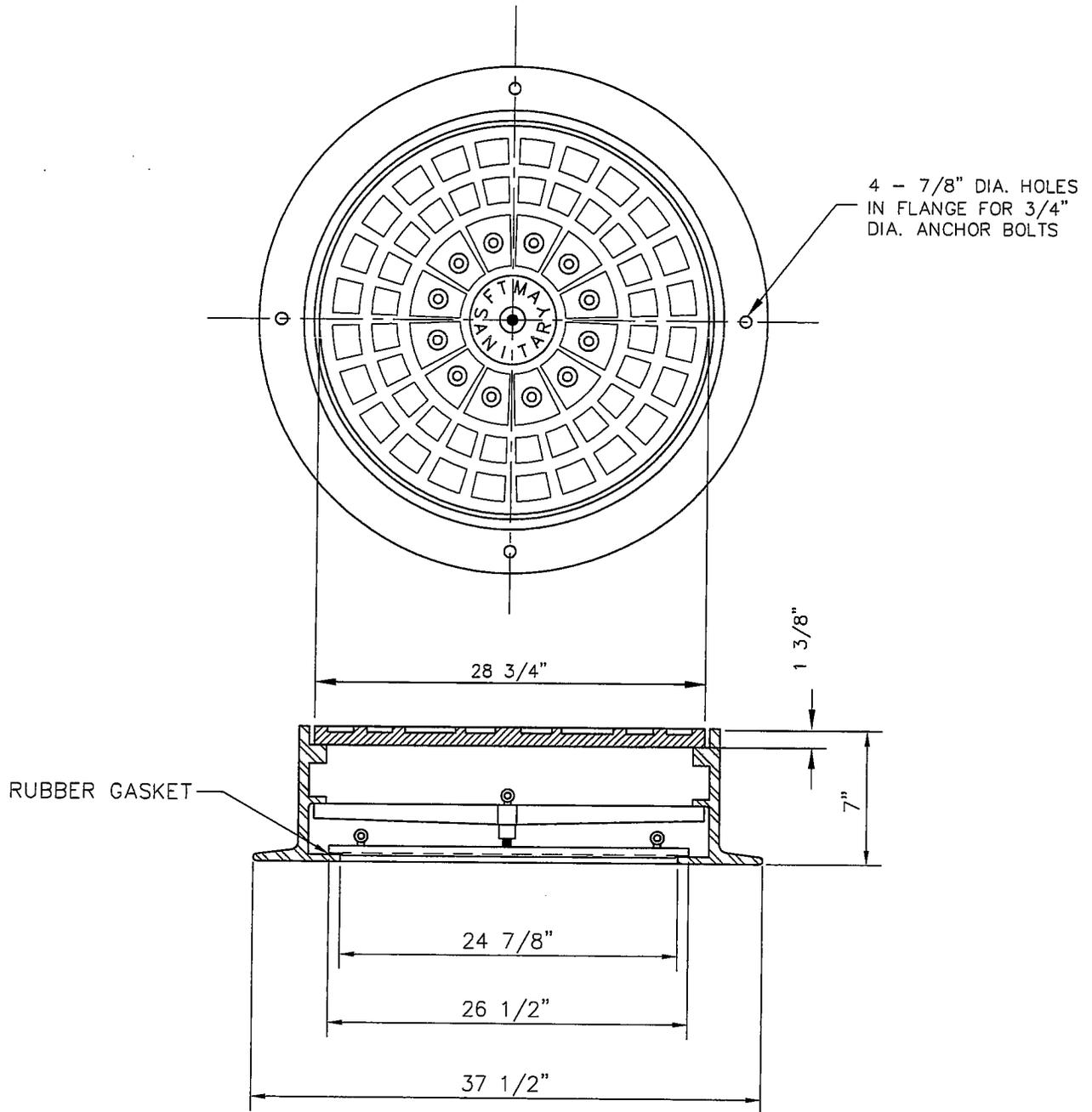
STANDARD MANHOLE
FRAME & COVER

NIRA Consulting Engineers, Inc.

REVISED: JULY, 2012

DATE: DEC., 2005

FILE: FTMA SD-03



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.

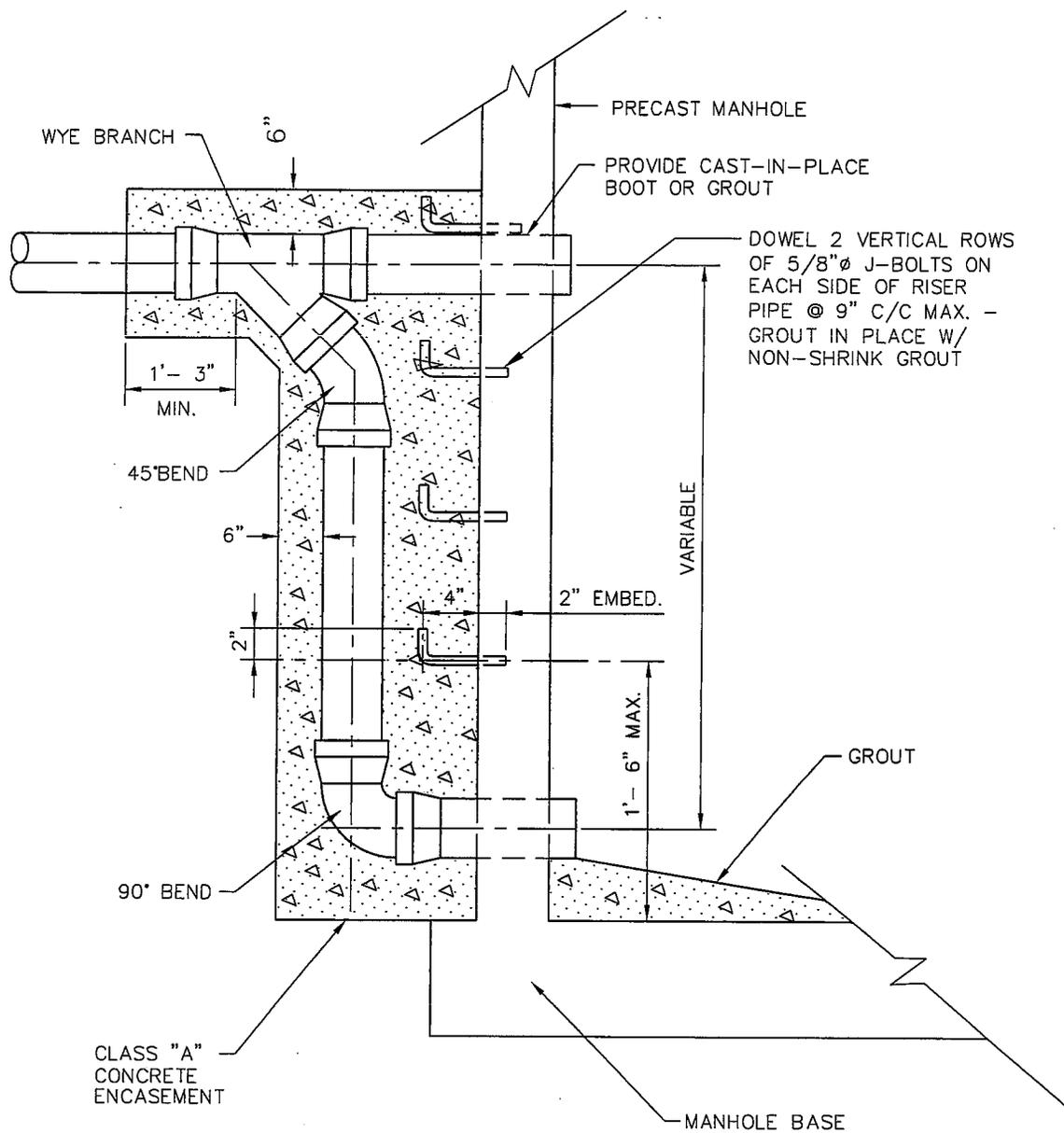
FINDLAY TOWNSHIP
MUNICIPAL AUTHORITY

WATER TIGHT MANHOLE
FRAME & COVER

NIRA Consulting Engineers, Inc.

DATE: SEPT. 2012

FILE: FTMA SD-04



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

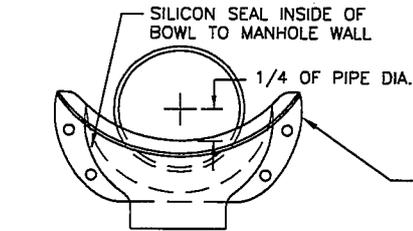
FINDLAY TOWNSHIP
MUNICIPAL AUTHORITY

DROP MANHOLE
CONNECTION DETAIL

NIRA Consulting Engineers, Inc.

DATE: SEPT. 2003

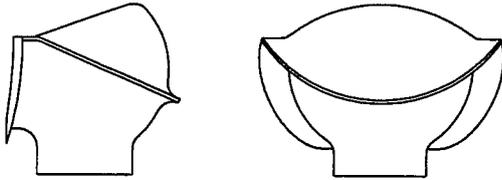
FILE: FTMA SD-05



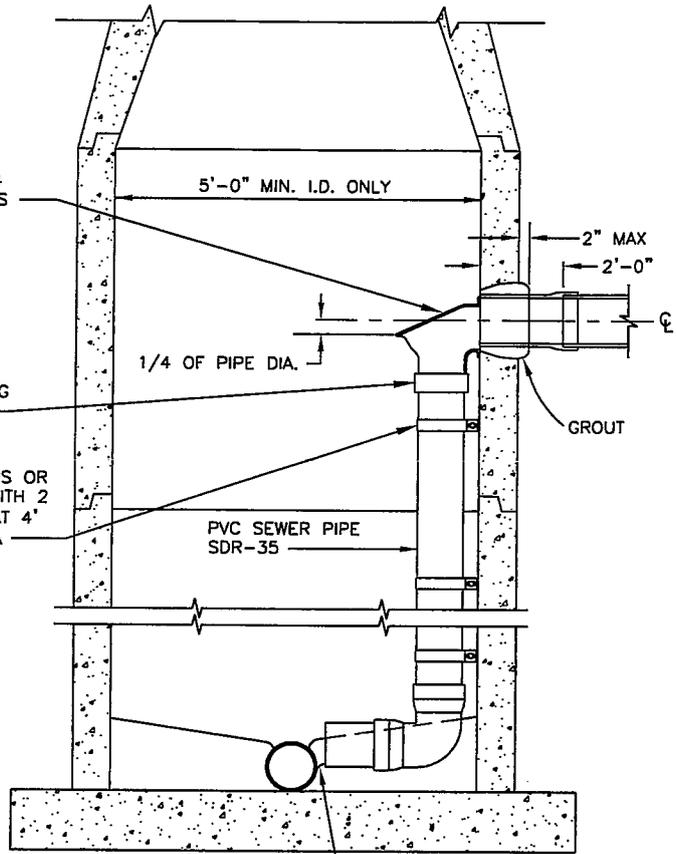
DROP BOWL MOUNTING POSITION

RELINER® INSIDE DROP BOWL SECURED WITH 4 STAINLESS STEEL BOLTS

RELINER® STAINLESS STEEL STRAPS OR EQUAL. SECURE TO STRUCTURE WITH 2 STAINLESS STEEL BOLTS. STRAP AT 4' INTERVALS (MIN. OF 2) SEE 7-3A



FORCE LINE HOOD



DROP CONNECTION PIPE INVERT SHALL MATCH THE SPRING-LINE OF THE EXIT PIPE.

INSIDE DROP CONNECTION (USE MUST BE APPROVED)

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:

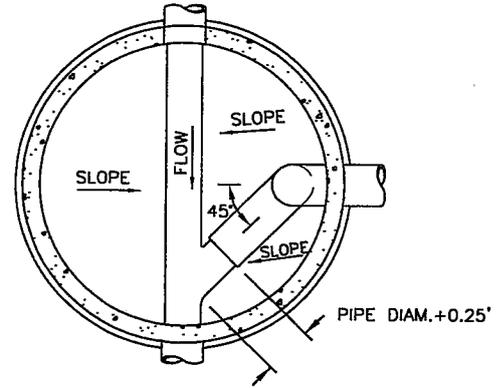
EPOXY PASTE SHALL BE A TWO COMPONENT, 100% SOLID SYSTEM. EPOXY SHALL BE SIKADUR 31 HI-MOD GEL BY SIKA CORPORATION (PHONE 592/941-0231) OR EQUAL.

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 - PLAN

FINDLAY TOWNSHIP MUNICIPAL AUTHORITY

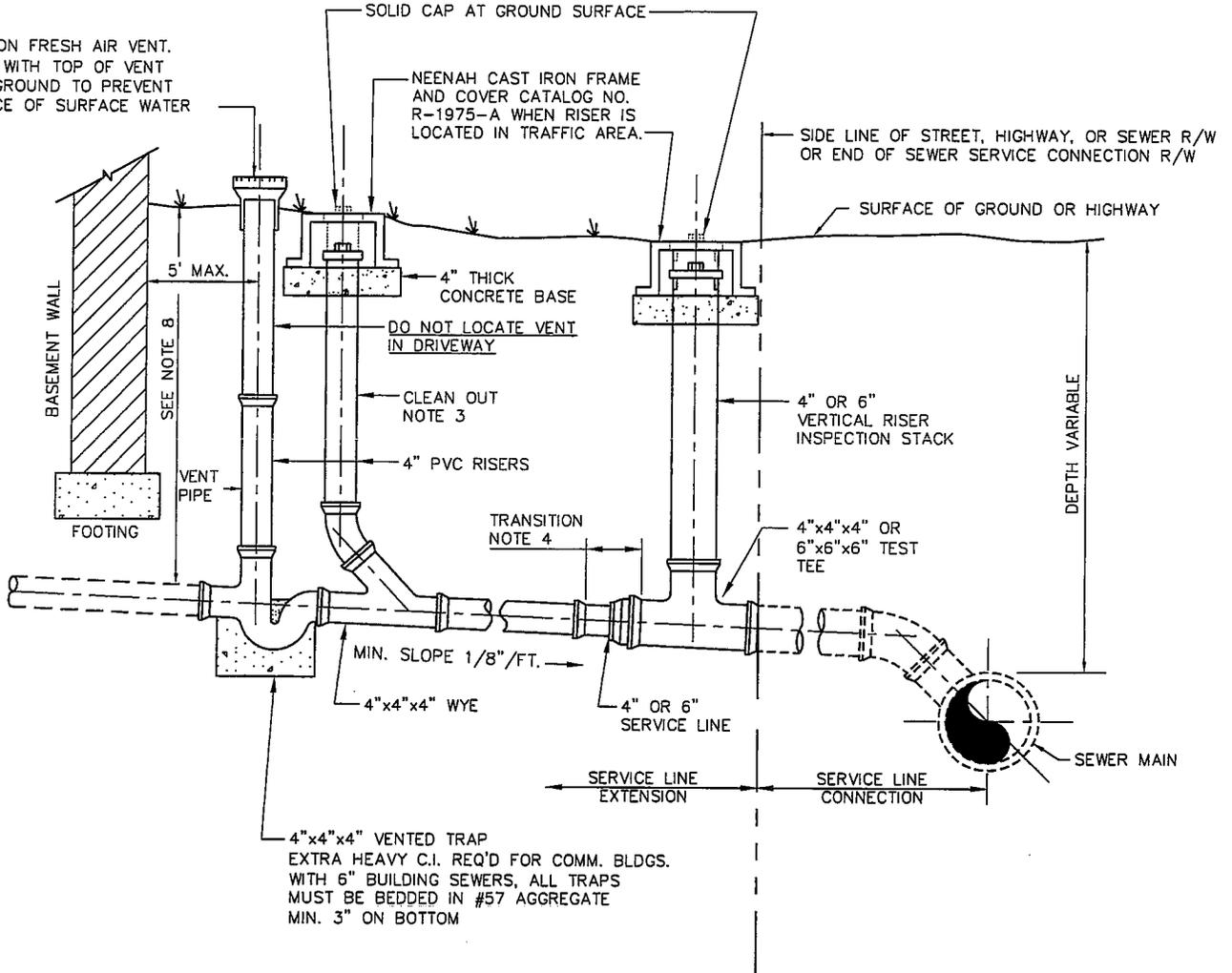
INSIDE DROP MANHOLE CONNECTION DETAIL

NIRA Consulting Engineers, Inc.

DATE: SEPT. 2003

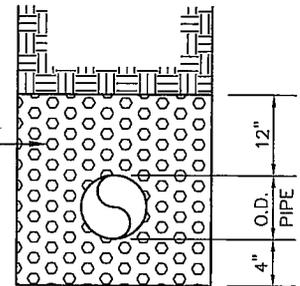
FILE: FTMA SD-05A

CAST IRON FRESH AIR VENT.
INSTALL WITH TOP OF VENT
ABOVE GROUND TO PREVENT
ENTRANCE OF SURFACE WATER



4" x 4" x 4" VENTED TRAP
EXTRA HEAVY C.I. REQ'D FOR COMM. BLDGS.
WITH 6" BUILDING SEWERS, ALL TRAPS
MUST BE BEDDED IN #57 AGGREGATE
MIN. 3" ON BOTTOM

PENN D.O.T.
NO. 57 COARSE
AGGREGATE



TRENCH
SECTION

NOTES:

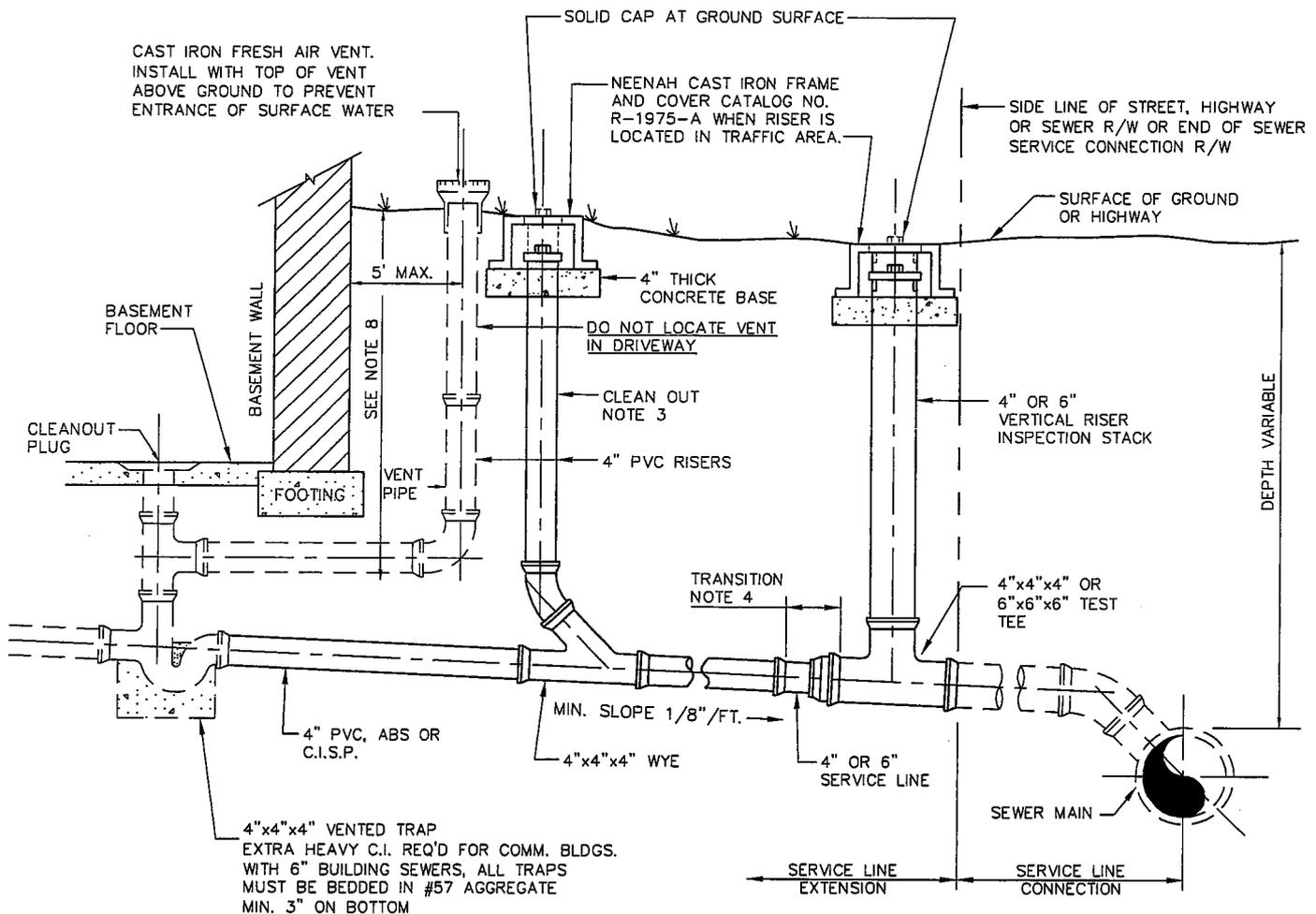
1. THE ENTIRE INSTALLATION MUST BE INSPECTED AND APPROVED BY THE FTMA REPRESENTATIVE AND THE ALLEGHENY COUNTY HEALTH DEPT.
2. ALL MATERIALS MUST BE INSTALLED IN ACCORDANCE WITH THE ALLEGHENY COUNTY PLUMBING CODE AND IN ACCORDANCE WITH THE FTMA RULES AND REGULATIONS.
3. BEFORE WORK IS STARTED A PLAN MUST 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.

FINDLAY TOWNSHIP
MUNICIPAL AUTHORITY
SANITARY SEWER
LATERAL CONNECTION
(EXTERIOR TRAP)

NIRA Consulting Engineers, Inc.

DATE: SEPT. 2003

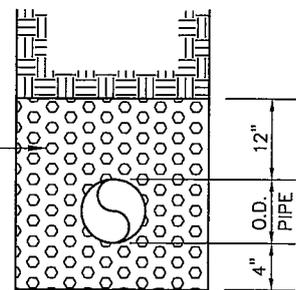
FILE: FTMA SD-06



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.

PENN D.O.T.
NO. 57 COARSE
AGGREGATE



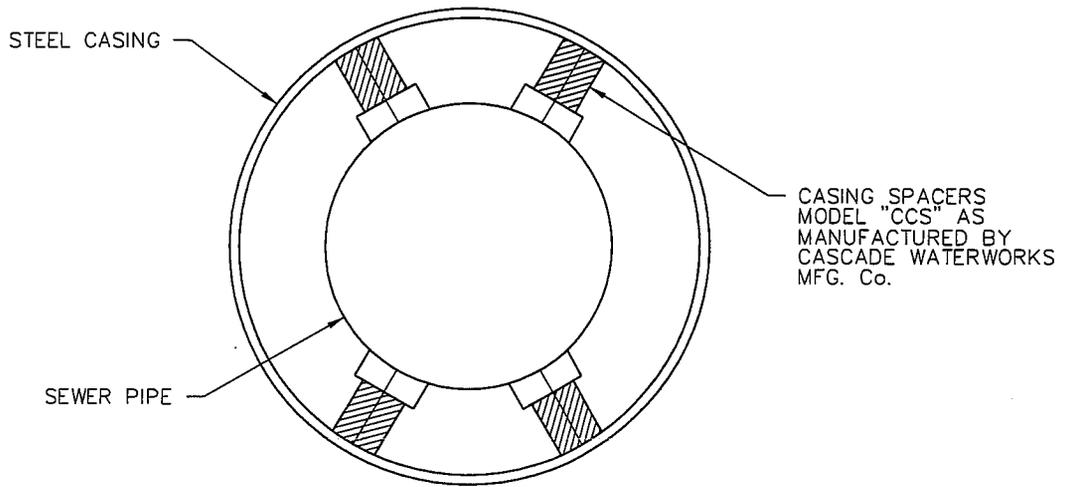
TRENCH SECTION

**FINDLAY TOWNSHIP
MUNICIPAL AUTHORITY
SANITARY SEWER
LATERAL CONNECTION
(INTERIOR TRAP)**

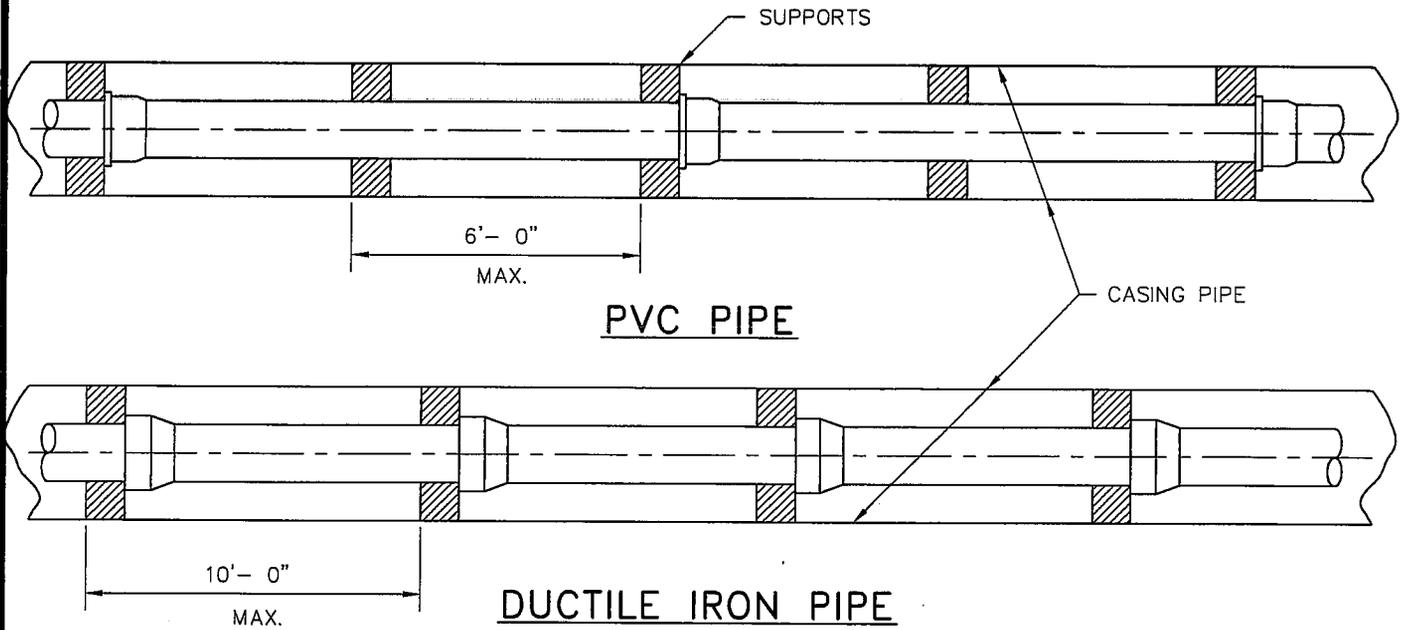
NIRA Consulting Engineers, Inc.

DATE: SEPT. 2003

FILE: FTMA SD-06A

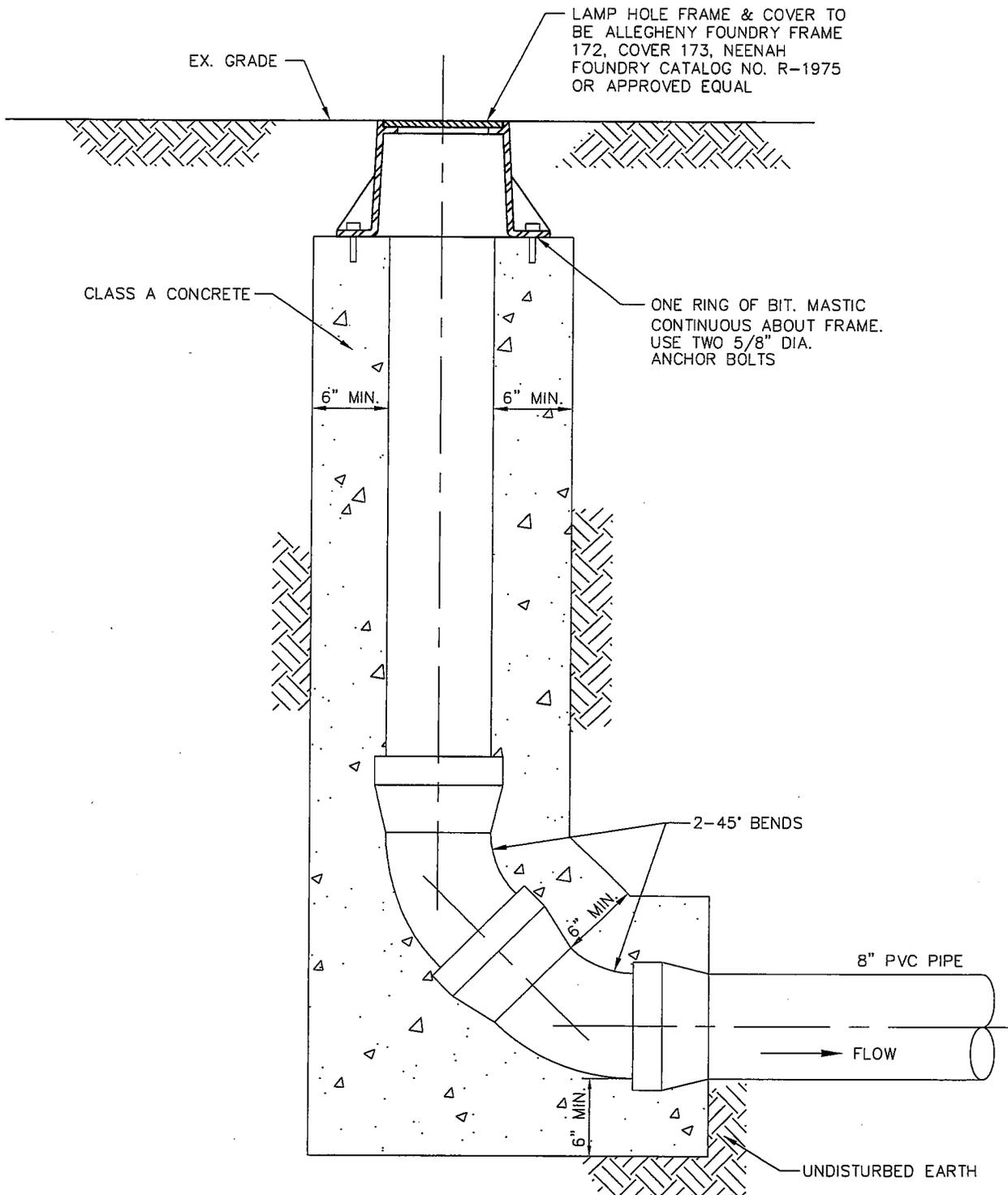


SEWER SIZE	6"	8"	10"	12"	15"	18"	21"	24"	27"	30"	42"
CASING SIZE	14"	16"	18"	20"	24"	28"	30"	34"	38"	42"	52"



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

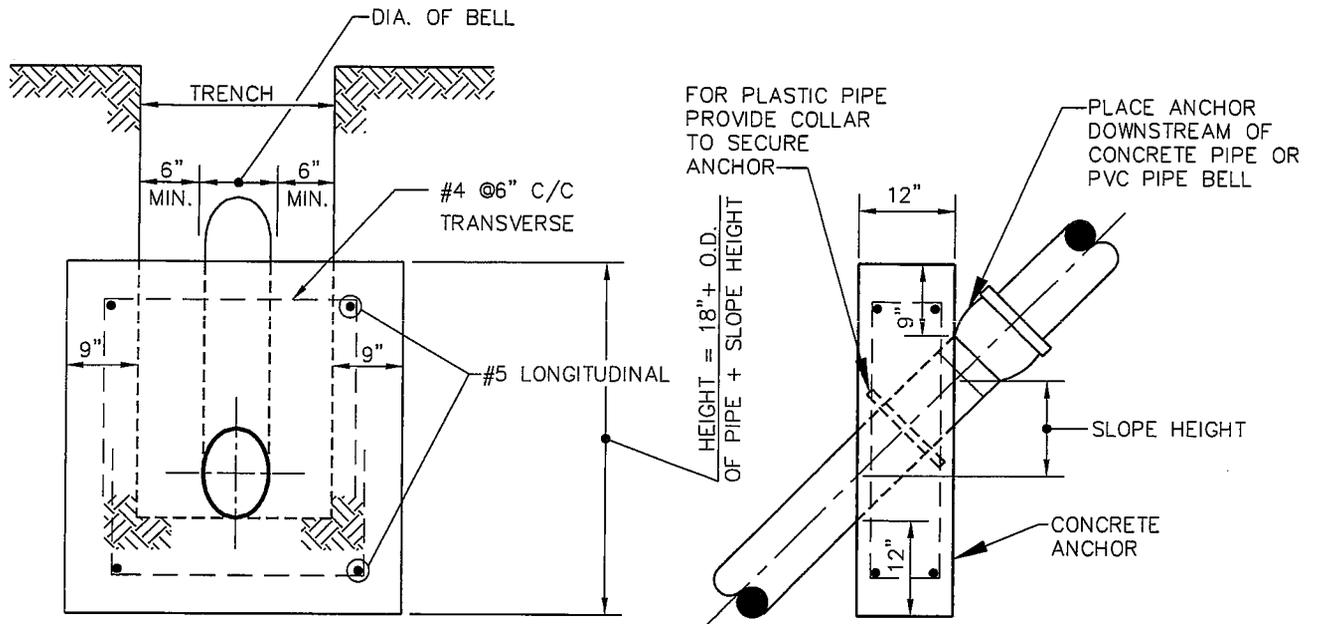
FINDLAY TOWNSHIP MUNICIPAL AUTHORITY	
SEWER CASING and SUPPORT DETAIL	
NIRA Consulting Engineers, Inc.	
DATE: SEPT. 2003	FILE: FTMA SD-07



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.

FINDLAY TOWNSHIP MUNICIPAL AUTHORITY	
LAMPHOLE DETAIL	
NIRA Consulting Engineers, Inc.	
DATE: SEPT. 2003	FILE: FTMA SD-08



END VIEW

SIDE VIEW

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.

<u>PIPE ANCHOR SPACING</u>	
<u>SLOPE</u>	<u>C-C SPACING</u>
20% - 35%	36'- 0" MAX.
35% - 50%	24'- 0" MAX.
50% - >	16'- 0" MAX.

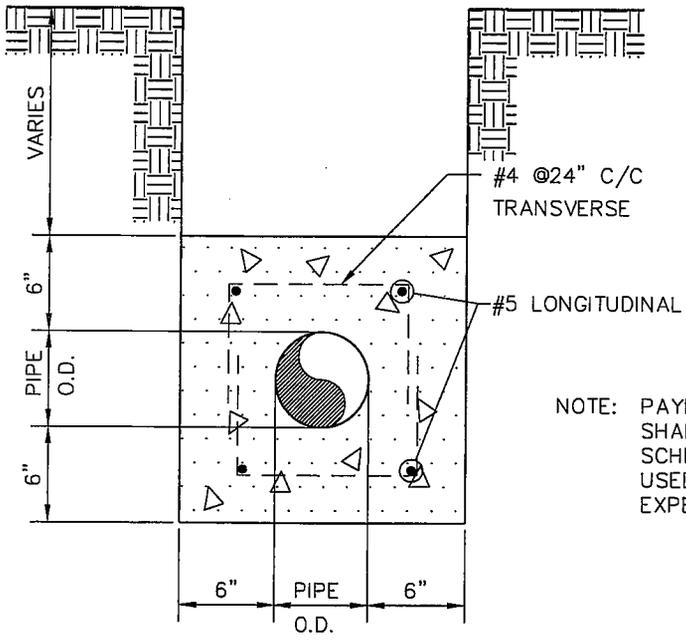
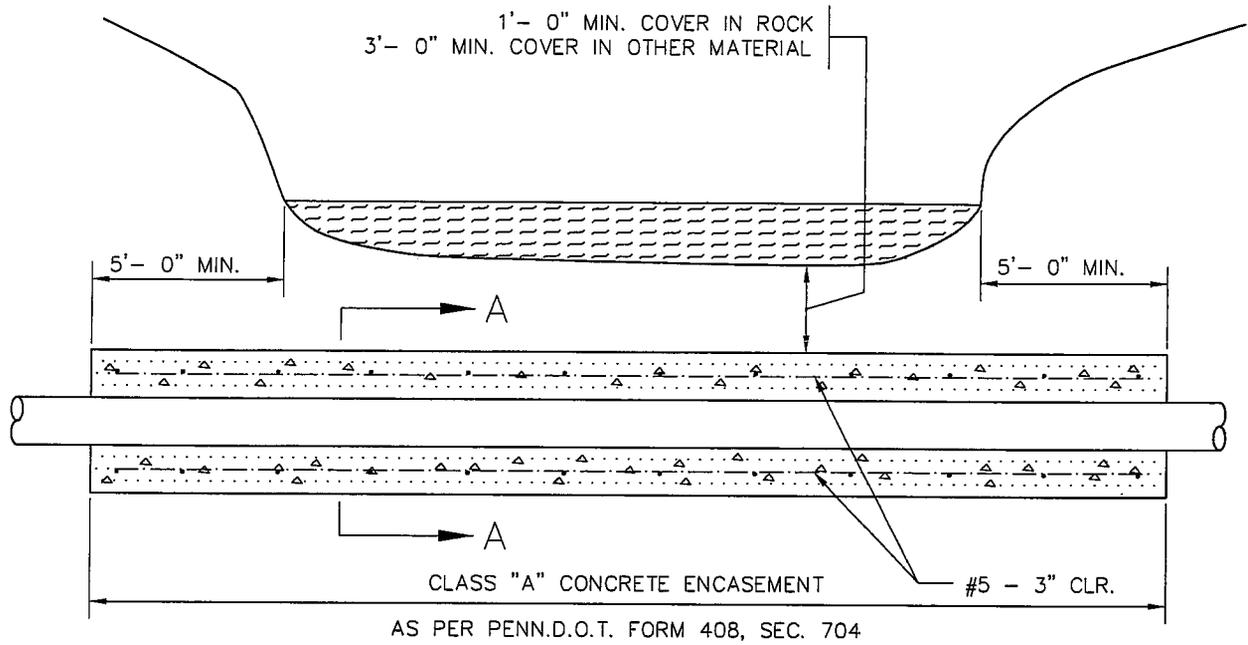
FINDLAY TOWNSHIP
MUNICIPAL AUTHORITY

CONCRETE PIPE
ANCHOR DETAIL

NIRA Consulting Engineers, Inc.

DATE: SEPT. 2003

FILE: FTMA SD-09

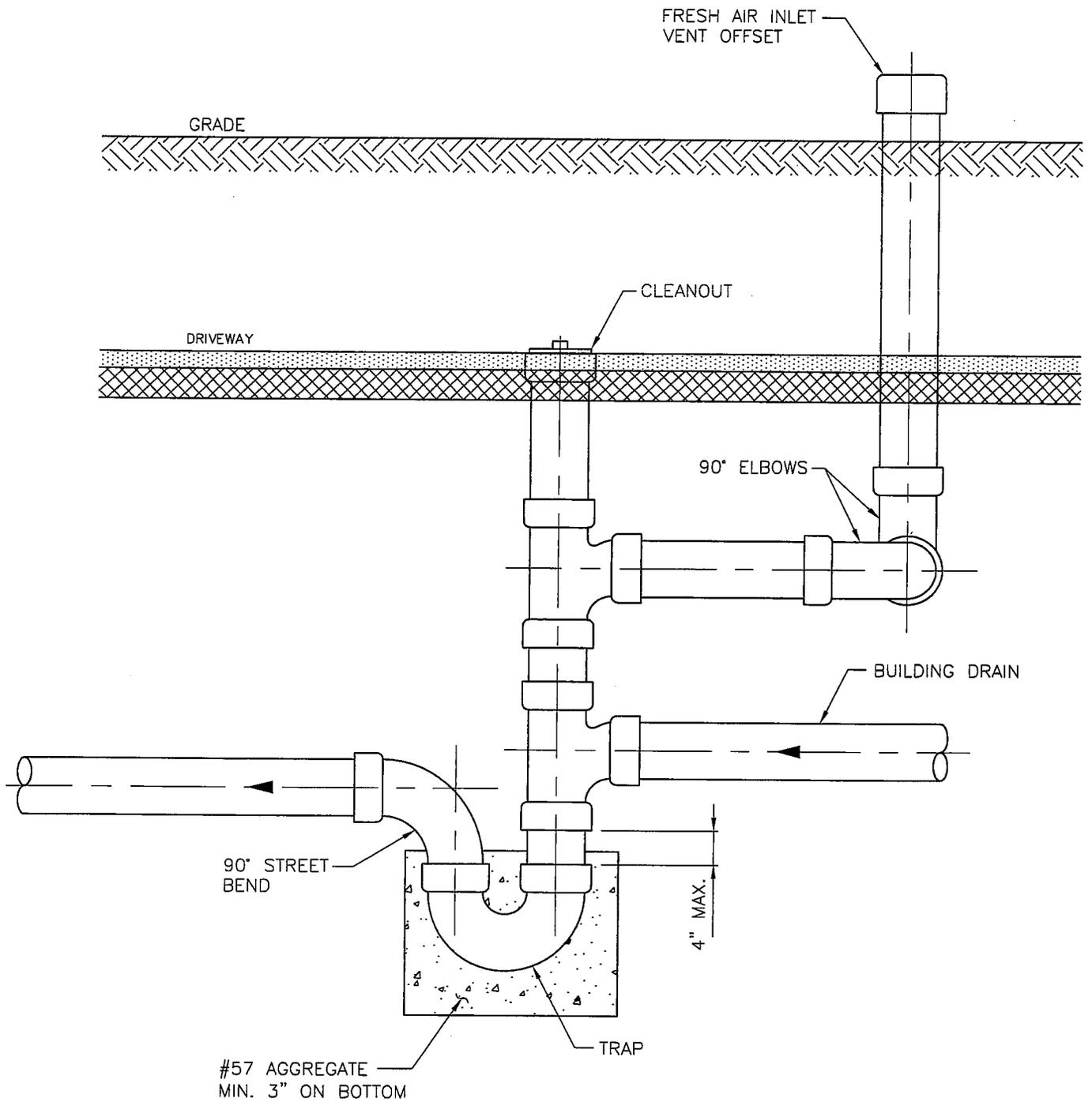


PIPE SIZE	PAYMENT QUANTITY (C.F./L.F.)
6"	2.1
8"	2.5
10"	2.9
12"	3.3
15"	3.8
18"	4.6
21"	5.4

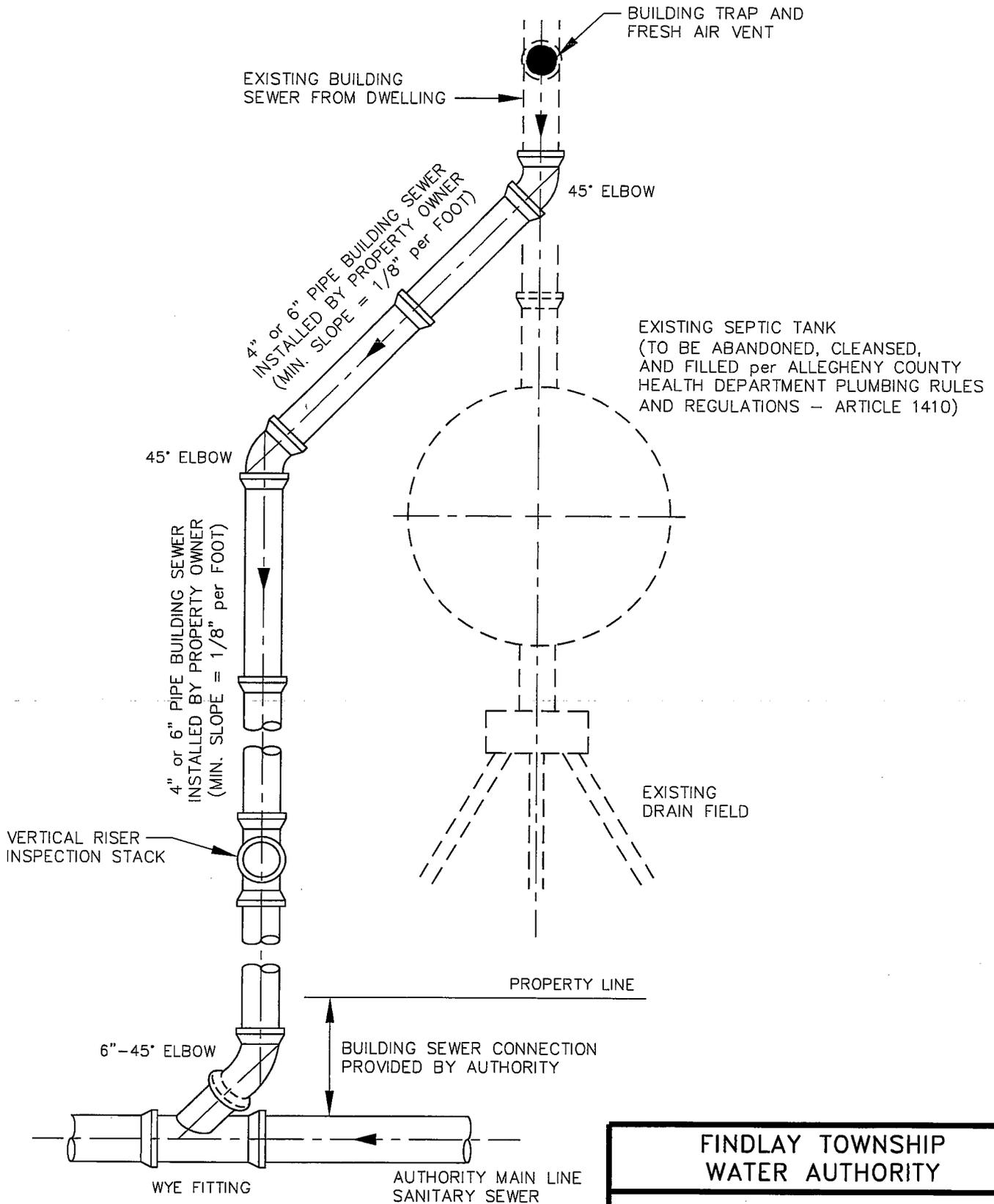
NOTE: PAYMENT FOR CONCRETE ENCASEMENT SHALL BE IN ACCORDANCE WITH SCHEDULE SHOWN. ADDITIONAL CONCRETE USED WILL BE AT THE CONTRACTOR'S EXPENSE.

SECTION A-A

FINDLAY TOWNSHIP MUNICIPAL AUTHORITY	
CONCRETE ENCASEMENT DETAIL	
NIRA Consulting Engineers, Inc.	
DATE: SEPT. 2003	FILE: FTMA SD-10



FINDLAY TOWNSHIP MUNICIPAL AUTHORITY	
FRESH AIR VENT ON ELEVATED GRADES AT DRIVEWAYS	
NIRA Consulting Engineers, Inc.	
DATE: JUNE 2006	FILE: FTMA SD-11



EXISTING SEPTIC TANK
 (TO BE ABANDONED, CLEANSED,
 AND FILLED per ALLEGHENY COUNTY
 HEALTH DEPARTMENT PLUMBING RULES
 AND REGULATIONS - ARTICLE 1410)

EXISTING
 DRAIN FIELD

PROPERTY LINE

BUILDING SEWER CONNECTION
 PROVIDED BY AUTHORITY

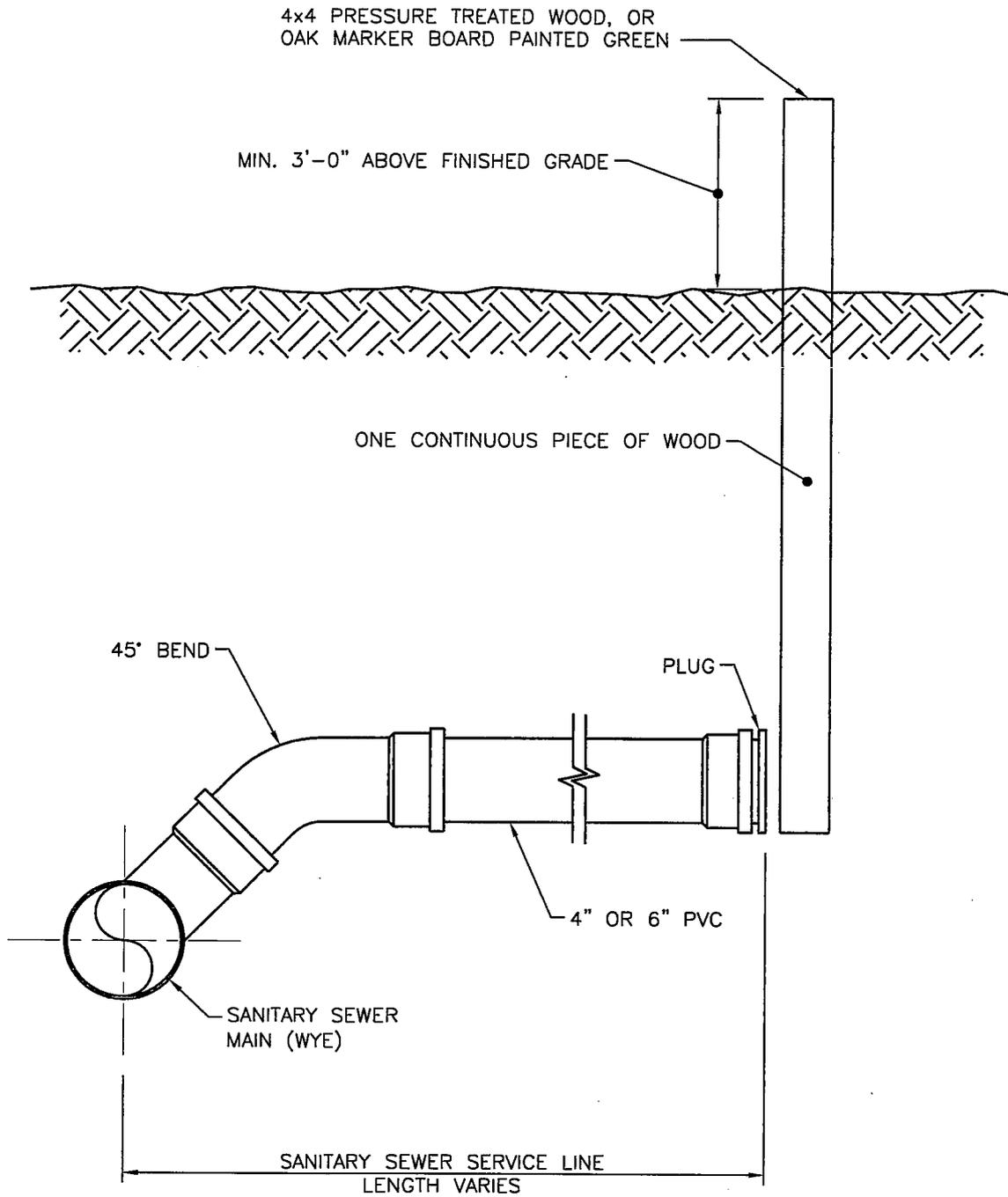
FINDLAY TOWNSHIP
 WATER AUTHORITY

BUILDING DISSEVERMENT
 FROM SEPTIC SYSTEM

NIRA Consulting Engineers, Inc.

DATE: SEPT. 2003

FILE: FTMA SD-12



FINDLAY TOWNSHIP
MUNICIPAL AUTHORITY

SANITARY SEWER SERVICE
LINE MARKER BOARD

NIRA Consulting Engineers, Inc.

DATE: SEPT., 2012

FILE: FTMA SD-13