

SECTION 02601

MANHOLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Precast concrete manhole sections
2. Precast concrete manhole bases
3. Cast-in-place concrete manhole bases
4. Manhole steps
5. Manhole frames and covers and adjusting rings

B. Related Work Specified Elsewhere:

- | | |
|--|---------------|
| 1. Trenching, Backfilling, and Compacting: | Section 02221 |
| 2. Soil Erosion and Sedimentation Control: | Section 02270 |
| 3. Finish Grading, Seeding, and Sodding: | Section 02485 |
| 4. Sanitary Sewer Pipe: | Section 02610 |
| 5. Sanitary Sewer Testing: | Section 02651 |
| 6. Plain and Reinforced Cement Concrete: | Section 03000 |
| 7. Cement Concrete for Utility Construction: | Section 03050 |

C. Definitions:

1. Standard Manhole - manhole with vertical height from top of base (invert) to top of rim greater than 5'.
2. Shallow Manhole - manhole with vertical height from top of base to top of rim less than 5'.

D. Applicable Standard Details:

- 02601-1 Cast-in-Place Manhole Base Details
- 02601-2 Precast Manhole Base Detail
- 02601-3 Standard Manhole Detail
- 02601-4 Shallow Manhole Detail
- 02601-5 Drop Connection Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation (PennDOT), latest revision:

Publication 408, Specifications

Publication 203, Work Zone Traffic Control

Publication RR-459, Occupancy of Highways by Utilities

Publication 19, Field Test Manual

▶ PTM No. 106 - Moisture-Density Relations of Soils
(using 5.5 lb. Rammer and 12 inch drop)

▶ PTM No. 402 - Determining In-Place Density and Moisture Content of
Construction Materials by Use of Nuclear Gauges
Publication 72M, Roadway Construction Standards (RC-39)

2. American Society for Testing and Materials (ASTM):

A48 Specification for Gray Iron Castings

A185 Specification for Welded Steel Wire Fabric, Plain, for Concrete
Reinforcement

A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete
Reinforcement

B221 Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods,
Wire, Profiles and Tubes

C443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe,
Using Rubber Gaskets

C478 Specification for Precast Reinforced Concrete Manhole Sections

C923 Specification for Resilient Connectors Between Reinforced Concrete
Manhole Structures, Pipes and Laterals

D1248 Specification for Polyethylene Plastics Molding and Extrusion Materials

3. Federal Specifications (FS):

SS-S-00210 Sealing compound, preformed plastic, for expansion joints and
pipe joints.

B. Inspections:

1. Inspections of the manholes by the Engineer will, at a minimum, be made of
materials upon delivery to the job site; of the subgrade, prior to manhole base
construction or placement; and of the completed manhole, prior to backfill.

2. Inspections of the frame and covers by the Engineer will be made upon delivery
to the job site; and of the completed installation, prior to backfill.

3. A final inspection of the manhole channels, steps, frames and covers, and all
joints will be performed upon completion of all testing, roadway restoration,
and/or seeding.

4. Manholes shall be subject to rejection for failure to conform with these specifications or if any one of the following conditions is noted:
 - a. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
 - b. Defects that indicate incorrect proportioning, mixing, and molding.
 - c. Surface defects larger than ½" diameter indicating honey-combed or open texture.
 - d. Damaged or cracked ends, where such damage would prevent making a satisfactory joint.
 - e. Any continuous crack having a surface width of 0.01 inches or more and extending for a length of 6 inches or more, regardless of position in the section wall.

C. Concrete Testing (For Cast-In-Place Work) - As specified in Section 03000.

1.03 SUBMITTALS

A. Certificates:

1. Submit two copies of certification from material suppliers attesting that materials meet or exceed specification requirements.

B. Shop Drawings:

1. Submit details of manhole sections, and precast bases if used.
2. Submit details of manhole frames and covers, including required lettering as specified on the Construction Drawings.
3. Submit details of adjusting rings.
4. Submit details of manhole steps.
5. Submit manufacturer's descriptive literature for the pipe to manhole flexible connections.
6. Submit manufacturer's descriptive literature for joint sealant compounds.

1.04 JOB CONDITIONS

A. As specified in Section 02221.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Precast Concrete Units:

1. After fabrication and curing, transport the manhole and components to the job site. Protect until required for installation.

2. Handle to avoid damage to surfaces, edges and corners and to avoid creation of stresses within the units.

PART 2 - PRODUCTS

2.01 CRUSHED STONE BASE

- A. AASHTO No. 57, Type C crushed stone or gravel aggregate, Section 703.2, Publication 408 Specifications. Do not use slag or cinders.

2.02 MANHOLE BRICK: Not Permitted

2.03 CONCRETE MASONRY UNITS: Not Permitted

2.04 CEMENT MORTAR: ASTM C270, Type S

2.05 CEMENT CONCRETE: Section 03050.

2.06 RUBBER GASKETS: ASTM C443

2.07 RESILIENT PIPE-TO-MANHOLE CONNECTION: ASTM C923

- A. PSX gaskets as manufactured by Press-Seal Gasket Corporation, Fort Wayne, Indiana or approved equal.

2.08 NON-SHRINK GROUT: Fastsetting, cement-based mortar such as Waterplug, manufactured by Thoro Division of ChemRex, Shakopee, MN, or approved equal.

2.09 PRECAST CONCRETE MANHOLE BASES AND SECTIONS: ASTM C478

- A. 5.5% \pm 1.5% air-entrained cement concrete.
- B. Eccentric cone or flat slab top sections; minimum 24" access opening.
- C. Precast riser sections of length to suit.
- D. Precast bases of a design similar to the precast riser sections.
- E. Precast drop connections, and precast lampholes are not permitted.
- F. Manholes shall have a 4' inside diameter unless otherwise noted on the Construction Drawings.
- G. Precast manhole bases shall be manufactured in accordance with the elevations shown on the Engineer's grade sheets and shall accommodate lateral hookups as marked in the field.
- H. Precast manhole bases and precast concrete channels shall be constructed specifically for the work intended.

2.10 GLASS FIBER-REINFORCED POLYESTER MANHOLES: Not Permitted

2.11 JOINT SEALANT COMPOUND

- A. FS SS-S-00210, preformed, flexible, self-adhering, cold-applied. Joints between manhole base and riser, between risers, between riser and cone, between cone and adjusting rings and cast iron frame, shall be made of RUB'R-NEK, a flexible plastic gasket-type sealant manufactured by K. T. Snyder Company, Inc., of Houston, Texas, or approved equal.

2.12 MANHOLE STEPS

- A. Manhole steps shall be made of non-corrosive aluminum, or steel reinforced fiberglass or polypropylene materials. Steps in precast walls shall terminate 1" from outer surface and shall be cast in place wherever possible or grouted with a waterproof, non-shrink grout.
 - 1. Aluminum alloy steps (Alloy 6061-T6) shall be Model No. F-140, manufactured by Washington Aluminum Company, Inc., of Baltimore, MD, or approved equal and shall have a protective coating consisting of asphalt coating conforming to AASHTO M-190 requirements applied to the portion to be embedded in the concrete.
 - 2. Steel reinforced fiberglass steps shall be Model No. 115 manufactured by R.J. Manufacturing, Inc. of San Antonio, Texas, or approved equal.
 - 3. Steel reinforced copolymer polypropylene plastic steps shall be Model No. PS-2-B or PS-2-PFS, manufactured by M. A. Industries, Inc. of Peachtree City, Georgia, or approved equal.

2.13 MANHOLE FRAMES AND COVERS

- A. Domestic soft, gray cast iron castings: ASTM A48, Class 35B or better; free of bubbles, sand and air holes, and other imperfections. Castings shall be furnished unpainted.
- B. Frames and covers shall be capable of withstanding an AASHTO HS-25 loading and shall have a minimum 21" clear opening. Watertight frames and covers shall meet AASHTO HS-20 loading requirements.
- C. Frame and cover shall have machined bearing surfaces and matched to ensure against rocking.
- D. Cover shall be lettered or marked "Sanitary Sewer" (or "Storm Sewer") as appropriate.
- E. Standard frames and covers shall be similar to Model No. 1788-A manufactured by the Neenah Foundry Company, Neenah, Wisconsin, or Model No. 1835A1 manufactured by East Jordan Iron Works, Inc., East Jordan, Michigan, or approved equal. Covers shall be self-sealing, have two (2) concealed watertight pick holes, and shall have two (2) lifting rings or bars, and no openings to permit surface water entry.

- F. Watertight frames and covers shall have suitable clamp, employing a rubber gasket seal, similar to Model No. 1755-F2 manufactured by the Neenah Foundry Company, Neenah, Wisconsin or Model No. 1040 manufactured by East Jordan Iron Works, Inc. East Jordan, Michigan, or approved equal.

2.14 REINFORCING STEEL: Section 03000

2.15 ADJUSTING RINGS

- A. Precast cement concrete grade adjustment rings shall be cast from 4000 psi concrete (28-day compressive strength), shall be a maximum of 2" thick per ring. Circumferential reinforcement shall be in conformance with ASTM C478. Split concrete rings are not permitted.
- B. Plastic adjusting rings shall be injection molded High Density Polyethylene (HDPE) conforming to ASTM D1248 as manufactured by Ladtech, Inc., Lino Lakes, MN. Maximum ring thickness shall be 2". Plastic rings must be approved by Municipality prior to use.

2.16 WALL PENETRATION SEALS

- A. Concrete wall penetration seals shall be "link-seal" as manufactured by Thunderline Corporation, Houston, TX or approved equal.
- B. Use appropriate wall sleeve type as recommended by manufacturer to provide watertight seal/connection.

PART 3 - EXECUTION

3.01 MAINTENANCE AND PROTECTION OF TRAFFIC: Section 02221

3.02 CUTTING PAVED SURFACE PRIOR TO EXCAVATION: Section 02221

3.03 BLASTING: Section 02221

3.04 EXCAVATION

- A. Excavate as specified in Section 02221.
- B. Excavate at location marked in the field.
- C. Excavate to the required depth and grade for the invert of the manhole plus that excavation necessary for placement of base material.

3.05 STANDARD MANHOLE CONSTRUCTION

- A. All manholes greater than 5' in vertical height from top of base to top of rim.
- B. Install a minimum of 4" thick compacted crushed stone base. Provide cast-in-place concrete or precast concrete bases.

1. Construct cast-in-place bases as shown on Standard Detail 02601-1.
 - a. Cast-in-place bases may be constructed with a special form for a joint to match the manhole cylinder sections.
2. Install precast bases as shown on Standard Detail, 02601-2.
 - a. Set the precast base on the crushed stone base.
 - b. Provide a sealed, flexible resilient connection between pipe and precast base section.
- C. Install the proper diameter watertight manholes on precast concrete or poured-in-place concrete bases shown on the Construction Drawings.
- D. Construct drop connections shown on Standard Detail. Encase drop connection in concrete.
- E. Form flow channels in manhole bases. Slope channels uniformly from influent invert to effluent invert, minimum 0.1' drop. Construct bends of the largest possible radius. Form channel sides and invert smooth and uniform, free of cracks, holes or protrusions.
- F. Do not permit pipe to project more than 2" into the manhole.
- G. Where special gaskets or water stops are recommended by pipe manufacturers for connections at manhole walls, these facilities shall be provided. All pipe connection joints shall be watertight.
- H. Seal joints between precast concrete manhole sections with preformed rubber gaskets or joint sealant compound.
 1. Place joint sealant compound on lower section to be compressed by the weight of the upper section.
 2. Place rubber gasket in groove formed in spigot end. Equalize gasket tension.
- I. Step placement:
 1. Install manhole sections with steps in proper vertical alignment. Distance from top of rim to top step shall not be greater than 22". Distance from floor of manhole to bottom step shall not be greater than 24".
 2. Manhole steps shall be placed perpendicular to the mainline channel. Do not locate steps over channels.

J. Install manhole frames and covers.

1. In all streets and private roadways the top rim elevation of all manhole frames and covers shall be depressed 1/4" below the elevation of the adjacent street surface.
2. Seal joint between manhole frame and manhole with joint sealant compound.
3. All manholes shall be adjusted to finished street grade utilizing no more than two (4" maximum thickness) adjusting rings. Brick and stone adjustments or the use of metal extension rings shall not be permitted.
4. If the proper adjustment cannot be achieved by the use of two rings, the cone section shall be removed and the proper barrel section inserted.
5. All concrete adjusting rings shall be parged and plastered on the inside and outside with cement mortar one-half (1/2") inch in thickness, carefully spread and thoroughly troweled to a smooth surface on the inside only.
6. Install plastic adjusting rings in accordance with manufacturer's recommendations using approved butyl sealant between cone and ring and between rings.

K. New manholes constructed on existing pipelines:

1. Only cast-in-place manhole bases shall be installed over existing sanitary sewers.
2. Carefully excavate around existing pipeline for placement of the new manhole base.
3. Take all measures necessary to control flow through the existing pipeline and to prevent leakage into the new base.
4. After completion of the manhole, carefully saw and remove the top portion of the existing pipeline.
5. No materials, construction debris, or ground and surface water shall enter the existing pipelines.
6. Upon completion of the connections, a properly sized plumber's stopper shall be placed in the new line and be adequately braced to prevent a "blowout".
7. The stopper shall not be removed until written permission is granted by the Engineer.

L. Concrete wall penetration shall be cored at the sizes and locations indicated on the Construction Drawings or as recommended by the seal manufacturer. Place wall sleeves in the concrete walls in accordance with manufactures requirements.

3.06 SUPPORT OF EXCAVATION: Section 02221

3.07 CONTROL OF EXCAVATED MATERIAL: Section 02221

3.08 DEWATERING: Section 02221

3.09 SHALLOW MANHOLES

- A. All manholes less than five (5') feet in vertical height shall have a flat top section without a cone transition section and shall be constructed in accordance with Standard Detail.

3.10 BACKFILLING

- A. Backfill only after examination of the manhole by the Engineer.

- B. Perform backfilling as specified in Section 02221

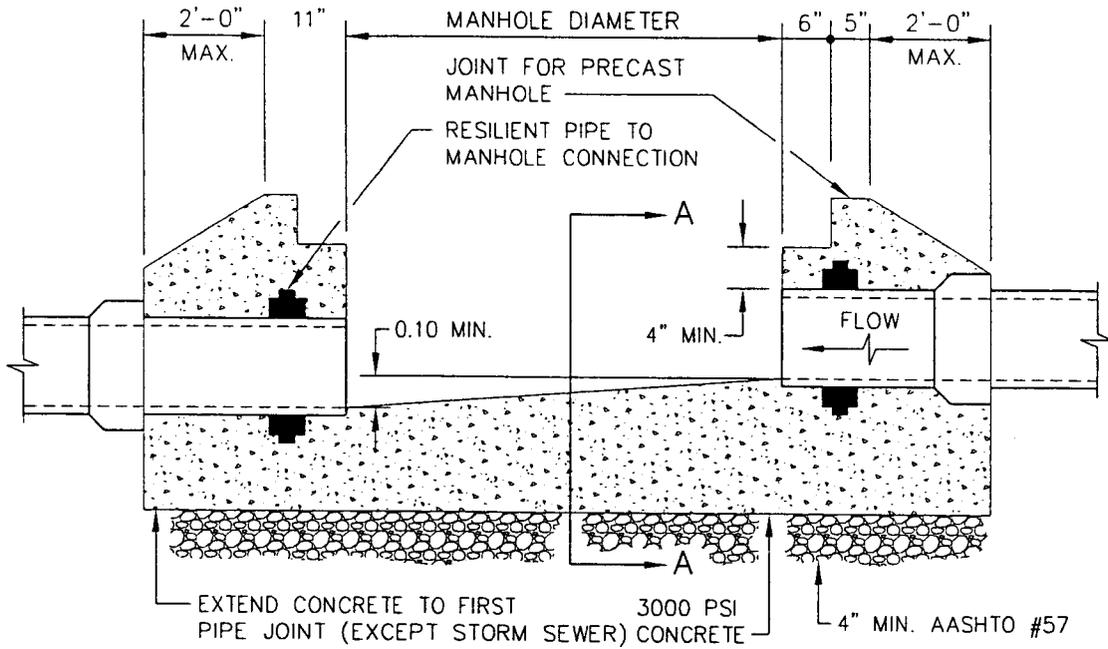
3.11 DISPOSAL OF EXCAVATED MATERIAL: Section 02221

3.12 RESTORATION OF SURFACE AREAS

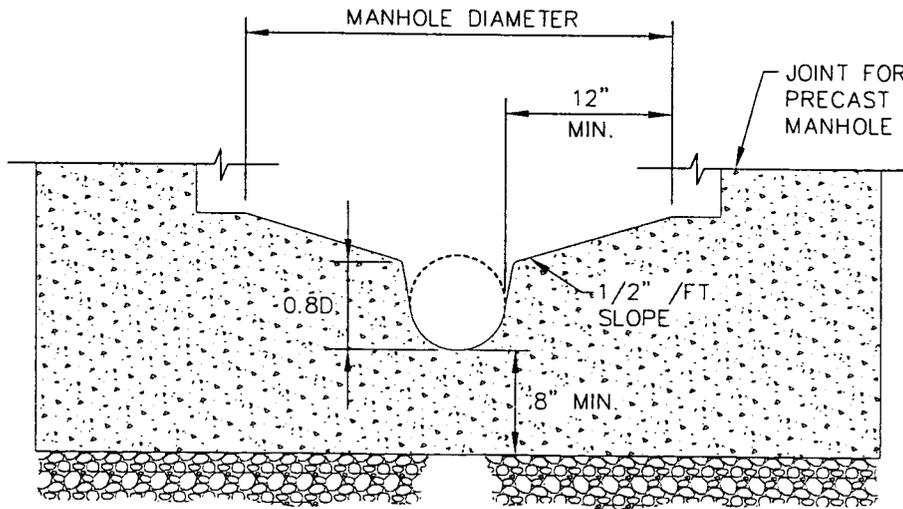
- A. Restore paved areas as specified by appropriate local regulations.

- B. Restore unpaved surfaces as specified in Section 02221.

END OF SECTION



ELEVATION



SECTION A-A

D = PIPE INSIDE DIAMETER

NOTE: NOT TO SCALE

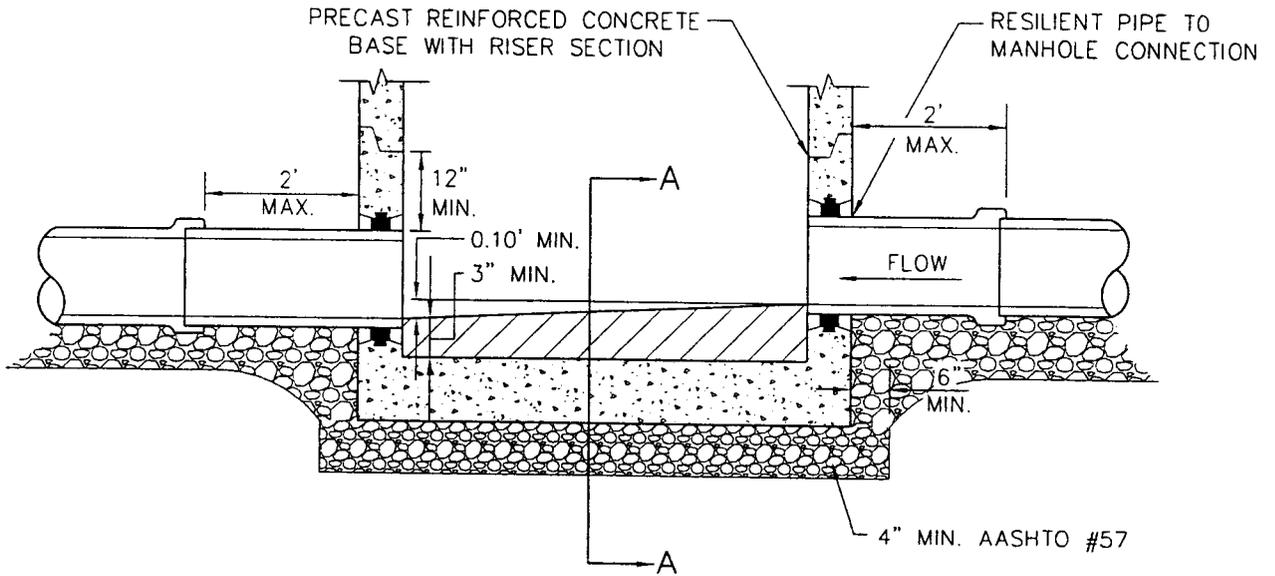
RED LION BOROUGH CONSTRUCTION & MATERIALS SPECIFICATIONS

RED LION BOROUGH
CENTER SQUARE, P.O. BOX 190
RED LION, PA 17356
TELEPHONE: (717)244-3475 FAX: (717)246-0455

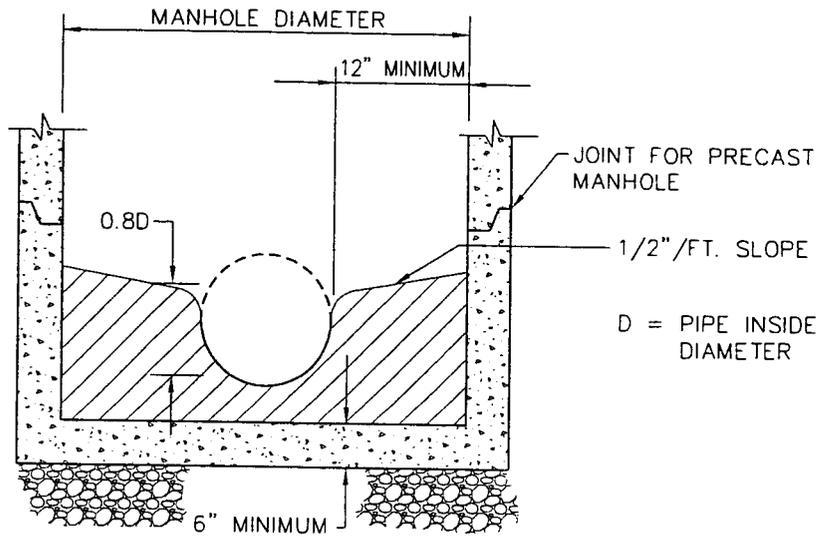
CAST-IN-PLACE
MANHOLE BASE DETAILS

DATE: 9/2005
DRAWN BY: APS
CHK. BY: SJS
NO. 02601-1

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ELEVATION



SECTION A-A

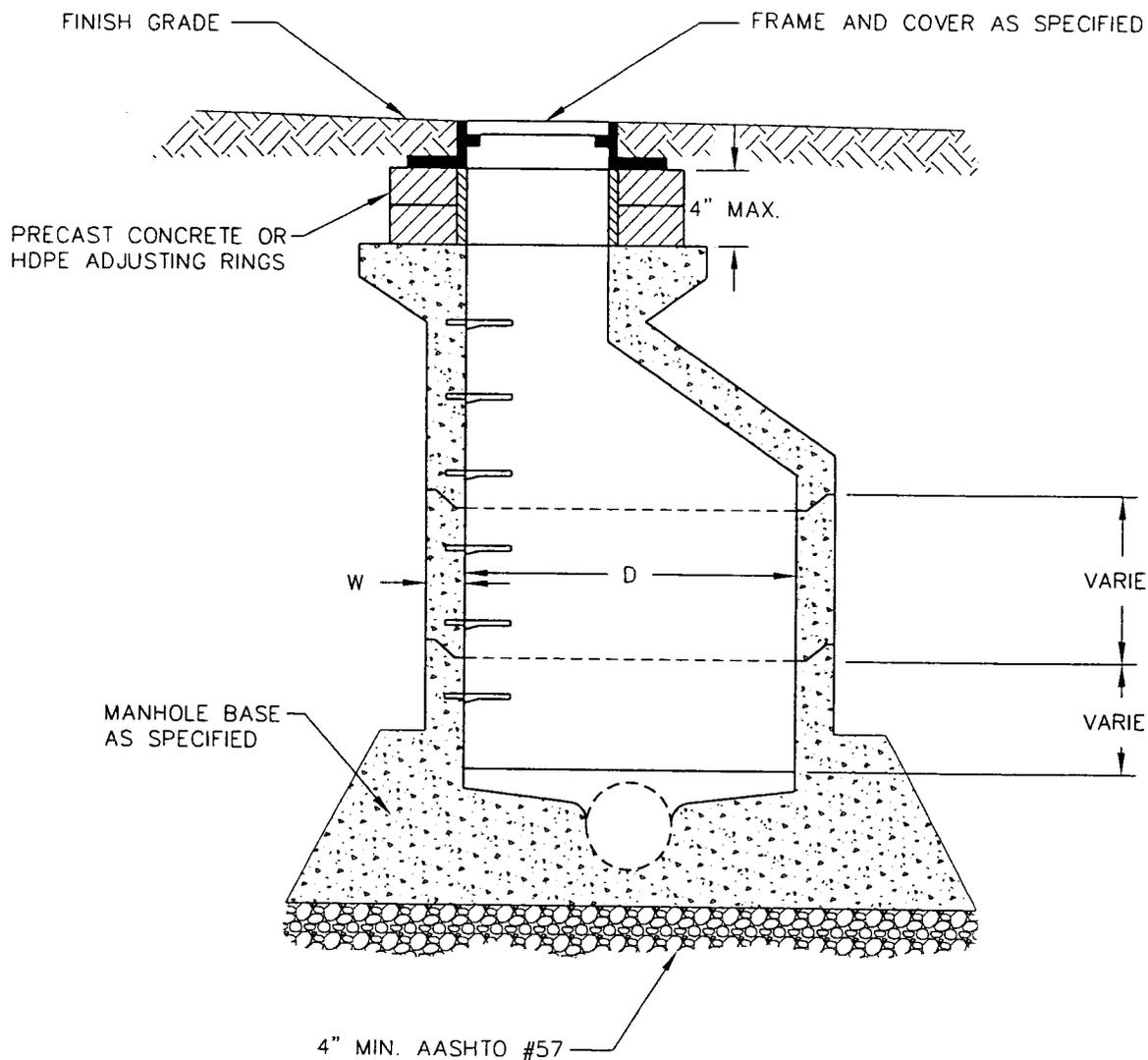
NOTE: NOT TO SCALE

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 CENTER SQUARE, P.O. BOX 190
 RED LION, PA 17356
 TELEPHONE: (717)244-3475 FAX: (717)246-0455

PRECAST MANHOLE
 BASE DETAIL

DATE:	9/2005
DRAWN BY:	APS
CHK. BY:	SKS
NO.	02601-2



D	W
4'-0"	5"
5'-0"	6"
6'-0"	7"

NOTE: NOT TO SCALE

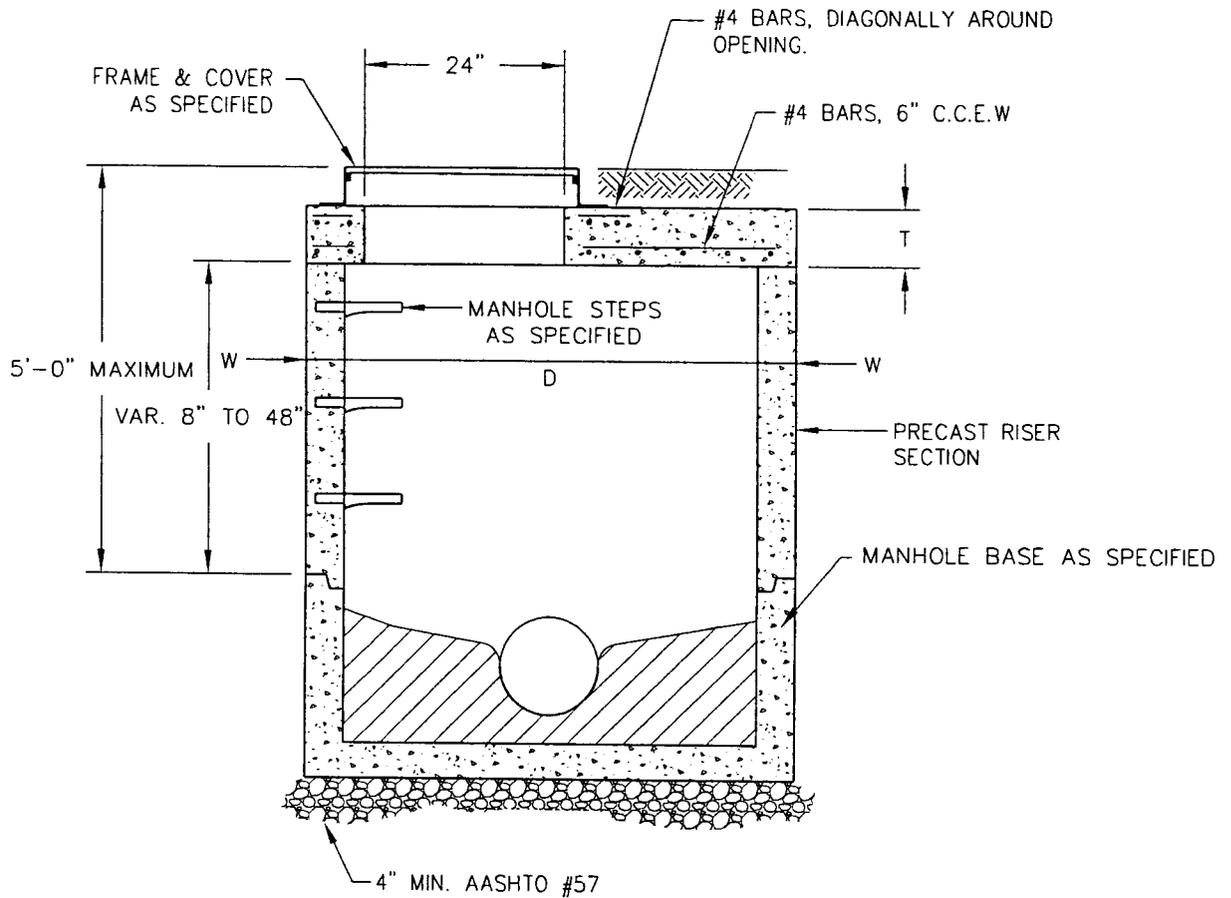
RED LION BOROUGH CONSTRUCTION & MATERIALS SPECIFICATIONS

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RED LION, PA 17356
TELEPHONE: (717)244-3475 FAX: (717)246-0455

STANDARD
MANHOLE DETAIL

DATE:	9/2005
DRAWN BY:	JLD
CHK. BY:	SKS
NO.	02601-3

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D	W	T
4'-0"	5"	6"
5'-0"	6"	8"
6'-0"	7"	8"

NOTE: NOT TO SCALE

RED LION BOROUGH CONSTRUCTION & MATERIALS SPECIFICATIONS

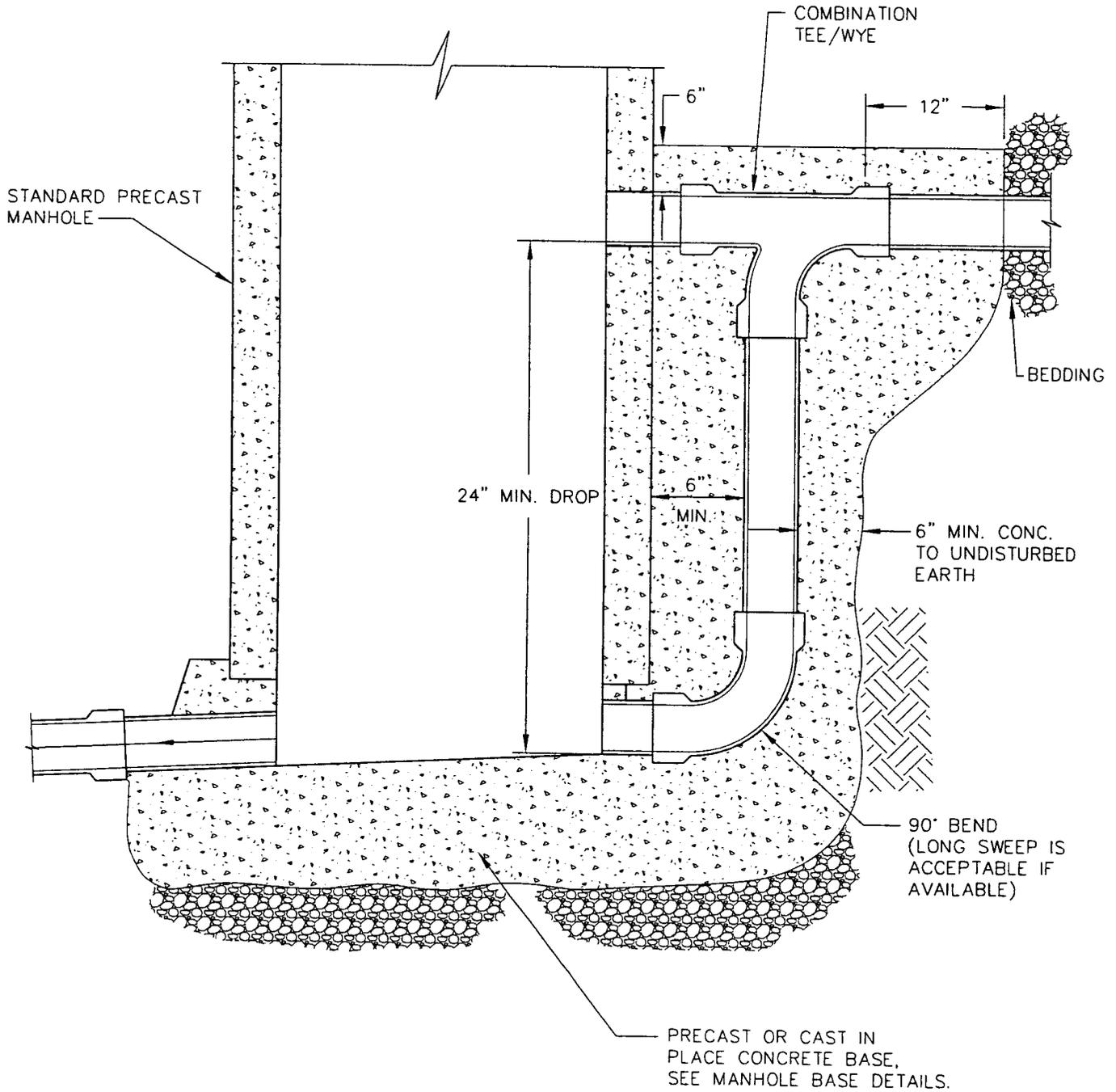
RED LION BOROUGH
CENTER SQUARE, P.O. BOX 190
RED LION, PA 17356
TELEPHONE: (717)244-3475 FAX: (717)246-0455

SHALLOW MANHOLE DETAIL

DATE: 9/2005
 DRAWN BY: JLD
 CHK. BY: *SKS*
 NO. 02601-4

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NOTE: NOT TO SCALE

RED LION BOROUGH CONSTRUCTION & MATERIALS SPECIFICATIONS

RED LION BOROUGH CENTER SQUARE, P.O. BOX 190 RED LION, PA 17356 TELEPHONE: (717)244-3475 FAX: (717)246-0455	DROP CONNECTION DETAIL	DATE: 9/2005
		DRAWN BY: JLD
		CHK. BY: <i>SY</i>
		NO. 02601-5