

Ordinance No. 95- 7

An Ordinance Adopting Lebanon Utility Standards

WHEREAS, the Lebanon Utility Service Board has established standards for the design and construction of water, wastewater collection, and storm sewer facilities to be built within the City of Lebanon service area; and

WHEREAS, the standards are intended for use by developers, engineers, land surveyors, and City Utility Department personnel; and

WHEREAS, the standards are intended to be used as a guide in the design of utilities, understanding there will be circumstances or conditions under which modifications to the design standards may be made; and

WHEREAS, the Common Council of the City of Lebanon, Indiana should approve said utility standards and give said standards the force of law.

NOW, THEREFORE, BE IT ORDAINED BY THE COMMON COUNCIL OF THE CITY OF LEBANON that:

1. The Lebanon Utility Standards for water, wastewater collection and storm sewers as approved by the Lebanon Utility Service Board in April of 1995, copies of which are on file at the Office of the Lebanon Utilities, are hereby approved and adopted herein.

2. The general and specific provisions of said standards are to be made available to developers, engineers, land surveyors, and City Utility Department personnel and employees as necessary for any design and construction of water, wastewater collection, and storm sewer facilities within the City of Lebanon.

3. This Ordinance shall be in full force and effect from and after its passage and any publication which may be required of the same by law.

All of which is considered, approved and adopted by the
Common Council of the City of Lebanon, Indiana, this 22nd day
of May, 1995.

James H. Acton, Mayor
James H. Acton, Mayor

COUNCILPERSONS:

Jack B. Bland
Jack Bland
Douglas W. Campbell
Douglas W. Campbell
John W. Lasley
John W. Lasley
James K. Urban
James Urban

Eric D. Hingate
Eric D. Hingate
Anne Good
Anne Good
David L. Leuck
David L. Leuck

Attest:

Laurie A. Gross
Laurie Gross, Clerk-Treasurer

Presented by me to the Mayor of the City of Lebanon,
Indiana, on the 22 day of May, 1995.

Laurie A. Gross
Laurie Gross, Clerk-Treasurer

APPROVED AND SIGNED by me this 22nd day of May,
1995.

James H. Acton, Mayor
James H. Acton, Mayor
City of Lebanon

March , 1995

**MEMORANDUM
LEBANON UTILITY STANDARDS**

The purpose of this document is to summarize and clarify the Standards established by the Lebanon Utilities Service Board for the design and construction of water, wastewater collection, and storm sewer facilities to be built within the City of Lebanon service area. These Standards are intended for use by developers, engineers, land surveyors, and City Utility Department personnel.

The Standards presented in this document are intended to be used as a guide in the design of utilities. It is understood that there will be circumstances or conditions which may require modifications to these design standards. The Lebanon Utilities Service Board and the Lebanon Utility Department personnel will work with you to resolve conflicts for special situations.

Any comments or suggestions you might have on this document would be welcomed.

Sincerely,

James B. Nelson, P.E.
Utility Manager

CITY OF LEBANON

**STANDARDS FOR WATER, WASTEWATER COLLECTION AND
STORM SEWERS**

Distributed by:
LEBANON UTILITIES SERVICE BOARD

March 1995

TABLE OF CONTENTS

	<u>Page</u>
GENERAL	1
Permits	1
Safety	2
Notification	2
Record Drawings	2
Field Tiles	2
Site Restoration	2
Definitions	3
WATER DISTRIBUTION SYSTEMS	4
Water Mains	4
Hydrants, Valves, and Appurtenances	5
Service Connections	5
WASTEWATER COLLECTION SYSTEM	7
Gravity Sanitary Sewers	7
Manholes	8
Building Laterals	9
Lift Stations	10
Force Mains	12
Special Requirements for Buildings	
Previously Served by Septic Tanks	13
Special Requirements for Commercial/Industrial Customers	13
STORM SEWER SYSTEM	15
Storm Sewers	15
Subsurface Drain	15
Manholes, Inlets and Catch Basins	16

GENERAL

PERMITS

The company or individual proposing to construct water, sewer or drainage structures in the City shall be responsible for the obtainment of all necessary regulatory permits. These permits may include permits from the Indiana Department of Environmental Management, Indiana Department of Natural Resources, Indiana Department of Transportation, Corps of Engineers, Boone County Highway Department, and Boone County Drainage Board.

The required City permits are:

1. Wastewater Collection System Construction Permit;
2. Water Distribution Construction Permit; and
3. Building Permit for any aboveground construction.

Inspection and approval of utilities will not be done until the proper City permits are obtained.

SAFETY

The City is not responsible for safety at the construction site. The Contractor for the project shall be responsible for compliance with all State and Federal Safety Regulations.

NOTIFICATION

The City shall be notified at least 48 hours prior to the commencement of construction of utility structures. The Street Department shall be notified prior to any street closing or traffic restrictions. The Utility shall be notified a minimum of 48 hours prior to any testing of water mains, sewers, or lift stations so that they may have a Utility personnel present at the time of the testing.

RECORD DRAWINGS

Record drawings shall be supplied to the Utility within 90 days of the completion and acceptance of water, wastewater collection, and storm sewer facilities. An AUTO CAD compatible 3.5" computer disk of the record drawings is requested for use by the Utility in updating their digital mapping of the City's sewer system.

FIELD TILES

If field tiles are disturbed during construction, the structure shall be repaired and the location of the tiles shown on the record drawings (as-built) and a copy supplied to the Utilities.

SITE RESTORATION

The Developer/Contractor shall be responsible for the restoration of a project site which is within the road right-of-way or within utility easements. The site shall be restored to its pre-construction condition. Restoration of City streets shall be coordinated with the City's Street Department.

It is suggested that the Contractor video tape the construction area and any access roads used during construction, prior to the commencement of construction. The video tape would document the pre-construction site condition.

DEFINITIONS

City-City of Lebanon

Utility - City of Lebanon Utility Department

Board - City of Lebanon Utilities Service Board

ASTM - American Society for Testing and Materials, latest edition

AASHTO - American Association of State Highway and Transportation Officials, latest edition

AWWA - American Society for Testing and Materials, latest edition

IDOHSS - Indiana Department of Highways Standard Specifications, latest edition

ISDH - Indiana State Department of Health

IDEM - Indiana Department of Environmental Management

WATER DISTRIBUTION SYSTEMS

WATER MAINS

Water main material for all lines 6 inches in diameter or greater shall be cement lined, ductile iron pipe conforming to AWWA C104, C110, C111, C150 or C151, as applicable. Water mains 8 inches or less in diameter shall be Class 50 ductile iron pipe. For lines 10 inches in diameter or greater, ductile iron pipe shall be Class 50 or 350. Ductile iron pipe shall be slip joint type.

All fittings shall be ductile iron with mechanical joints conforming with AWWA C110. Retainer glands shall be manufactured by Tyler Manufacturing Co. or approved equal.

In general, retainer glands shall be installed either side of a fitting whenever the water main direction changes. Concrete thrust blocks may be acceptable for use in lieu of the retainer glands at elbows, tees and plugs. Utility approval of the use of concrete thrust blocks shall be obtained prior to their use.

Whenever concrete poured-in-place thrust blocks are used, bolts and nuts shall be protected by visqueen.

Water mains 4 inches in diameter or less may be PR 20 PVC or Schedule 40 PVC pipe. All nonmetallic pipe shall be laid with a tracer wire.

Depth of cover over the top of the water main shall be a minimum of 4 feet and a maximum of 6 feet unless otherwise approved by the Utility.

Minimum trench width shall be 1.25 times the pipe outside diameter plus 12 inches.

When rubber gasketed PVC pipe is used for the water main construction, the pipe shall be bedded. Bedding for the water mains shall be No. 8 stone from a minimum 4 inches below the pipe barrel to 6 inches above the pipe or per the manufacturer's specification, whichever is greater.

Backfilling of trenches under paved areas or roads or drives (excluding sidewalks) shall be in accordance with IDOHSS, Section 211. The granular backfill shall be placed and compacted in lifts. The granular material shall extend 5 feet beyond the limits of the paved area with a 1:1 slope to the bottom of the trench

Granular backfilling shall not be required when the water main runs parallel with the curb and the trench is more than 2 feet beyond the back of curb.

All water mains shall be hydrostatically tested at a pressure of 150 psi.

All water mains shall be disinfected according to ANSI/AWWA C651-92 standards.

All bacteriological samples must be collected by or with a representative from the Utilities. Two consecutive bacterial samples must pass the ISDH requirements before a new line may be opened to the system and only an Utility employee may open a new line to the system.

All water lines shall be constructed a minimum of 10 feet horizontally and 18 inches vertically from any existing sanitary sewer.

Connection of new water lines to the existing system shall be coordinated with the Utility on a case-by-case basis.

HYDRANTS, VALVES, AND APPURTENANCES

Hydrants specification shall be approved by the Utility prior to construction.

Maximum distance between hydrants shall be 500 feet. Hydrants shall be installed to grade with hose connection situated towards the road.

All hydrants shall be installed with shut-off valves. Both retainer glands and thrust blocks shall be used in the hydrant installation.

Hydrant shall be yellow in color.

All valve operators shall be left to open so as to be consistent with the existing system valves.

Valves shall be epoxy coated with stainless steel bolts and nuts.

SERVICE CONNECTIONS

All service connections shall be Class K copper.

Minimum depth of water service shall be 42 inches.

The services shall be extended a minimum of 2 feet from the curb and terminate with a curb valve. Mark service line location on the curb and, in addition, place a 4x4 post at the curb valve location.

Prior to setting the meter for a new customer, the meter setting for the water service shall pass an inspection by a Utility representative. The meter pit shall

have a locking street-side valve with yoke attachment to the customer's side and an expansion nut attached to a 90 degree elbow or valve. The meter setting shall be set at an elevation 15 to 18 inches below finish grade.

No taps will be allowed prior to ISDH approval of bacteriological sampling of the line.

Prior to meter setting and service connections to commercial and industrial customers, all necessary backflow prevention devices shall be installed. The backflow device shall be installed on the industry's side of the service flow meter.

For all turbo or compound type water meters, a means to lock out the bypass line shall be provided.

All service connections shall be inspected prior to turning on the water service.

WASTEWATER COLLECTION SYSTEM

GRAVITY SANITARY SEWERS

Mainline gravity sanitary sewers and fittings shall be constructed of Polyvinyl Chloride (PVC) meeting the requirements in ASTM D 3034 and ASTM D 1784. The minimum cell classification shall be 12454-B or 12454-C. The pipe and fittings shall have a standard dimension ratio (SDR) of 26.

Pipe shall be the integral wall bell and spigot type with elastomeric seal joints.

Minimum cover over the pipe shall be 52 inches unless otherwise approved by the Utility.

The minimum slope for sanitary sewers shall be:

<u>Pipe Size</u>	<u>Slope</u>
8-inch	0.40%
10-inch	0.28%
12-inch	0.22%
15-inch	0.15%
18-inch	0.12%

Minimum trench width shall be 1.25 times the pipe outside diameter plus 12 inches.

Bedding for the sewer pipe shall be No. 8 stone from a minimum 4 inches below the pipe barrel to 6 inches above the pipe or per the manufacturer's specification, whichever is greater.

For trenches crossing a road or within 2 feet of the roadway, the trench shall be backfilled with granular material. The last 6 inches of the trench below the asphalt or concrete pavement shall be No. 53 stone. The granular backfill shall be placed in lifts and mechanically compacted to 85% maximum dry density per ASTM D 698.

No sanitary line, including laterals, shall be constructed closer than 10 feet horizontally or 18 inches vertically of a water line.

All sanitary sewers shall be tested for watertightness and deflection. A low pressure air test of the line shall be conducted at a pressure of 4 to 6 psi over a 10 minute period. The line shall pass a 5% mandrel deflection test conducted a minimum of 30 days after installation. A representative from the Utility shall be

present for all sewer testing. A forty-eight hour notice shall be given to the Utility prior to the testing.

The sewer contractor shall have the sanitary sewer video taped. The video tape shall include information on the line location, manhole from which the camera is entering and exiting, and line length and size. One copy of the video tape shall be provided to the Utility.

MANHOLES

Minimum inside diameter of sanitary manholes shall be 48 inches.

Manholes shall be pre-cast concrete complying with ASTM C478. The manhole base and first riser section shall be constructed as one complete unit whenever possible. Contact the Utility prior to constructing the base in a different manner.

Cone sections shall be eccentric type.

Joints between all pre-cast manhole sections shall be made with an approved rubber O-ring and a ½ inch diameter non-asphaltic mastic (Kent Seal or equal). A mastic coating shall be applied to both the interior and exterior surface at each joint.

The adjusting rings and top casting shall be sealed using 2 rows of ½ inch extrudable performed gasket material and a coal tar epoxy coating.

All lift holes in the pre-cast sections shall be filled with non-shrink mortar or epoxy grout.

The manhole casting shall be self-sealing type complying with ASTM A 48. All sanitary manholes that follow a stream, swale or open storm channel shall have locking or bolt down lids with an inside seal between the lid and the casting. Manhole lids shall be stamped "SANITARY." Casting shall have a total weight of not less than 340 pounds.

Manholes shall be furnished with steps placed a maximum 16 inches apart with the first step placed no greater than 2 feet below the top of the frame. Steps shall be vertically aligned. The steps shall be made from a steel reinforcing rod encapsulated in a copolymer polypropylene resin.

Bench walls shall be formed in the manhole to provide a smooth transition within the structure.

Pre-cast adjusting rings shall be used to adjust the casting height for manholes. The adjusting rings shall not exceed a total height of 12 inches.

Manholes shall be placed at all changes of grade, size, materials, or alignment.

Maximum distance between manholes shall be 400 feet.

Manholes shall not be installed in a swale or storm water channel without redirecting the storm flow away from the manhole structure.

Unless approved otherwise by the Utility, concrete manhole structures shall be core drilled to allow for line connection. Connection shall be with boot, link seal or "fernco" type adapters.

Where the elevation of a pipe entering a manhole is 24 inches above the invert of the manhole, an outside drop connection shall be provided.

Manholes shall be placed on a minimum of 6 inches of No. 2 crushed stone which has been mechanically compacted. Where unstable or poor soil conditions exist, additional No. 2 crushed stone or Class B concrete shall be placed to form a stable base. Backfill the remainder of the manhole excavation with No. 53 crushed stone. Placed stone in 12 inch lifts and mechanically compacted to 95% maximum dry density per ASTM D 698.

BUILDING LATERALS

Building laterals shall be either SDR 35, SDR 26 or Schedule 40 PVC pipe. Either solvent cement welded joints or flexible gasket push-on compression type joints will be accepted.

Minimum slope of a building lateral shall be $\frac{1}{4}$ inch per one foot unless otherwise approved.

Lateral connections to the mainline sewer shall be a minimum 6 inches in diameter. Lateral size can be reduced beyond this connection to a minimum size of 4 inches in diameter.

A building lateral shall serve one building only.

All sewer laterals constructed within the City's right-of-way or easement shall be bedded in the same manner as the mainline sewer. Bedding for all other laterals shall be No. 8 stone or pea gravel. Bedding shall extend a minimum 4 inches below the pipe barrel to 4 inches above the pipe.

All laterals shall be inspected prior to backfilling. No lateral shall be approved without a diagram showing the depth and position of the line from the mainline sewer to the building. The following information shall be included on the diagram: lot number, address; date and time of installation; pipe material; bedding type and depth; pipe installer; and City Inspector.

Laterals shall be extended one pipe length from the mainline sewer and cap tightly. Mark the location of all laterals on the curb, and place a 4x4 post at the end of the pipe to mark its termination.

No lateral shall discharge directly to a manhole without prior approval from the Utility. Lateral connections at the time of mainline construction shall be at manufactured fittings only. Lateral connections made to existing sewers shall be made using a saddle connection. Direct stubbing of the lateral into an existing or new sewer is prohibited.

A wye cleanout shall be installed within 3 feet, but not closer than 18 inches of the building. The cleanout shall extend to the surface and be properly capped.

No lateral shall be constructed closer than 10 feet horizontally or 18 inches vertically of a water line.

LIFT STATIONS

Lift stations shall be submersible type unless otherwise approved by the Utility.

Lift stations shall be provided with an access road to the nearest public right of way. Access roads shall be constructed to INDOT's specifications for a secondary roadway.

All components of the lift station exposed to the weather shall be constructed of corrosion resistant material which will not require surface protection for the expected life of the lift station.

All of the mechanical and electrical equipment shall be supplied by the pump manufacturer. Pumps shall be submersible, non-clog sewage pumps manufactured by Aurora/Hydromatic or Flygt. The pumps shall be capable of handling a 3-inch spherical solid.

Each pump shall be supplied with mechanical seals. A seal leak detection system shall be provided. A mechanical seal failure shall illuminate a seal failure light.

Each pump shall be equipped with heat sensors mounted directly on the motor windings. If the windings over heat, the heat sensors shall deactivate the pump and sound an alarm.

The motors shall be equipped with current overload protection. Detection of a current overload shall deactivate the pump and sound an alarm.

The lift station wet well shall be provided with a rail system for easy removal of the pumps and motors. The system shall not require entry into the wet well for pump and motor assembly removal.

The lift station basin, base slab and flat top shall be constructed of pre-cast reinforced concrete manhole sections. The basin shall have a minimum inside diameter of 6 feet. The lift station construction shall adhere to the requirements for manhole construction as presented elsewhere in these standards.

The valve vault may be either a pre-cast concrete structure or a poured-in-placed concrete structure. Provide steps into the valve pit only.

The wet well shall be provided with a 4 inch vent having downward pointing inlet and screen over the inlet opening.

An aluminum access hatch shall be provided into the wet well. The size of the hatch shall be adequate to allow for the removal and installation of the pumps. The doors shall have a non-skid finish and be supplied with lifting handle, safety latch to hold door in the open position and a hasp suitable for padlock. A similar access hatch shall be provided for the valve pit with position offset over steps into the valve pit chamber.

All piping from pump discharge elbows through the valve pit and exiting the valve pit shall be ductile iron Class 250 flanged pipe. Valving within the valve vault shall include a weighted swing check valve and a plug valve for each of the pump discharge lines as well as a plug valve on the 4-inch bypass line. A PVC drain pipe and check valve shall be installed to drain the valve pit back to the wet well.

All lift stations shall be provided with (1) portable pump connection for use in case of pump failure and (2) portable generator connection. The pump connections shall be 4-inch male aluminum camlock fitting with cap.

Telemetry shall be provided for all lift stations. The system shall be capable of transmitting signals to the Utility's Ilex SCADA system. Information to be transmitted shall be all pump failures, pump seal failure, overcurrent alarm, high level alarm, pump run with low level cut out on, power failure alarm, and pump failure.

The lift station control panel shall be stainless steel construction, NEMA 4X rating mounted on an aluminum pedestal. The control cabinet shall house the following controls and indication: warning lights for each pump, indicator lights, common alarm, H-O-A switches, silence button, pump alternator, warning reset buttons, relays, heater, surge protection, phase monitoring, hour meters, and a GFI 110 volt, single phase convenience outlet.

All alarms shall be wired such that they will remain on until manually reset.

Each lift station shall have four mercury float switches for pump operation and high level alarm. The float positions shall control the following operations:

1. Level 1 (the lowest setting) - Deactivate All Pumps;
2. Level 2 - Activate Lead Pump;
3. Level 3 - Activate Lag Pump; and
4. Level 4 - Sound Alarm.

A disconnect switch of adequate size for the pumping system shall be provided and housed in a stainless steel enclosure, NEMA 4X rated.

Shop drawings for all equipment and materials shall be supplied to the Utility for approval prior to construction. The Utility shall be notified a minimum of 48 hours in advance of start-up.

Three copies of an operation and maintenance manual and the pump testing results shall be supplied to the Utility at the time the lift station construction is completed.

A warranty for the pumps and the lift station controls shall be provided to the Utility by the manufacturer. The equipment shall be warranted against defects in workmanship and materials for a period of 5 years under normal use, operation and service. A copy of the warranty shall be submitted to the Utility with approved drawings.

FORCE MAINS

Force mains shall conform with ASTM D 2241 and D 1784 (Class 12454 - B, PVC 1120). The minimum pressure class/SDR rating shall be Class 200/SDR 21. The joints shall be push-on type complying with ASTM D 3139. Fittings shall be of the same material and class as the pipe.

Minimum coverage over the top of the force mains shall be 54 inches unless otherwise approved by the Utility.

Minimum trench width shall be 1.25 times the pipe outside diameter plus 12 inches.

All force mains shall have a tracer wire from the valve chamber to the connecting gravity sewer.

Force mains shall be anchored at bends, angles, tees, etc. to resist thrusts. Anchorage shall be attained using restrained pipe joints or concrete thrust blocks.

Force mains shall be designed to avoid the need for air or vacuum relief valves. Where such devices are necessary, the Utility shall approve the design.

Bedding for the force main pipe shall be No. 8 stone from a minimum 4 inches below the pipe barrel to 6 inches above the pipe or per the manufacturer's specification, whichever is greater.

For trenches crossing a road or within 2 feet of the roadway, the trench shall be backfilled with granular material. The last 6 inches of the trench below the asphalt or concrete pavement shall be No. 53 stone. The granular backfill shall be placed in lifts and mechanically compacted to 85% maximum dry density per ASTM D 698.

No force main shall be constructed closer than 10 feet horizontally or 18 inches vertically of a water line. Any sanitary sewer installed above a water main shall be constructed of water main quality pipe.

Force mains shall be hydrostatically tested prior to acceptance. The hydrostatic test shall be conducted in accordance with the applicable AWWA standards.

SPECIAL REQUIREMENTS FOR BUILDINGS PREVIOUSLY SERVED BY SEPTIC TANKS

Connection of a building to the sanitary sewer, which was previously served by a septic tank, will require that the sewer connection bypass the septic tank and that the abandoned septic tank be properly closed per the standards established by the Boone County Board of Health.

SPECIAL REQUIREMENTS FOR COMMERCIAL/INDUSTRIAL CUSTOMERS

All restaurants and food service industries (including schools, motels, etc.) shall install grease traps ahead of their discharge to the City's sanitary sewer system. The sanitary flow shall be separated from the flow passing through the grease trap. The minimum capacity of the grease trap shall be 1000 gallon.

All industries shall comply with the Utility's Pretreatment Ordinance and IDEM requirements.

All industrial manufacturers shall provide the Utility a means of collecting wastewater samples of the industry's plant effluent prior to discharge into the City sewer. The sampling point shall reflect the industrial wastewater and exclude sanitary waste streams.

STORM SEWER SYSTEM

STORM SEWERS

Acceptable pipe material for construction of storm sewers shall meet one of the following:

1. Non-reinforced concrete pipe shall conform with ASTM C14, AASHTO M86, and Federal SS-P-375;
2. Reinforced concrete pipe shall conform with ASTM C76, AASHTO M170, and Federal SS-P-375; and
3. Polyethylene pipe shall conform with ASTM F 405, ASTM F 667, and AASHTO M252 and AASTHO M294.

Minimum cover over the top of storm sewer shall be 30 inches, unless otherwise approved by the Utility.

Minimum pipe diameter shall be 12 inches.

The mainline storm sewer shall be bedded per AASHTO T 99. Bedding shall be a minimum of 12 inches over the top of the pipe. Backfill shall be placed in lifts and mechanically compacted to 85% maximum dry density per ASTM D 698.

Minimum trench width shall be 1.25 times the pipe outside diameter plus 12 inches.

If the mainline storm sewer size is 48 inches in diameter or less, intersecting lines shall occur at either manholes or inlets. For mainline storm sewers greater than 48 inches in diameter, pre-cast wyes or tees may be used for connection of lateral storm sewers or subsurface tile lines to the mainline.

Full pipe velocity shall be not less than 2 feet per second nor greater than 12 feet per second.

SUBSURFACE DRAIN

Subsurface drains shall be a minimum of 6 inches in diameter.

The subsurface drains shall be installed along the curb line for all new storm sewer systems. The subsurface drain shall collect drainage water from sump pumps and building footer drains to the mainline storm sewer.

Subsurface drains shall not cross roadways. When extension of the drainage system requires a road crossing, the line shall be constructed as a storm sewer.

Acceptable materials for subsurface drains shall be:

1. Corrugated polyethylene Tubing, ASTM F 405 and ASTM F 667;
2. PVC Corrugated Pipe with Smooth Interior Walls, ASTM F 949;
3. PVC, ASTM D 2729; and
4. Type PSM SDR 35 PVC Sewer Pipe, ASTM D 3034.

Jointing of subsurface drains shall be by use of external coupling bands, bell and spigot joints, or solvent welding.

Minimum cover over drain shall be 12 inches. Drain shall be bedded in No. 8 stone.

MANHOLES, INLETS AND CATCH BASINS

Manhole structures shall be pre-cast reinforced concrete structures meeting the requirements of ASTM C478.

Catch basins and inlets shall be pre-cast structures complying with ASTM C890.

Minimum inside diameter of manhole structures for storm lines 24 inches in diameter or smaller shall be 48 inches. Minimum inside diameter of manhole structures for storm lines are greater than 24 inches in diameter shall be 60 inches.

Bench walls shall be formed in the manhole and inlet structures to provide a smooth transition within the structure.

Manholes shall be furnished with steps placed a maximum 16 inches apart with the first step placed no greater than 2 feet below the top of the frame. Steps shall be vertically aligned. The steps shall be made from a steel reinforcing rod encapsulated in a copolymer polypropylene resin.

Manholes shall be placed on a minimum of 6 inches of No. 2 crushed stone which has been mechanically compacted. Where unstable or poor soil conditions exist, additional No. 2 crushed stone or Class B concrete shall be placed to form a stable base. Backfill the remainder of the manhole excavation with No. 53 crushed stone. Placed stone in 12 inch lifts and mechanically compacted to 95% maximum dry density per ASTM D 698.

Pre-cast adjusting rings shall be used to adjust the casting height for manholes. The adjusting rings shall not exceed a total height of 12 inches.

Pre-cast concrete spacers shall be used to adjust the casting height for inlets. The maximum height of the concrete spacers shall be 12 inches.

A soil tight seal shall be provided for the manhole and inlet structures. The seal shall be a trowelable grade butyl rubber or a non-asphaltic mastic, such as Kent Seal. A seal shall be provided for the manhole structures between each riser ring and between the riser ring and the casting. A seal shall be provided for the inlet structure between the pre-cast inlet and the pre-cast spacer, between each spacer and between the spacer and the casting.

Manhole covers shall have a solid lid casting. The castings shall be a minimum of 340 pounds. The lid shall be marked "STORM."

A manhole or inlet shall be installed at the end of each line.

Manholes shall be places at all changes of grade, size, materials, or alignment.

Maximum distance between manholes shall be 400 feet.

Unless approved otherwise by the Utility, concrete manhole structures shall be core drilled to allow for line connection. The opening shall be patched with concrete from both the interior and exterior of the manhole.

W1003.hsc