

LEOLA SEWER AUTHORITY

SPECIFICATIONS FOR

ADDITIONS AND EXTENSIONS TO

THE SEWER SYSTEM

AUGUST 2007

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AGREEMENT

MADE and entered into this _____ day of _____, 19__, by and between LEOLA SEWER AUTHORITY, a municipal authority organized and existing under the Municipality Authorities Act of 1945, as amended, of Lancaster County, Pennsylvania (hereinafter called "AUTHORITY"), and _____ (hereinafter called "OWNER").

WHEREAS, Owner, at its expense, desires to construct and convey to Authority certain sewer facilities and appurtenances, to serve Owner's proposed development known as _____, in Upper Leacock Township, Lancaster County, Pennsylvania, on condition that Authority furnish sewer service to the same; and

WHEREAS, Authority is willing to do this, provided said sewer facilities and appurtenances are constructed at Owner's sole expense in accordance with plans and specifications approved by Authority's Engineers and provided the obligation of the Authority in relation to the same is clearly defined.

NOW, THEREFORE, KNOW ALL MEN BY THESE PRESENTS, that the parties hereto, intending to be legally bound hereby, for themselves and each of their respective heirs, personal representatives, successors and assigns, do, jointly and severally, covenant and agree as follows:

1. Owner agrees to construct sewer facilities and appurtenances in the locations as shown on plans prepared by Sheets ____ through ____ inclusive, dated _____. Said plans and related specifications are incorporated herein by reference thereto. Owner agrees to provide Authority with a completion bond insuring the completion of the sewer facilities and appurtenances (as shown on the aforementioned plans and specifications), issued by a reputable insurance company and approved by the Authority's Solicitor as to form and manner of execution, comparable to the bonding provided to the Township of Upper Leacock for completion of the streets, etc., in Owner's subdivision. Said bond shall be in an amount equal to one hundred ten percent (110%) of the cost of said sewer facilities, as estimated by Authority's Engineer. In Authority's discretion, a letter of credit drawn on a lending institution acceptable to Authority, in the form and manner approved by Authority's Solicitor, may be substituted, in Authority's discretion, for said completion bond.

2. Authority agrees to accept said facilities upon completion, provided that:

- A. Owner has complied fully with the plans and specifications;
- B. Approval of grades and locations has been obtained from all appropriate municipal bodies;
- C. Owner shall obtain a Highway or Township Road Occupancy Permit from the Department of Highways of the Commonwealth of Pennsylvania or the appropriate municipality for any laying of a line on public highways (if any), shall pay all expenses in connection with

compliance with state or local requirements, and shall hold Authority harmless from any cost in connection with state or local requirements;

D. Owner shall obtain a permit from the Pennsylvania Department of Environmental Resources for construction of the sewer facilities, (as required), shall pay all expenses in connection with compliance with state or local requirements, and shall hold Authority harmless from any cost in connection with state or local requirements;

E. In the event Owner engages a contractor to construct the facilities, Authority must approve in advance the selection of the contractor and the right is retained by Authority to require that the contractor selected have prior experience in construction of sewer facilities of the type specified;

F. That Owner has prepared and delivered to the Authority, record plans (one (1) set of reproducible mylars and three (3) sets of prints) delineating the sewer facilities actually installed. The record plans shall clearly show the location of the sewer facilities and shall be free of extraneous markings which may obscure the water facilities. The material, size and location of all facilities shall be shown. The location of all valves, fittings, manholes, cleanouts, pumping stations, and grinder pump units shall be triangulated on the plans. In addition, the following gravity lateral sewer information shall be provided: manhole run, station, length of lateral from centerline of sewer main, invert elevation or depth at termination point of lateral, and the address or property owner's name for whom the lateral is provided. The adequacy of the record plans will be determined by the Authority, in its sole discretion. In addition to the record plans, two (2) sets of equipment shop drawings shall be provided to the Authority when requested.

G. That Owner has paid all cost of review and inspection as required in Section 6 of this Agreement.

3. Owner agrees that upon Authority's acceptance of said facilities, title to said facilities as shown on _____, attached hereto, together with all appurtenances thereto, shall be and remain at all times in Authority, its successors and assigns.

4. It is understood by the parties hereto that title to the aforementioned sewer facilities shall be and remain in Owner until such time as said sewer facilities are accepted by Authority, and it is further understood that Authority will accept said sewer facilities only after completion and a final inspection and approval of said facilities.

5. Upon acceptance of said sewer facilities by Authority, Owner shall convey to Authority rights-of-way or easements for sewer facilities and appurtenant facilities which have been located on private property. Said rights-of-way or easements shall be permanent and shall be in form (legal documentation) satisfactory to the Authority. In the case of rights-of-way or easements for sewer lines, said rights-of-way or easements shall be twenty (20) feet in width. Installed sewer facilities shall be conveyed by bill of sale.

6. The Authority will require review of the proposed facilities in addition to inspection and testing during construction of the sewer facilities. The Owner agrees to pay the cost of any and all reviews, inspections and testing as well as all legal fees incurred by the Authority in connection with this project of Owner, and will deposit with the Authority, prior to the start of construction, cash in an amount sufficient to cover these costs. The amount of the deposit will be determined by the Authority. The Authority will make payments from the account to cover the actual review, inspection, legal and testing costs. Any monies remaining after completion of the facilities shall be returned to the Owner.

If additional money is required to complete the review, inspection testing work or legal fees, the Owner agrees to provide such funds prior to acceptance of the facilities by the Authority.

7. In the event the Owner must perform excavation and construction work within a highway right-of-way and is, therefore, required to obtain a Highway Occupancy Permit from the Pennsylvania Department of Transportation, then Authority agrees to apply for such a permit on behalf of Owner in consideration for the Owner's agreement to indemnify Authority against all costs, losses or claims resulting from the construction. Owner hereby agrees, for itself, its contractees, licensees and all others engaged in installing, maintaining or using the sewer facilities to be connected to the Authority's sewer system, that the Authority, its successors and assigns and its agents and consulting engineers, shall not be liable for injury to or death of any person whomsoever or for loss or damage to property in the possession, custody or control of such Authority while said excavation and construction work is being performed. Owner further agrees to protect, indemnify and save harmless the Authority, its successors and assigns and its agents and consulting engineers, from and against any and all liability, loss, cost, damage, expense and claims of every kind and character due to injury to or death of any person or loss of or damage to any property whatsoever arising directly or indirectly out of and incident to the installation of the connection of the sewer facilities between the facilities owned by the Authority and the Owner's land, which connection will be over the land controlled by the Pennsylvania Department of Transportation and will be the subject of the permit which the latter will issue to the Authority.

8. If, in the construction work, the Owner will be required to use certain blasting operations in the excavation, the Owner agrees to make, execute and deliver to the Commonwealth of Pennsylvania, Department of Transportation, a certificate of insurance as stipulated by the Department of Transportation. All policies shall name the Authority as well as the Commonwealth of Pennsylvania as insured parties, and conditioned that the Owner will save harmless the Authority as well as the Commonwealth of Pennsylvania, Department of Transportation, from any damages whatsoever to its subgrade, subbase, modified subbase, drainage facilities, road metal and any other installments or matters in, under or upon the highway right-of-way for a period of two (2) years from the date of completion of the last work covered by the Highway Occupancy Permit issued to Authority by the Commonwealth of Pennsylvania, Department of Transportation.

9. Owner hereby guarantees for a period of eighteen (18) months from the date of acceptance of the sewer facilities by the Authority, the stability of all materials and equipment (including grinder pumps, controls, etc.) and the workmanship of all labor. Owner further agrees to correct and/or replace all defective materials, equipment, and pumps, and controls, and work, as well as all shrinkage, settlement or other faults of any kind whatsoever arising from the construction, at its own expense and to the satisfaction of the Authority when notified in writing by the Authority to do so.

To secure the aforesaid guarantee, the Owner shall provide the Authority with one of the following:

A. A letter of credit from a commercial banking institution acceptable to the Authority and approved by the Authority's Solicitor as to form and manner of execution for the faithful performance thereof. Said letter of credit shall be for a period of eighteen (18) months commencing from the date of acceptance of the sewer facilities and shall be in an amount equal to fifteen percent (15%) of the Authority engineer's estimate of construction cost but not less than \$5,000.00; or

B. A surety bond issued by a reputable insurance company acceptable to the Authority and approved by the Authority's Solicitor as to form and manner of execution for the faithful performance thereof. Said surety bond shall be for a period of eighteen (18) months commencing from the date of acceptance of the sewer facilities and shall be written in a face amount equal to fifteen percent (15%) of the Authority engineer's estimate of construction cost but not less than \$5,000.00; or

C. A cash payment to be maintained by the Authority in a non-interest bearing escrow account for a period of eighteen (18) months from the date of acceptance of the sewer facilities in an amount equal to fifteen percent (15%) of the Authority engineer's estimate of construction cost but not less than \$5,000.00.

10. This Agreement has been executed by Authority pursuant to an oral motion approved at its meeting duly and lawfully held on _____, 19__.

IN WITNESS WHEREOF, this Agreement has been executed by the parties hereto, the day and year first above written.

LEOLA SEWER AUTHORITY

By:

Chairman

(AUTHORITY SEAL)

Attest:

Secretary

OWNER

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SECTION 1 - GENERAL INFORMATION

1.1 SCOPE

These specifications cover the requirements for additions and extensions to the Leola Sewer Authority's sewer system. All additions and extensions shall be completed in accordance with the requirements of the Leola Sewer Authority and these specifications. The work shall include furnishing of all plans, labor, new materials, equipment, supplies, transportation, fuel and power and performing all work as required by the specifications and including such detail drawings as may be required to perform the work. The work shall be executed in the best and most workmanlike manner by qualified, careful and experienced workmen.

The Leola Sewer Authority reserves the right to establish special supplemental requirements for any given addition or extension based upon unique features of the specific project, recent changes in standard sewer system operating and construction practices which may not be reflected within the specifications as herein contained, or for other legal or administrative reasons which the Authority may identify.

1.2 SUBMITTALS

Prior to the start of construction, the developer shall submit utility plans for the project to the Authority for review. The Authority will approve Step 3 requests for sewer service only after approval of these utility plans.

These plans may be part of subdivision or land development plans prepared to meet regulatory requirements pertaining to land development activities, or the plans may be specially prepared to meet the requirements of the Leola Sewer Authority. Four copies of each set of submission documents will be submitted to the Authority. The Authority will cause the proposed additions or extensions, as described in the plans and supporting documentation to be reviewed by its engineer, solicitor, and Authority staff, as required. When the plans describing the proposed work are found to be acceptable for construction, four copies of the final plans shall be submitted to the Authority for its use during observation of construction. As necessary, additional sets of drawings may be required for attachments to legal agreements which address the provisions through which the extension or addition to the system may be constructed.

All drawings shall show the location of the sewer lines, valves, fittings, manholes, cleanouts, pump stations, grinder pump units, and other necessary sewer appurtenances required for the completion of the work. All drawings shall incorporate both a plan view and a profile drawing which shall contain the proposed location of the sewer lines, along with the location of the existing and proposed water lines, storm sewers, sanitary sewers, and other underground utilities within the project site.

All drawings shall contain details for the proposed sewer facilities. Details should be sufficient for construction of the facilities, and should include, but not necessarily be limited to, restoration details, casing cradle detail, cleanout details, air vacuum valve details, grinder pump stations and other appurtenances, electrical details, vault and manhole details, and details of specific connections to the sewer system.

In the case of submissions which are clearly incomplete or which are significantly non-responsive to the Authority's standards for system additions and extensions, the Authority will reject the proposed submission without extensive review, pending the receipt of plans which reasonably address the Authority's requirements. It shall not be the Authority's responsibility to design such extensions or additions.

Following completion of construction, the following shall be submitted to the Authority: 3 copies of As-built Plans, CD with full-sized scans of final submitted plan set in both .pdf (Adobe Acrobat) and .jpg formats, CD with final plan submitted in both CAD and ArcGIS format is defined as appropriate shapefiles or geodatabase files being created for each data layer in the final plan. Include metadata for description of layer names and attributes fields information included with each layer. All data must be projected to PA state plane south zone, NAD 83 and NAVD 88, feet. (Lancaster County's GIS standard projection).

1.3 AUTHORITY REVIEW COSTS

The developer shall agree to pay all engineering, legal and administrative costs incurred by the Authority in the review of the utility plans. These costs shall be in addition to and separate from any costs which may be required by the Township or the County Planning Agency.

1.4 DEVELOPER'S AGREEMENT

In all cases where a sewer line will be extended, the Developer shall enter into an agreement with the Authority before commencing any work on the project. A sample agreement between the Authority and the Developer is included in Appendix 2 for reference. The Authority reserves the right to add to, delete from, or modify this sample agreement from time to time, and as required by the specific circumstances of each specific project.

1.5 TAPPING, CONNECTION AND CUSTOMER FACILITIES FEES

The Developer and/or property owner shall pay tapping, connection, and customer facilities fees as required by the Authority's resolution governing the same.

1.6 CONSTRUCTION COMPLETION SECURITY

The Developer shall provide the Authority with security to insure completion of the sewer facilities. This security shall be in the amount of one hundred ten percent (110%) of the construction cost of these facilities. Said security shall be in the form of a completion bond issued by a reputable insurance company and approved by the Authority's Solicitor as to form and manner of execution. In the Authority's discretion, a letter of credit drawn on a lending institution acceptable to the Authority, in the form and manner approved by the Authority's Solicitor, may be substituted, in Authority's discretion, for said completion bond.

1.7 OBSERVATION OF THE WORK

The Developer shall establish with the Leola Sewer Authority an escrow account in an amount sufficient to cover the established cost of construction observation, engineering expenses, administrative expenses, legal expenses, and other charges related to the proposed construction. The amount of the escrow fund for construction-related activities shall be established by the Authority. The Developer, acting through its contractor, shall notify the Leola Sewer Authority no less than three (3) days in advance of the commencement of construction work, so that appropriate construction observation time may be scheduled. Testing of all sanitary sewer facilities shall be done in the presence of the Authority personnel or representatives, and in accordance with the Authority's requirements. No work may be performed in the absence of construction observation, and any work performed without construction observation shall be re-excavated, exposed and observed by the Leola Sewer Authority's representatives as ordered by the Authority. Any defective work, or work not conforming to the specifications is to be replaced to the satisfaction of the Authority at no expense to the Authority. The allowable work days are Monday through Friday of any week excluding holidays. Should the escrow account be depleted prior to completion of the construction, additional escrow funds shall be deposited by the Developer with the Authority. Any unused escrow funds shall be returned to the Developer upon completion of the construction.

1.8 RECORD PLANS AND SHOP DRAWINGS

Before acceptance of system extensions and additions, the Developer shall prepare and deliver to the Authority, record plans (one (1) set of reproducible mylars, one (1) set of GIS record drawings and three (3) sets of prints) delineating the sewer facilities actually installed. The record plans shall clearly show the location of the sewer facilities and shall be free of extraneous markings which may obscure the sewer facilities. The material, size and location of all facilities shall be shown. The location of all valves, fittings, manholes, cleanouts, pump stations, and grinder pump units shall be triangulated on the plans. In addition, the following gravity lateral sewer information should be provided: manhole run, station, length of lateral from centerline of sewer main, invert elevation or depth at termination point of lateral, and the address or property owner's name for whom the lateral is provided. The adequacy of the record plans will be determined by the Authority, in its sole discretion. In addition to the record plans, two (2) sets of shop drawings for equipment incorporated into the work shall be provided to the Authority for review and

approval prior to construction.

The developer shall include the following notes on the plan sets submitted to the Authority.

- A. Shop drawings shall be submitted to the Authority for review and approval prior to construction.
- B. The Authority shall receive notification no less than one week prior to the start of construction. A pre-construction conference shall be held with the Authority and a construction schedule and emergency contact list shall be submitted to the Authority prior to starting the work.
- C. Testing of all sanitary sewer and water facilities shall be done in the presence of the Authority personnel or representatives, and in accordance with the Authority's requirements.
- D. Following completion of construction, The following shall be submitted to the Authority:
 - a. 3 copies of As-built Plans.
 - b. A CD with full-sized scans of final submitted plan set in both .pdf (Adobe Acrobat) and .jpg formats.
 - c. CD with final plan submitted in both CAD and ArcGIS format is defined as appropriate shapefiles or geodatabase files being created for each data layer in the final plan. Include metadata for description of layer names and attributes fields information included with each layer. All data must be projected to PA state plane south zone, NAD 83 and NAVD 88, feet. (Lancaster County's GIS standard projection).

1.9 ACCEPTANCE OF SYSTEM EXTENSIONS AND ADDITIONS

After any sewer facilities which have been added to or extended from the existing system, have been satisfactorily tested and approved by the Authority's representatives, and have been placed in operation, the Authority will notify the Developer of its intention to accept dedication of the facilities. No sewer facility shall become the responsibility of the Leola Sewer Authority until a deed of dedication has been fully executed by the Developer and accepted by the Authority. For a period of eighteen (18) months after the date of dedication, the Developer shall guarantee the stability of all materials and equipment and the workmanship of all labor, and shall correct and/or replace all defective materials, equipment and work at its own expense and to the satisfaction of the Authority when notified in writing by the Authority to do so. The Developer shall provide the Authority with security for the aforesaid guarantee in the amount of fifteen percent (15%) of the Authority Engineer's opinion of construction cost but not less than \$5,000.00. Said security shall be in the form of a letter of credit from a commercial banking institution acceptable to the Authority and approved by the Authority's Solicitor as to form and manner of execution; or a surety bond issued by a reputable insurance company acceptable to the Authority and approved by the Authority's Solicitor as to form and manner of execution; or a cash payment to be maintained by the Authority in a non-interest bearing escrow account. Should the Developer not promptly address any defects in the work, the Authority will invoke its security guarantee to provide funds for the repairs.

1.10 MATERIAL PURCHASE

All components of the grinder pump units including grinder pumps, basin, and electrical equipment are available from and should be purchased from the Leola Sewer Authority, unless otherwise determined by the Authority.

1.11 INSTALLATION RESPONSIBILITY

A. *Individual Connections to Existing Low Pressure Sewer Mains:*

1. The Authority will install the low pressure lateral sewer from the Authority's existing low pressure sewer main in the street to and including the valve and cleanout at the street right-of-way line. The property owner will install all facilities, from the valve and cleanout at the street right-of-way line to the building, including the grinder pump unit components purchased from the Authority.

B. *Individual Connections to Existing Gravity Sewer Mains:*

1. The Authority will install the gravity sewer lateral from the Authority's existing gravity sewer main in the street to the street right-of-way line. The property owner will install the house connection from the street right-of-way line to the building.

C. *Low Pressure Sewers in New Developments:*

1. The Developer will install all sewer facilities up to and including the valve and cleanout at the street right-of-way line of each lot. This includes those portions of the sewer system defined as low pressure sewer mains and force mains, and low pressure lateral sewers in Section 3, Paragraph 3.1. The Developer or each property owner will install all facilities from the valve and cleanout at the street right-of-way line to the building, including the grinder pump unit components purchased from the Authority.

D. *Gravity Sewers in New Developments:*

1. The Developer will install all sewer facilities up to the street right-of-way line, including those portions of the sewer system defined as gravity sewer mains and gravity lateral sewers in Section 2, Paragraph 2.1. The Developer or each property owner will install the house connection from the street right-of-way line to the building.

1.12 RIGHT-OF-WAY

Before a sewer permit will be issued, each property owner must execute and submit a notarized Agreement Providing for Grant of Sewer Easement which grants a right-of-way to the Authority for access to each grinder pump unit.

1.13 DESIGN FLOW

Design calculations shall be submitted to the Authority which show the calculated average daily flow for the development. Design flows shall be based upon 200 gallons per day per equivalent dwelling unit.

1.14 INDUSTRIAL/COMMERCIAL CONNECTIONS

All industrial/commercial connections shall be in strict conformance with these specifications and with the requirements of the Pennsylvania Department of Environmental Protection (PA DEP). Any industrial/ commercial customer which will require a pump greater than 3 hp shall construct and maintain its own pump station.

Since sewage from the Authority's system is treated at the City of Lancaster's South Wastewater Treatment Plant, all dischargers of industrial waste to the Authority's system shall obtain an industrial waste discharge permit, or exemption of same, from the City of Lancaster.

SECTION 2 - GRAVITY SEWER MAINS

2.1 GENERAL

A. *Definitions:*

1. *Gravity Sewer Main:* Collecting sewer which conveys flow by gravity from individual buildings to a pumping station or interceptor.
2. *Gravity Lateral Sewer:* That part of the Sewer System extending from a gravity sewer main to the street right-of-way line.
3. *House Connection:* That part of the sewer system extending from a gravity lateral sewer (for gravity connections), or the grinder pump tank (for low pressure connections) to the main house drain or sewer line extending from the outer building wall or foundation wall.

B. See Section 1, paragraph 1.11 for installation responsibility.

C. Gravity lateral sewers, house connections, and all fittings shall be furnished and installed in strict accordance with these Specifications. Any and all practices and precautions required for the gravity sewer mains are equally applicable to the gravity lateral sewers and house connections. The Developer shall place a 2" x 4" wooden marker at the end of each sewer lateral unless connecting directly to an existing main house drain. The marker shall be one piece and may not be constructed from two or more smaller pieces. The marker shall extend from the lateral invert to 36" above grade.

2.2 MATERIALS

2.2.1 *General: All materials shall be new and manufactured within one (1) year prior to date of installation.*

2.2.2 *Polyvinyl Chloride Sewer Pipe: For 6" and 8" Pipe, Type PSM SDR-35 PVC pipe and fittings shall conform to ASTM D3034. For 4" Pipe, Schedule 40 PVC Solvent Weld.*

1. Minimum gravity sewer main diameter shall be 8".
2. Minimum gravity sewer lateral diameter shall be 6".
3. gasket, suitable for conveying domestic sewage, and shall conform to ASTM D3212.
4. Minimum gravity sewer house connection diameter shall be 4".

5. Fittings shall conform to same applicable ASTM specification required for pipe.

2.2.3 *Cast-In-Place Concrete Manholes:*

A. *Materials:*

1. Portland Cement: ASTM C150 of the following Type:
 - a. Type II, Moderate Sulfate Resistance.
2. Normal Weight Aggregates: Meeting requirements of ASTM C33.
3. Water: Potable quality, clean and free of injurious amounts of oil, acid, alkali, organic matter, suspended matter, and other deleterious substances,
4. Concrete Admixtures:
 - a. *Air-Entraining Admixture:* Use a product conforming to ASTM C260, certified by manufacturer to be compatible with other required admixtures.
 - b. *Water-Reducing Admixture:* ASTM C494, Type A, and containing not more than 0.1 percent chloride ions.
 - c. *High-Range Water-Reducing Admixture (Super Plasticizer):* ASTM C494, Type F or Type G and containing not more than 0.1 percent chloride ions.
 - d. *Water-Reducing, Non-Chloride Accelerator Admixture:* ASTM C494, Type E, and containing not more than 0.1 percent chloride ions.
 - e. *Water-Reducing, Retarding Admixture:* ASTM C494, Type D, and containing not more than 0.1 percent chloride ions.
 - f. *Prohibited Admixtures:* Calcium chloride thyocyanates or admixtures containing more than 0.1 percent chloride ions are not permitted.
5. *Moisture-Retaining Cover:* One of the following, complying with ASTM C171:
 - a. Waterproof paper.
 - b. Polyethylene film.
 - c. Polyethylene-coated burlap.

6. *Liquid Membrane-Forming Curing Compound*: Liquid type membrane-forming curing compound complying with ASTM C309, Type I, Class A. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.

- a. *Acceptable Manufacturers*:

- 1) Masterseal; Master Builders.
- 2) L&M Cure; L & M Construction Chemicals.
- 3) Or LSA Approved.

B. *Proportioning and Design of Mixes*:

1. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301.

2. *Design Mixes*: Provide normal weight concrete with the following properties:

- a. 3000 psi 28-day compressive strength.

3. *Admixtures*:

- a. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.

- b. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).

- c. Use high-range water-reducing admixture in pumped concrete; concrete required to be watertight, and concrete with water/cement ratios below 0.50.

- d. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1-1/2 percent within the following limits:

- 1) Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or subjected to hydraulic pressure:

- a) 4.5 percent (moderate exposure); 5.5 percent (severe exposure) 1-1/2" max. aggregate. 4.5 percent (moderate exposure); 6.0 percent (severe exposure) 1" max. aggregate.

- b) 5.0 percent (moderate exposure); 6.0 percent (severe exposure) 3/4" max. aggregate.

- c) 5.5 percent (moderate exposure); 7.0 percent (severe exposure) 1/2" max. aggregate.

4. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
 - a. 3000 psi W/C Ratio: 0.58 maximum (non air-entrained), 0.46 maximum (air-entrained).
5. *Slump Limits*: Proportion and design mixes to result in concrete slump at point of placement as follows:
 - a. Slump: Not less than 1" nor more than 4".

C. *Concrete Mixes*:

1. *Job-Site Mixing*: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cubic yard, or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cubic yard, increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cubic yard, or fraction thereof.
2. *Ready-Mix Concrete*: Comply with requirements of ASTM C94/C94M, and as herein specified.
 - a. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94/C94M may be required.
 - b. When air temperature is between 85° F (300C) and 90° F (320C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90° F (320C), reduce mixing and delivery time to 60 minutes.

D. *PVC Waterstop*: Gasket type composed of virgin polyvinyl chloride (PVC) for use with cast-in-place base.

1. *Acceptable Manufacturers*:
 - a. Fernco Joint Sealer Co.
 - b. Or LSA Approved.

2.2.4 *Precast Reinforced Concrete Manhole*:

- A. Materials should conform to requirements specified in ASTM C478 except as follows:
1. *Concrete*: Composition and compressive strength conforming to ASTM C478 except use Type II cement in manhole components and increase compressive strength to 4500 psi (at 28 days) in precast bases.

2. *Casting and Curing:* Wet cast and steam curing process in accordance with Section 3.6.11 and 3.7.2 of AWWA C302.
 3. *Manhole Component Seals:* Manhole component joints factory formed for self-centering concrete to concrete bearing employing a preformed plastic sealing compound as specified in Section 2.2.10.
 4. *Manhole Component Design:* Base, tapered and straight riser section, and top section dimensions and diameters consistent with ASTM C478.
- B. *Manhole Precast Top Sections:* Designs of materials and construction as specified above except additional and differing requirements as follows:
1. *Frame Hold Down Bolt Insets:* Factory cast in top section, four (4) 3/4-inch slotted, moveable, polypropylene-coated, threaded inserts, of 3 inches depth, to accommodate manhole frame hold down bolts. Inserts shall be designed for an ultimate load in tension of 12,500 pounds. Inserts shall be factory plugged for shipping. Coordinate insert location with frame manufacturer to assure proper location in top sections.
 - a. *Acceptable Manufacturers:*
 - 1) Thunderstuds
 - 2) A-LOK bolt slot Insert
- C. *Pipe Opening Seals - rubber Gaskets (for new manholes):* Resilient rubber gasket type, cast integrally with manhole component conforming to requirements specified in ASTM C923.
1. *Acceptable Manufacturers:*
 - a. A-LOK Products: A LOK Manhole Pipe Seal.
 - b. Or approved equal.
- D. *Pipe Opening Seals - Mechanical Pipe Seals (for existing manholes):* Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be connected with stainless steel bolts to form a continuous belt.
1. *Acceptable Manufacturers:*
 - a. Thunderline Corp; LinkSeal.
 - b. Or approved equal.

- E. *Pipe Opening Seals - Expandable Sleeve and boot Seals (for new or existing manholes):* Shall consist of a stainless steel expandable sleeve, rubber boot and stainless steel take-up ring installed to manufacturer's specifications. Pipe opening seals shall conform to ASTM C923.

1. *Acceptable Manufacturers:*
 - a. Press Seal PSX.
 - b. Kor-N-Seal.
 - c. Or approved equal.

2.2.5 *Standard Manhole Frame and Cover:* Gray iron castings conforming to ASTM A48/A48M, Class No. 30, designed for AASHTO Highway Loading Class HS-25. Provide castings of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion or other defects.

- A. *Finish:* Bearing surfaces machined to prevent rocking and rattling under traffic. Casting surfaces shotblast cleaned and coated with asphalt paint, non-tacky drying.
- B. *Identification:* Cast the word SANITARY integrally on 24" cover in 2-inch size raised letters.
- C. *Frame Hold-Down bolts:* ASTM A307.
- D. *Tensile Test Bar:* Size B, cast separately, but poured from same iron as castings they represent.
- E. *Acceptable Manufacturers:*
 1. Neenah Foundry Company.
 2. Modena Foundry.
 3. Or approved equal.

2.2.6 *Watertight Manhole Frame and Cover:* Gray iron castings conforming to previously specified requirements for Manhole Frame and Cover with the addition of cover hold-down bolts (inner sealing lid, gasket, and locking bar).

- A. *Cover Hold-down Bolts:* Type 316 stainless steel, ASTM A276, bolts and washers; or manufacturer's standard bronze bolts and washers.
- B. *Inner Sealing Lid:* Gray iron casting with steel locking bar and stainless steel locking screw. Provide rubber gasket of commercial grade rubber.

- C. *Acceptable Manufacturers:*
1. Neenah Foundry Company.
 2. Modena Foundry.
 3. Or approved equal.

2.2.7 *Flexible Pipe Coupling:* Clamped design with virgin PVC coupling and two type #305 stainless steel bands.

- A. *Acceptable Manufacturers:*
1. Fernco Joint Sealer Co.
 2. The General Engineering Company.
 3. Or LSA Approved.

2.2.8 *Non-Shrink Non-Metallic Grout:* Factory pre-mixed material containing no corrosive irons, aluminums, chemicals or gypsums.

- A. Grouts containing water reducers, accelerators, or fluidifiers shall have no drying shrinkage greater than the equivalent sand cement and water mix as tested per ASTM C596.
- B. Grout shall be non-shrink before initial set and show no expansion after set as tested per ASTM C827.
- C. Initial set of grout not less than 60 minutes per ASTM C191 Test.
- D. Use Type I (Normal) cement for grout applications.
- E. *Acceptable Manufacturers:*
1. U.S. Grout Corporation; FIVE STAR.
 2. Or LSA Approved.

2.2.9 *Manhole Steps:* Co-polymer polypropylene plastic steel reinforced step, conforming to ASTM D4101, Type II, Grade 43758 with a 1/2 inch Grade 60 reinforcing rod conforming to ASTM A615, and step having serrated tread with tall end lugs; or 3/4-inch diameter aluminum alloy 6061-T6, similar to design to R-1982-W as manufactured by the Neenah Foundry Co., Neenah, Wisconsin. The distance between rungs shall be 12 inches. The rungs shall have a minimum clear rung width of 10-1/2 inches. Manhole steps shall be grouted in place using a non-shrink, nonmetallic grout, cast-in-place, or driven into polypropylene inserts.

Manhole steps shall be positioned in the manhole in such a manner so as to permit easy entrance and exit from the manhole and so as not to conflict with any pipes or valves. The first step shall be no further than 24 inches from the top of the manhole. The Authority reserves the right to have steps tested according to the latest revision ASTM Specification C478.

2.2.10 *Preformed Plastic Sealing Compound:* Fed. Spec. SS-S-210A, Type 1, Rope Form, of either bitumastic base compound or butyl rubber base compound, and shipped protected in a removable two-piece wrapper. Size cross-section of rope form to provide squeeze-out of material around entire interior and exterior circumference when joint is completed.

A. *Acceptable Manufacturers:*

1. Henry Sealant Division; RUB-R-NEK.
2. Press-Seal Gasket Corp.; Ex-Stik.
3. Or LSA Approved.

2.2.11 *Outside Manhole Coatings:* Prepare outer surfaces of manholes in accordance with the written instructions of the coating manufacturer, including cleaning, sandblasting, or acid etching as necessary.

Coat precast components at the factory.

A. *Acceptable Manufacturers:*

1. Koppers Company, Inc.; Bitumastic No. 300-M, 20 mil minimum thickness.
2. Pennsbury Coating Corp.; Bitu-Chem No. 32-B-4 Pennoxy-Tar, 20 mil minimum thickness.
3. Or LSA Approved.

2.2.12 *Inside Manhole Coatings:* Prepare inside surfaces of manholes in accordance with the written instructions of the coating manufacturer.

Coat inside of manholes, including piping, valves and appurtenances with an epoxy resin to the extent directed by the Authority and in accordance with the manufacturer's recommendations.

A. *Acceptable Manufacturers:*

1. Conlux; Epoxide 34, Ceramic White.
2. Or LSA Approved.

2.2.13 *External Sealing System:* Consisting of multi-section, continuous bands, placed overlapping each other. All bands should be the same and full adhesive backing (12"). All bands shall be 60 mil minimum thickness. Bands shall be provided with butyl-rubber type sealant at the point of connection to the manhole cone/top, over the lip of the manhole frame and at overlapping band joints.

A. *Acceptable Manufacturers:*

1. Infishield.
2. Or LSA Approved.

2.2.14 *Interior Plastic Liner:* Air release manholes, manholes to which Force Mains discharge and the next five (5) manholes downstream, and other manholes as required shall be fitted with thermoplastic liners. Liners shall be semirigid PVC formed to fit manhole contours.

- A. Liner sheets formed with dove-tail ribs to accommodate factory casting integrally in each manhole component.
- B. Provide liner in white color to reflect light.
- C. Protection between the lined manhole and the frame and cover shall be obtained by installing either a PVC telescoping connector, of the same manufacturer as the liner, or a one-piece liner cover manufactured from semirigid PVC.

D. *Acceptable Manufacturers:*

1. A-LOK Products, Inc.; Dura Plate 100.
2. Ameron Protective Linings; T-Lock PVC Liner.
3. Or approved equal.

2.2.15 *Saddles (PVC):* Correctly contoured for outside diameter of pipe and incorporating ring gasket bell outlet.

- A. Wye or tee saddle of same material as specified previously for sewer pipe.
- B. *Solvent Cement:* ASTM D2564.

C. *Acceptable Manufacturers:*

1. Romac.
2. General Engineering.
3. Or LSA Approved.

2.2.16 *Pipe Plugs:* Designed for permanent installation and removable. Compatible with pipe.

2.2.17 *Manhole Precast Grade Rings:* Leveling and adjusting units of 3-inches or 4-inches thickness of materials and constructions as specified previously. Factory cast grade rings with hold down bolt holes matching location of same in manhole frame. Design must provide for full bearing of manhole frame.

2.3 INSTALLATION

A. *Pipe Installation:*

1. *General:* Grade of pipe and distance between manholes must meet all requirements in the most recent PA DEP Domestic Water Facilities Manual. All pipe shall be laid to a uniform line and grade, bell ends upgrade, with a firm and even bearing along the barrel of the pipe, close joints and smooth invert. The spigot end of the pipe is to be centered in, shoved tight and secured against the bell of the previously laid pipe. The interior of each pipe shall be cleaned of all excess joint and foreign material before the next pipe is laid. The pipe shall be laid in the backfill materials as specified in Section 6. Pipe-laying shall commence at the lowest point and proceed upgrade. At the close of each day's work, and at such other times when pipe is not being laid, the open end of the pipe shall be protected with a close fitting stopper. Installation and joint assembly of plastic pipe shall be in accordance with ASTM D2321. Gravity lateral sewers and house connections shall be constructed at a minimum 1% slope.

B. *Manholes - General:*

1. Manholes shall be placed at each change of grade, size or alignment of the pipe, and at all intersections. Terminal cleanouts will not be accepted. The maximum distance between manholes shall not exceed 400 linear feet.
2. The invert channels shall be smooth, with the bottom of the channel semicircular in shape conforming to the inside of the adjacent sewer section, and the sides rising vertically to the height of the crown of the largest diameter pipe entering or exiting the manhole. Changes in direction of flow shall be with a smooth curve of the largest radius that the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly. The invert channels may be precast in the factory or formed in the field. The floor of the manhole outside of the channels shall be smooth and shall slope toward the channels at a minimum slope of one inch per foot and a maximum slope of two inches per foot.

C. *Cast-In-Place Manholes:*

1. *Concrete Placement:*
 - a. *General:* Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.

- b. *Cold Weather Placing:* Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306.
 - c. *Hot Weather Placing:* When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305.
- 2. *Concrete Curing and Protection:*
 - a. *General:* Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 - 1) Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than seven days.
 - 2) Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
 - b. *Curing Methods:* Perform curing of concrete by curing and sealing compound, by moist curing, by moisture retaining cover curing, and by combinations thereof, in accordance with ACI 308.
- 3. *Quality Control:*
 - a. Sampling and testing for quality control during placement of concrete may include the following, as directed by the Authority:
 - 1) *Sampling Fresh Concrete:* ASTM C172, except modified for slump to comply with ASTM C94/94M.
 - 2) *Slump:* ASTM C143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - 3) *Air Content:* ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 - 4) *Concrete Temperature:* Test hourly when air temperature is 40 degrees F (4 degrees C) and below, and when 80 degrees F (27 degrees C) and above; and each time a set of compression test specimens made.
 - 5) *Compressive Strength Tests:* ASTM C39; one set for each day's pour exceeding five cubic yards plus additional sets for each 50 cubic yards over and above the first 25 cubic yards of each concrete class placed in any one day; one specimen tested at seven days, two specimens tested at 28

days, and one specimen retained in reserve for later testing if required.

4. *Construction Methods:*

- a. Vibrate poured concrete using mechanical vibrator of a type and design approved by Authority. Use vibrators of type capable of transmitting vibration to concrete in frequencies of not less than five thousand impulses per minute.
- b. Form and pour joint monolithically in manhole base top to match joint of adjoining precast riser section. Use template as obtained from precast concrete manhole component manufacturer of manhole components used in the project.
- c. Do not place precast riser sections on cast-in-place bases for a minimum of 48 hours after pour.
- d. Install sewer piping in cast-in-place manhole bases prior to pouring the concrete.
 - 1) Apply epoxy bonding compound in accordance with manufacturers instructions to pipe at base connection prior to pouring the concrete.
 - 2) Install PVC waterstop on pipes entering and leaving manhole base prior to pouring concrete. Install PVC waterstop in accordance with manufacturer's written instructions.

D. *Precast Concrete Manhole Bases:* Install bases on a 6-inch deep compacted layer of aggregate meeting requirements of pipe bedding as specified in Section 6.

1. When using prefabricated pipe opening seals for connecting pipes into manholes, and such seals create an annular space on interior and exterior of manhole wall after pipe connection is made, fill such annular spaces with preformed plastic sealing compound.
 - a. Tightly caulk sealing compound into annular spaces, completely filling the spaces, and render the installation watertight.
 - b. Following sealing compound installation, trowel compound surface smooth and flush with interior face of manhole.

E. *Concrete Channel Fill in Manhole Base:* Field pour concrete channel fill for each manhole base.

1. Form inverts directly in concrete channel fill.
2. Accurately shape invert to a semi-circular bottom conforming to inside of connecting pipes, and steel trowel finish to a smooth dense surface.
3. Make changes in size and grade gradually.
4. Make changes in direction of entering sewer and branches to a true curve of as large a radius as manhole size will permit.
5. Make slopes gradual outside the invert channels.
6. Use 3000 psi concrete.

- F. *Manhole Wall Erection:* Provide precast reinforced concrete straight riser, tapered riser and top sections necessary to construct complete manholes. Fit the different manhole components together to permit watertight jointing true vertical alignment of manhole steps.
1. If rubber compression gaskets are used between sections, install gaskets and join sections in accordance with written instructions of manhole component manufacturer.
 2. If preformed plastic sealing compound is used between sections, install sealing compound in accordance with manufacturer's recommendations, and join sections also in accordance with written instruction of manhole component manufacturer.
 - a. Prime joint surfaces if required by preformed sealing compound manufacturer.
 - b. If sealing compound is installed in advance of section joining, leave exposed half of two piece protective wrapper in place until just prior to section joining.
 - c. Use preformed sealing compound as the sole element utilized in sealing section joints from internal and external hydrostatic pressure.
 - d. Following manhole section installation, trowel sealing compound surface smooth and flush with interior face of manhole.
- G. *Precast Manhole Lifting Hole Sealing:* Seal with properly designed tapered rubber plugs. Drive plugs into holes in such manner to render holes completely water and air tight. Sealing of lifting holes with grout not permitted.
- H. *Manhole Frame and Cover Installation (For Low Pressure Manholes Only):*
1. Where required, make final adjustment of frame to elevation using precast grade rings:
 - a. Set precast grade rings in water-proof mortar. Mortar thickness not to exceed 3/4-inch maximum and 3/8-inch minimum. Wet, but do not saturate precast grade rings immediately before laying.
 - b. Pre-set grade rings to proper plane and elevation using wedges or blocks of cementitious material not exceeding one square inch wide on all sides. No more than four wedges or blocks per grade ring permitted. Incorporate wedges or blocks in fresh mortar in a manner to completely encase each. Crown fresh mortar to produce squeeze-out between grade rings. Tool exposed joints with appropriately shaped tool and compact mortar edge into joints. Clean off excess mortar prior to initial mortar set.
 2. Bolt manhole frames in place on manhole top section, or on leveling units if required, after installing 1/2-inch thick preformed plastic sealing

compound on bearing surface of manhole frame. Remove excess sealing compound squeeze-out after manhole frame is bolted in place.

3. Use bolts of sufficient length to properly pass through leveling units, if any, engage full depth of manhole top section inserts and allowing enough threaded end to pass through manhole frame to properly tighten nut and washer. Tighten manhole frame bolts after mortar has cured.

I. *Plugging Pipe Openings:* Plug pipe openings in manholes where such openings are required for future pipe connections.

1. Use masonry units and waterproofed mortar laid up to prevent deterioration.
2. Install such materials to meet exfiltration limits to allow future removal without damage to manhole.

J. *Sewers on Steep Slopes:*

1. Sewers on 20 percent slope or greater shall be anchored securely with concrete anchors or equal, spaced as follows:
 - a. Not over 36 feet center to center on grades 20 percent and up to 35 percent.
 - b. Not over 25 feet center to center on grades 35 percent and up to 50 percent.
 - c. Not over 16 feet center to center on grades 50 percent and over.

K. *Handling of Materials Into Trench:*

1. Proper implements, tools and facilities satisfactory to the Authority shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings, jointing materials, etc. shall be carefully lowered into the trench piece-by-piece by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to sewer line materials and/or workmen. Under no circumstances shall such materials be dropped or dumped into the trench.

L. *Pipe Clearance in Rocks:*

1. Ledge rock, boulders and large stones shall be removed to provide a clearance of at least 6 inches below and on each side of all pipe and fittings. This specified minimum clearance is the minimum clear distance which will be permitted between any part of the pipe and/or fitting being laid and any part, projection or point of such rock, boulder or stone.
2. If rock is encountered during the installation of the lateral, the Contractor shall extend the lateral to provide a minimum "rock-free" distance of one

foot beyond the end of the lateral. No lateral shall be "butted" against rock.

M. *Concrete Cradle and Encasement:*

1. *Preparation:* Prior to the formation of the cradle or encasement, temporary supports consisting of timber wedges and solid concrete bricks or cap blocks shall be used to support the pipe in place. Temporary supports shall have minimum dimensions and shall support the pipe at not more than two locations, one at the bottom of the barrel of the pipe adjacent to the shoulder of the socket and the other near the spigot end.
2. *Placing:* After jointing of the pipe has been completed, concrete shall be uniformly poured beneath and on both sides of the pipe. The concrete shall be wet enough during placement to permit its flow, without excessive prodding, to all required points around the pipe surface. The width of cradle shall be such as to fill completely the trench width. In case of extremely wide trenches, concrete encasement may be confined above the top of the pipe to a narrower width but in no case shall it be less than the size of pipe being used plus one (1) foot.
 - a. Before depositing concrete, the space within the limits of the pour shall have been cleared of all debris and water. Water shall not be allowed to rise adjacent to, or flow over, concrete deposited for at least 24 hours. Concrete shall be protected from the direct rays of the sun and kept moist, by a method acceptable to the Authority, for a period of seven days or until backfilling is begun. In no case shall backfilling begin within 24 hours of the time of placing and the Authority shall have strict control of the rate of backfilling.

N. *Connections to Existing Manholes or Structures:*

1. Core required opening or openings using a coring machine. No other methods of cutting the opening will be permitted. Core openings of sufficient size to permit installation of flexible pipe-to-manhole connector with positive expansion-type seal.

O. *Drop Connections:*

1. Make drop connections where drop in invert is two feet or more or as required by the Authority. Use same pipe material used to construct the main from which the drop connection is made. Construct drop connection in accordance with the Standard Sanitary Manhole Drop Connection Detail.

P. *Service Connections:*

1. *General:* Fittings, wye branches, and service pipe shall be provided in strict accordance with these specifications and any and all practices and precautions required for the gravity sewer main are equally applicable to the service connections. The developer shall place a 2" x 4" wooden marker at the end of each sewer lateral. The marker shall be one piece and may not be constructed from two or more smaller pieces. The marker shall extend from the lateral invert to 36 inches above grade.
2. *Wye Branches:* Wye branches shall be used in all new installations. Saddles will not be permitted.
3. *Saddles (PVC):* Place saddle in position on pipe and mark guide for hole cut-in, using saddle as a template. Remove saddle from pipe and using hole guide mark, cut hole through pipe wall 1/2-inch outside the hole guide mark.
 - a. Install saddle in accordance with manufacturer's installation instructions for solvent weld sewer saddle connections.
 - b. After saddle is satisfactorily installed, completely concrete encase sewer pipe and saddle to a minimum thickness of 12 inches and extend encasement along the sewer pipe 12 inches minimum on each side of center line of the saddle.

Q. *Watertight Frame and Covers:*

1. Watertight frame and covers shall be used in all areas where the manhole is subject to flooding.

2.4 TESTS

A. *Pipe Alignment:* After the mains have been laid and backfilled, a light will be flashed between manholes to determine whether the alignment of the sewer is true and whether any pipe has been displaced, broken or otherwise damaged subsequent to laying. This test will again be conducted before final acceptance of the sewer. Each section (manhole to manhole) of sewer shall show a good full light circle throughout its length and any and all defects shall be corrected by the Contractor, to the satisfaction of the Authority, before the work shall proceed and before acceptance shall be made.

B. *Pipe Leakage Tests Using Low Pressure Air:*

1. *Air Testing:* The Developer shall test each section of sewer between manholes and all laterals with low pressure air. Testing shall not be performed, until all backfilling has been completed. The Developer may, at his option, test the section of sewer for his own purposes, prior to

completion of backfilling; however, the requirements of this subsection shall not be deemed to be completed until the lines have been tested after the backfilling has been completed and trench settlement has been minimized. The costs of any testing incurred prior to authorization from the Authority after backfilling has been completed shall be borne by the Developer.

2. A minimum of two minutes shall be provided before test readings commence to allow equilibrium of the air temperature with the pipe wall. The rate of air loss shall be determined by measuring the time interval required for the average internal pressure to decrease by 1.0 psig.
3. The initial test pressure to be developed in the sewer and laterals shall be determined as follows:
 - a. For depths six (6) feet or less, the internal pressure shall not be less than 6.0 psig.
 - b. For depths greater than six (6) feet, the internal pressure in psig shall be calculated as the sum of 3.5 psig plus the maximum height in feet (divided by 2.3 to get psig) between the invert of the sewer and the existing ground surface in the section of sewer to be tested. (For example, if the maximum height is determined to be 9.2 feet, the added pressure would be 4.0 psig. The initial test pressure in the sewer would then be 7.5 psig. The allowable drop would be to 6.5 psig within the time indicated in the table below.)
 - c. In no case shall the test pressure in the sewers or laterals be greater than the maximum internal differential joint pressure recommended by the manufacturer of the pipe.
4. The pipe shall be considered acceptable if the air loss rate does not exceed 0.0030 cubic feet per minute per square foot of internal pipe surface when tested at the initial pressure previously defined in this subsection. The time for the air pressure to decrease 1.0 psig shall not be less than the time indicated in the following table:

<u>Pipe Diameter</u>	<u>Minutes</u>	<u>Seconds</u>
8"	3	57
10"	4	43
12"	5	5
15"	7	5

5. If the above rate of leakage (0.0030 cfm/sf) is exceeded, the Developer shall, at his expense, determine source of leakage and make all necessary corrections and retest.

6. The Developer shall submit to the Authority for approval the detailed test procedure and list of test equipment he proposes to use prior to testing.

C. *Pipe Infiltration:*

1. After the air testing described in the preceding paragraph has been completed by the Developer, regardless of any indications of the test results made by the Authority, the Authority reserves the right to perform field investigations, prior to final written acceptance of each sewer run by the Authority and/or during the maintenance period specified elsewhere in these specifications, to establish the leakage of groundwater into the sewer and laterals constructed under this contract. The cost of these investigations shall be borne by the Authority.
2. Should the leakage exceed 100 gallons per day per inch diameter per mile of pipe for any section, the Developer shall, at the direction of the Authority, and at no cost to the Authority, perform any additional testing or corrective work required to reduce the infiltration in each manhole run from those lines installed by the Developer to less than 100 gallons per day per inch diameter per mile of pipe. This leakage applies to each manhole run separately and should not be construed to mean total leakage in the total system. The scope of this corrective work shall include, but not be limited to, cleaning, televising and testing the sewer and laterals to the limits installed by the Developer. It shall also include testing and grouting of joints, excavation and replacement of faulty or damaged portions of the work, and all final restoration.

D. *Manhole Testing - General:* Test each manhole constructed in the project by one of the methods specified herein. If the manhole is constructed on an existing sewer where sewage flow must be maintained, the test will be waived.

1. Conduct tests in presence of and to complete satisfaction of the Authority.
2. Should a manhole not satisfactorily pass testing, discontinue manhole construction in the project until such manhole does test satisfactorily.
3. Provide tools, materials (including water), equipment and instruments necessary to conduct manhole testing specified herein.
 - a. Vacuum Testing Equipment:
 - 1) Use vacuum apparatus equipped with necessary piping, control valves and gauges to control air removal rate from manhole and to monitor vacuum.
 - 2) Provide an extra vacuum gauge of known accuracy to frequently check test equipment and apparatus.
 - 3) Vacuum testing equipment and associated testing apparatus subject to Authority's approval.

- 4) Provide seal plate with vacuum piping connections for inserting manhole frame.
4. Prior to testing manholes, thoroughly clean such and seal openings, both to complete satisfaction of the Authority. Seal openings using properly sized plugs.
5. Perform testing with frames installed. The joint between the manhole and the manhole frame shall be included in the test.
6. The Developer may elect to make a test prior to backfilling for his own purposes; however, the tests of the manholes for acceptance shall be conducted after the backfilling has been completed.

E. *Vacuum Test Procedure:*

1. Perform vacuum testing in accordance with the testing equipment manufacturer's written instructions.
2. Draw a vacuum of 10 inches of mercury and close the valves.
3. Consider manhole acceptable when vacuum does not drop below 9 inches of mercury for the following manhole sizes and times:
 - a. 4-foot diameter - 60 seconds. 5-foot diameter - 75 seconds.
 - b. 6-foot diameter - 90 seconds.

F. *Repair and Retest:* Determine source or sources of leaks in manholes failing acceptable limits.

1. Repair or replace defective materials and workmanship, as is the case, and conduct such additional manhole acceptance tests and such subsequent repairs and retesting as required until manholes meet test requirements.
2. Materials and methods used to make manhole repairs must meet with Authority's approval prior to use.
3. Make repairs, replacements and retests at no additional expense to owner.

G. *Acceptance:* Observation of successful testing of manholes or sewers by the Authority does not constitute acceptance of the system or any portion thereof. Only upon final inspection by the Authority and upon written acceptance for same will the system or portion thereof be considered substantially completed. Upon such acceptance, the warranty period as specified in Section I will commence.

1. If, during this final inspection, any irregularities are observed, the condition must be corrected at the Developer's expense prior to acceptance.

SECTION 3 - LOW PRESSURE SEWER MAINS AND FORCE MAINS

3.1 GENERAL

A. *Definitions:*

1. *Low Pressure Sewer Main and Force Main:* Sewers which convey sewage flows, by means other than gravity, from grinder pump stations and pumping stations to a pumping station or interceptor. Typically, sewer mains conveying sewage flow from pumping stations are considered force mains. All other sewer mains conveying sewage flows under pressure are considered low pressure sewer mains.
2. *Low Pressure Sewer Lateral:* That part of the sewer system extending from a low pressure sewer main or force main to the valve and cleanout at the street right-of-way line.
3. *Low Pressure Service Line:* That part of the sewer system extending from a low pressure sewer lateral to a grinder pump tank.

B. See Section 1, paragraph 1.11 for installation responsibility.

C. Low pressure sewer laterals, low pressure service lines, and all fittings shall be furnished and installed in strict accordance with these Specifications. Any and all practices and precautions required for the low pressure sewer mains and force mains are equally applicable to the low pressure sewer laterals and low pressure service lines.

3.2 MATERIALS

A. *Polyvinyl Chloride Pipe, Fittings, and Joints (PVC):*

1. PVC pipe conforming to ASTM D1784, ASTM D2241, and ASTM D2672, SDR-21; minimum class 200 psi.
 - a. *Acceptable Manufacturers:*
 - 1) Certain-Teed.
 - 2) Eslon Thermoplastics.
 - 3) J-M Pipe.
 - 4) Or LSA Approved.

2. *Fittings and Joints:*
 - a. *Buried Fittings and Joints:*(see details 36 and 38) Fittings and joints shall be PVC Schedule 80, gasketed fittings conforming to ASTM D1784 and ASTM D2466.
 - 1) Minimum Class: 200 psi.
 - 2) Mechanical Restraint: Mechanical restraint shall be Uni-Flange Block Buster Pipe Restraint system or equal and are only used on Ductile Iron or C900 4-inch and larger pipe.
 - 3) Concrete Restraints and PVC Thrusting are used on pipe less than 4 inches.
 - b. *Fittings in Vaults and Manholes:* Fittings shall be PVC Schedule 80, solvent welded fittings conforming to ASTM D1784 and ASTM D2467.
 - 1) Minimum Class: 200 psi.
 - 2) Solvent shall conform to ASTM D2564.
- B. *PVC Valves:* Shall be schedule 80 true union ball valves in manholes manufactured from PVC (1244B) conforming to ASTM D1784 with VITRON O rings seals and self-lubricating teflon seats.
 1. *Acceptable Manufacturers:*
 - a. Celanese Piping Systems, Inc.
 - b. Or LSA Approved.
- C. *Gate Valves:* Shall conform in all respects to AWWA Specification C500, and Federal Specification WW-V-50b, Type II, Class I. All valves shall be of the resilient seat, nonrising stem type, with iron body full bronze mounted. Gate valves shall be of such design as to maintain the full area of the pipe through the valve when open and shall be designed to take the full unbalanced pressure upon either face.
- D. *Check Valves:* Shall be brass swing check type with brass body, threaded bonnet, integral seat, and brass disc. The valve shall have a vertical closed position.
 1. *Acceptable Manufacturers:*
 - a. Hammond Valve Corp.
 - b. Or LSA Approved.
- E. *Service Lateral Valves:* Shall be Dezurik Eccentric Valve, cast iron construction, resilient faced lug, NPT threaded ends.

- F. *Sewage Air Release/Vacuum Valve*: Designed to automatically exhaust large quantities of air during the filling of a system and to allow air to re-enter the system during draining or when a vacuum occurs. Valve design shall feature long body and float stem components so that the operating mechanism is kept free from contact with sewage during operation. Valve construction as follows:
1. *Valve Body and Cover*: 304 Stainless steel.
 2. *Inlet Size*: 2 inches.
 3. *Discharge Orifice*: 1-inch.
 4. *Float Stem and Guide*: Stainless steel T304, ASTM A276.
 5. *Floats*: Stainless Steel T304, ASTM A240.
 6. *Orifice Seat*: Buna-N, Nitrile Rubber.
 7. *Backflushing and Cleaning Accessories*: Factory assembled to the valve and consisting of a 2-inch inlet shut-off valve, a 1-inch blow-off valve near the bottom of the valve body, quick disconnect couplings and a 1/2-inch shut-off valve at the top of valve, and a section of rubber hose with quick disconnect coupling.
 8. *Acceptable Manufacturers*:
 - a. Val-Matic Valve and Manufacturing Corp.; Model No. 300 Series.
 - b. APCO/Valve & Primer Corp.; Model No. 400 SAVV Series.
 - c. Or LSA Approved.
- G. Valves shall open left (counter-clockwise) and shall be supplied with operators where required.
- H. PVC Valves installed in valve and cleanout manholes shall be actuated with a quarter turn type hand lever. Buried valves shall be actuated with an underground actuator through a valve box as described above. Buried gate valve shall have a 2-inch square operating nut.
- I. All flanged valves shall be drilled and faced to the ASA 125 pound standard template, and in accordance with ANSI B16.1.
- J. *Valve Boxes*: Standard 7-inch cast iron or plastic valve boxes shall be installed over all buried valves and house connection cleanouts in accordance with AWWA C500.

K. *Tapping Saddles:* (connecting lateral to mainline)(minimum of 150 PSI working pressure)

1. -4" and larger C-900, PVC SDR 21 and ductile iron mainline. Tapping size up to 2".
 - a. Double bolts 304 stainless steel band saddle.
 - b. Female IPT tap.
2. -3" and smaller PVC SDR 21 mainline (Tapping size up to 2"):
 - a. Type 304 stainless steel band with gridded rubber gasket, ASTM D2000.
 - b. Female IPT tap.
 - c. or cut mainline and install PVC SCH 40 gasketed tee.
3. *Acceptable manufacturers:*
 - a. Ford or Mueller Co.
 - b. Or LSA Approved.

L. *Tapping Sleeves:* (connecting a mainline extension)(minimum of 150 PSI working pressure)

1. -4" and larger C-900, ductile iron or PVC SDR 21 mainline.
 - a. Mechanical joint iron tapping sleeve.
 - b. Type 304 stainless steel band with gridded rubber gasket, ASTM D2000.
2. -3" and under SDR 21 mainline:
 - a. Type 304 stainless steel band with gridded rubber gasket, ASTM D2000.
 - b. or cut mainline and install a PVC SCH 40 gasketed tee.
3. *Acceptable Manufacturers*
 - a. Ford or Mueller Co.
 - b. Or LSA Approved.

M. *Repair Clamps:*

1. -Type 304 stainless steel band with gridded rubber gasket, ASTM D2000.

N. *Manhole Materials and Components:* and as specified previously in Section 2.2.3 Manhole details 1 through 16.

3.3 INSTALLATION

A. *Pipe Installation:*

1. *General:* All pipe shall be laid and maintained to the required lines and grades with fittings and valves at the required locations, spigots centered in bells, and all valves plumb. The pipe shall be laid in the backfill materials as specified.
2. *Pipe Backfill and Bedding:* All pipe installed shall have 6 inches minimum of AASHTO No. 8 pipe bedding and 12 inches of AASHTO No. 8 backfill above top of pipe.
3. *Construction Control:* During the installation of a low pressure sewer main or force main, the pipe shall be laid at a constantly increasing grade to each high point, air release manhole, or point of discharge. The Contractor shall provide sufficient construction control to assure that there are no sags or loss in grade in the force main which could tend to accumulate air other than at the high points. Failure to comply with this requirement shall necessitate the Contractor to take remedial steps to correct this situation.
4. *Sewers on Steep Slopes:* Sewer on 20 percent slope or greater shall be anchored securely with concrete anchors or equal, spaced as follows:
 - a. Not over 36 feet center to center on grades 20 percent and up to 35 percent.
 - b. Not over 25 feet center to center on grades 35 percent and up to 50 percent.
 - c. Not over 16 feet center to center on grades 50 percent and over.
5. *Variations:* The Authority reserves the right to vary the line and/or grade from that shown on the submitted Drawings for the pipe lines and manholes and to vary the location of fittings and valves when such changes may be necessary or advantageous.
6. *Caution in Excavation:* The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined, and he shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on his part.
7. *Depth of Pipe:* All pipe shall be laid to the depth indicated on the submitted Drawings or a minimum of 3.5' from grade to the crown of pipe.
8. *Rock at Lateral Ends:* If rock is encountered during the installation of the

lateral, the Contractor shall extend the lateral to provide a minimum "rock-free" distance of one foot beyond the end of the lateral. No lateral shall be "butted" against rock.

9. *Handling of Sewer Line Materials Into Trench:* Proper implements, tools and equipment satisfactory to the Authority shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings, valves, etc., shall be carefully lowered into the trench piece by piece by means of a derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to sewer line materials, protective coatings and lining. Under no circumstances shall such materials be dropped or dumped into the trench.
10. *Laying Pipe:* Every precaution shall be taken to prevent foreign material from entering the pipe while the pipe is being placed in the trench. If the pipe-laying crew cannot put the pipe into the trench and in place without allowing earth into it, the Authority may require that before lowering the pipe into the trench, a suitable cover be placed over each end and left there until the connection is to be made into the adjacent pipe. During laying operations, no debris, tools, clothing or other material shall be placed in the pipe. After placing a length of pipe in the trench, the spigot end shall be centered in the bell or coupling and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material tamped under it except at the joints. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space. Precautions shall be taken to prevent dirt from entering the joint space. At times when pipe-laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other approved means approved by the Authority. This provision shall apply during the lunch hour or any extended break period, as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.
11. *Cutting Pipe:* The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner, without damage to the pipe, so as to leave a smooth end at right angles to the axis of the pipe.
12. *Bell and Spigot Pipe Installation:* Bell and spigot pipe shall be laid with spigot ends facing in the direction of the proposed sewerage flow.
13. *Permissible Deflection of Joints:* If deflection is required, make after joint is assembled. The amount of deflection shall not exceed fifty percent (50%) of the maximum limits as specified by the manufacturer. Restrained joints may be deflected up to the maximum limits as specified

by the manufacturer.

14. *Unsuitable Conditions for Laying Pipe:* No pipe shall be laid in water or when, in the opinion of the Authority, trench conditions are unsuitable.

B. *Pipe Jointing:* Make joints as recommended by the manufacturer.

C. *Valve Installation:*

1. Shutoff valves shall be provided in locations required by the Authority.

D. *Combination Air and Vacuum Valve Installation:*

1. Combination air and vacuum release valves shall be installed on long stretches of low pressure sewer mains and force mains that do not summit and at each high point and drastic change in grade. The Authority reserves the right to require a combination air and vacuum release valve in locations other than the described locations.

E. *Valve and Cleanout Manhole Installation:*

1. Valve and cleanout manholes shall be provided every 500 feet (minimum) on long stretches of low pressure sewer mains and force mains. Terminal Cleanout Manhole (see standard Type 1 or Type 4 details) shall be used on all dead ends. The Authority reserves the right to require cleanouts in locations other than described herein.

F. *Anchorage:*

1. *Concrete Thrust Blocks:* Provide concrete thrust blocks for all fittings, and at all locations where horizontal and/or vertical deflections are made in the joints of the piping.

Reaction Backing: Reaction backing shall be 2500 psi concrete. Backing shall be placed between solid ground and the fitting to be anchored. The backing shall, unless otherwise indicated or directed, be so placed that the pipe and fitting joints will be accessible for repair.

Metal Harness: Metal harness of tie rods of adequate strength to prevent movement shall be used. Steel rods or clamps shall be type 304 stainless steel.

2. *Anchorage for Bends:* All bends deflecting 11.25 degrees or more shall be provided with a thrust restraint system to prevent movement. Either a restrained joint pipe, mechanical restraint system, or thrust block system will be permitted. Suitable metal rods shall be used only as directed by the Authority and must comply with ANSI/AWWA C111-A21.11.

3.4 TESTS

A. *Hydrostatic Tests:*

1. *Pressure Test:* After the pipe has been laid and backfilled as specified, all newly laid pipe, or any valves section thereof, shall be subjected to a hydrostatic pressure of 150 pounds per square inch, or 50% in excess of the normal working pressure, whichever is greater. Where any section of a main is provided with concrete reaction backing, the hydrostatic pressure test shall not be made until at least five days have elapsed after the concrete reaction backing was installed. If high early strength cement is used in the concrete reaction backing, the hydrostatic pressure test shall not be made until at least two days have elapsed.

Duration of Test: At least ½ hour.

Procedure: Each section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Authority. The pump, pipe connections, and all necessary apparatus, including gauges, shall be furnished by the Contractor. The Contractor will make all taps into the pipe, and furnish all necessary assistance for conducting the tests.

Expelling Air Before Test: Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall make the necessary taps at such points before the test is made. After the test has been completed the Contractor shall insert plugs at the tapping points.

Examination Under Pressure: Any cracks or defective pipes, fittings, or valves discovered in consequence of this pressure test shall be removed and replaced by the Contractor with sound material, and the test shall be repeated until satisfactory to the Authority.

2. *Leakage Test:* A leakage test shall be conducted concurrently with the pressure test. The Contractor will furnish laboratory calibrated test gauge and measuring device, and all necessary assistance to conduct the test.

Leakage Definition: Leakage is defined as the quantity of water that must be supplied into the newly laid pipe, or any valve section thereof, to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

Permitted Leakage: No pipe installed will be accepted until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = \frac{SD\sqrt{P}}{133,200}$$

in which "L" equals the allowable leakage in gallons per hour; "S" is the length of pipeline tested in feet; "D" is the nominal diameter of the pipe, in inches, and "P" is the average test pressure during the leakage test, in pounds per square inch gauge. (The allowable leakage according to the formula is equivalent to 11.65 U.S. Gal. per 24 hours per mile of pipe per inch nominal diameter, for pipe in 18 foot lengths evaluated on a pressure basis of 150 psi). When testing against existing closed metal seated valves, an additional leakage per closed valve of 0.0078 gallon per hour per inch of nominal valve size shall be allowed. There shall be no additional leakage allowed for pressure lateral sewers.

The Authority will record both the makeup water and pressure at one-half hour intervals during the test period.

Should any test of pipe laid disclose leakage greater than that specified above, the Contractor shall, at his own expense, locate, repair, and replace the defective joints, pipe, or fittings until the leakage is within the specified allowance.

3. *Common Requirements:*

- a. *Authority's Presence:* The Authority's representative shall monitor the pressure and leakage tests. The Contractor shall notify the Authority of the test day at least 48 hours in advance.
- b. If test fails to meet test requirements, the Contractor shall pay for all additional Authority personnel testing time.
- c. *Weather:* No testing will be authorized unless air temperature is 35 degrees F. or higher.
- d. *Field Joints:* All field joints of fittings and valves shall be exposed and examined during pressure and leakage test.

SECTION 4 - GRINDER PUMP UNITS

4.1 GENERAL

- A. All grinder pump units and related appurtenances must be reviewed and approved by the Authority before installation.
- B. All components of the grinder pump stations including grinder pumps, basin, and electrical equipment are available and recommended to be purchased from the Leola Sewer Authority.
- C. See Section 1, paragraph 1.10 for installation responsibility.

4.2 MATERIALS

- A. *Grinder Pump Units:*
 - 1. Simplex (single) grinder pump units shall be used at residential property locations, while either simplex or duplex (double) grinder pump units may be utilized at commercial and industrial properties.
 - 2. Grinder pump units shall be installed in either concrete or fiberglass-reinforced polyester basins for outdoor installations only.
 - 3. The grinder pump package shall consist of the basin, grinder pump(s) and motor(s), junction box, start-stop level controls, motor high temperature shutoff, motor seal leak alarm, high water alarm, shutoff valve, discharge piping and fittings and all internal wiring terminating into a junction box.
 - 4. An externally mounted control panel shall be provided for each unit.
 - 5. The pump unit shall be a minimum 2.5 HP submersible centrifugal grinder pump.
 - a. All 2.5-hp grinder pump units in the system shall be ABS Piranha 2.5W, single phase.
 - b. All 3-hp grinder pump units in the system shall be ABS Piranha 3, 3 phase, 230 volt.
 - c. All 5hp and larger sewage pump units in the system shall be Myers pumps, grinders, or non-clog, 3phase 230 volt.
 - 6. The grinder pump and motor are to be specially designed and manufactured so they can operate completely submerged in wastewater. The cord cap shall be sealed into the motor housing with a Buna-N O-ring, providing an electrical connection which is completely watertight, yet may be easily removed for service.

7. The combination centrifugal pump impeller and grinder unit shall be attached to a common motor and pump shaft made of 420 stainless steel. The grinder unit shall be on the suction side of the pump impeller, discharging directly into the impeller inlet leaving no exposed shaft to permit packing of ground solids. Both stationary and rotating cutters shall be made of hardened and ground stainless steel. Pump and motor housings are to be high quality grey iron castings. All fasteners shall be of stainless steel.
8. The pump-motor shaft shall be sealed by two mechanical carbon and ceramic faced seals or similar sealing material within an oil filled seal chamber. All electric sensing probes shall be mounted in the seal chamber to detect any water leakage past the lower seal before damage is done to the motor. The seal probe circuit sensitivity shall not be affected by cable length between the motor and the seal probe circuitry in the control panel. This probe shall be connected to an amber light in the control panel. The shaft shall be supported by an upper ball radial and thrust bearing and a lower bronze radial sleeve or oversized single row ball bearing, both running.
9. The rotor winding and rotor are to be mounted in a sealed, submersible type housing which is filled with clean high dielectric oil or air as pump design dictates. A heat sensor thermostat which will detect overheat conditions and stop the pump shall be located in the motor winding. When the temperature drops to a safe level, the pump will automatically reset.
10. Submersible motor shall be constant speed type. The motors shall be of proper size to drive the pump at any point on the pump curve. Thrust bearings shall be of the ball type. The single phase motor shall be a capacitor start-capacitor run type with high starting torque.
11. Motor shall be amply rated for the head and capacity valves specified, on continuous duty, without exceeding 1.0 service factor load at the minimum capacity design point, and without exceeding the motor full service factor load at any head between shutoff and 10 feet TDH, which is the minimum expected dynamic head to be found.
12. *Rail Assembly:* A lift-out guide rail assembly shall be included as part of the grinder pump unit, which will permit easy removal and installation of the pump and lower check valve without the necessity of personnel entering the basin. Cast iron guide brackets with guide brackets and guide yokes of sufficient bearing strength to prevent binding shall bolt to the pump. The yokes shall mate over guide rails of 1-1/4-inch galvanized 80 PVC or stainless steel pipe running between an upper rail support casting

which shall be attached to and supported by the basin sidewalls and the fixed attachment point on the floor of the basin. The guide rails may be supported by a fixed connection to the top of the basin provided that the connection is not part of the removable access cover and is not affected by the removal of the access cover.

- a. A stainless steel lifting chain shall be securely fastened to the top of the pump and to the top of the basin to facilitate removal of the pump. The chain shall be minimum of 3/16" welded link type to support the weight while removing and installing the pump.

13. *Level Controls:* Sealed float-type mercury switches shall be supplied to control sump level sealed in a solid polypropylene float for corrosion and shock resistance. The support wire shall have a heavy Neoprene jacket. A weight shall be attached to cord above the float to hold switch in the sump. Weight shall be above the float to effectively prevent sharp bends in the cord when the float operates. Multiple switches shall be used to control the level. The float switches shall hang in the sump and be supported by a stainless steel bracket and cord snubber which will give positive support to the controls and allow flexibility in the set levels. Other level controls such as a bubbler system will be considered an option at LSA's discretion.
14. *Corrosion Protection:* All materials exposed to wastewater shall have inherent corrosion protection, i.e., cast iron, fiberglass, stainless steel, PVC. Any interior steel surfaces are to be suitably protected against corrosion. All fasteners shall be stainless steel.
15. *Junction Box:* The junction box shall be constructed of fiberglass or PVC for corrosion resistance. The enclosure shall be of adequate thickness and properly reinforced to provide good mechanical strength. The junction box shall have a fully gasketed cover that is held in place by four stainless steel captive screws with slotted/flat sided heads totally encapsulated in PVC so that no metal parts are exposed.

B. *Valves:*

1. *Check Valve:* The pumps shall be equipped with a factory-installed integral flapper-type check valve or integral ball check valve built into the discharge plumbing. This valve shall provide a full-ported passageway when open, and shall introduce a friction loss of less than six inches of water at maximum rated flow. The valve body shall be made of cast iron. Working parts of flapper-type check valves shall be made of 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A non-metallic hinge shall be an integral part of the flapper assembly providing maximum degree of freedom for assured seating even at a very low pressure.

Ball check valves shall include a corrosion resistant nonmetallic ball and rubber sealed seat.

2. *Ball Valve:* The pump shall be equipped with an isolation ball valve which shall be true union type manufactured from PVC (1244-B) conforming to ASTM D1784 with VITRON 0 ring seals and self-lubricating Teflon seat valves shall be lever-operated with an extension handle extended vertically to a supporting bracket fixed not more than 12 inches below finish grade. Valves shall be as manufactured by Celanese Piping Systems, Inc., or equal.

3. *Redundant Brass Check Valve:* All pumps shall include one separate check valve per unit for installation in the discharge line between the Grinder Pump and the sewer main for maximum protection against backflow.

The valve shall be gravity-operated, flapper-type. The check valve shall provide a full-ported passageway when open and shall introduce a friction loss of less than six inches of water at maximum rated flow.

4. *Check Valves:* Shall be brass swing check type with brass body, threaded bonnet, integral seat, and brass disc. The valve shall have a vertical closed position.

a. *Acceptable Manufacturers:*

- (1) Hammond Valve Corp.
- (2) Or LSA Approved.

5. *Anti-Siphon Valve:* The pump shall be constructed with a positively-primed flooded suction configuration. As added assurance that the pump cannot lose prime even under negative pressure conditions in the discharge piping system, the pump shall be equipped with an integral anti-siphoning, air relief valve in the discharge piping. This valve will be closed when the pump is running and open to atmosphere if a negative pressure occurs in the line.

C. *Grinder Pump Basin Materials:*

1. Either concrete or fiberglass basins may be provided in areas with no traffic loadings. All chambers, whether in lawns, driveways or parking lots, shall register 6 to 12 inches above grade.
2. The inside diameters of the fiberglass basin shall be 36 inches minimum for simplex units and 42 inches minimum for duplex units. The minimum depth of the basins shall be 8.0 feet. Where additional depth is needed, the basin will have to be a custom concrete structure.

3. Each basin shall be equipped with guide rail assemblies discharge piping with check valves, ball valves, anti-siphon valves, stainless steel lifting chain, waterproof electrical junction box, and level sensor float assemblies. Check valves and ball valves shall be provided for the discharge piping of each individual pump in duplex units.
4. *Concrete Basin:* Precast reinforced concrete chambers shall conform to ASTM Specification C478 (Latest Revision) and shall be of watertight construction. Joints between sections shall be provided with preformed plastic joint sealing material such as Ram-Nek as manufactured by K. T. Snyder Co., MAS-STIK as manufactured by Concrete Products Supply Co., or equal. The preformed joint sealer shall be protected by a removable two-piece wrapper and shall be applied in strict accordance with the manufacturer's recommendations. The chemical composition of the sealer shall meet the following requirements: bitumen - ASTM D452, Inert Ash Mineral AASHTO T-111-42, Volatile Matter ASTM D-6-39T.
 - a. Mixing water for mortar and concrete shall be clean and free from oil, acid, alkali, sewage or other deleterious substances.
 - b. Portland cement shall conform to ASTM specification C150, Type 1. Where specifically authorized or required, high early strength (Type 3) shall be used.
 - c. Concrete shall have a compressive strength of not less than 3,000 psi after 28 days (tests to be in accordance with ASTM specification C39, (Latest Revision). Aggregates shall be of quality, gradation and proportions as approved by Authority after submission of test results on the design mix. Each cubic yard of concrete shall contain no less than 6 bags of Portland Cement. Slump of concrete shall not exceed 4". Ready-mixed concrete shall conform to ASTM specification C94/94M (Latest Revision).
 - d. Reinforcing steel shall be clean and free from rust, scale or coatings that will reduce bond.
 - e. The exterior of concrete basins shall be coated with bitumastic no less than twenty (20) mils in thickness. The coating shall be Bitumastic Super Service Black as manufactured by Koppers or equal.
 - f. Concrete basins shall be equipped with a double door access frame and cover assembly of extruded aluminum. Each cover shall be provided with a lifting handle, safety catch to hold cover open and locking hasps. The cover surface shall be of a non-skid checkered pattern and shall be provided with a padlock. This lock shall be of the solid rustless case design with a hardened steel shackle and zinc coating. Frame and cover shall be suitable to withstand HS-25 traffic loads.
5. *Fiberglass Basin:* The basin shall be custom molded of fiberglass reinforced polyester resin using a lay-up and spray technique which will

assure that the interior surface is smooth and resin-rich. The basin shall have a nominal wall thickness of 1/4-inch minimum. The basin shall include a hopper bottom.

- a. The fiberglass basins shall be built in accordance with:
 - 1) Plastic Laminate ASTM C581 and C582.
 - 2) Chemical-Resistance Test ASTM C581; previous tests will be acceptable provided laminates are representative.
- b. The basin shall be free of imperfections, sound, watertight and of high quality workmanship. Basins shall have lifting lugs or other devices for unloading and installation.
- c. Two discharge hubs shall be provided for the grinder tank unit. Internal piping shall be provided to one discharge hub and electrical J-box to the other one.
- d. Fiberglass basins shall be equipped with a gasket and a green colored fiberglass lid. The cover shall be bolted to the basin with stainless steel bolts. Stainless steel nuts shall be embedded in the fiberglass to prevent turning and for corrosion resistance.

D. *Grinder Pump Electrical Control Panel:*

1. The grinder pump electrical controls shall be located as a separate remote electrical control panel. This control panel shall be either pedestal or wall mounted, dependent upon the decision of the property owner.
2. The control panel shall contain the following: a main disconnect switch, motor circuit breaker, control circuit breaker, lightning arrester, start relay, capacitors, contactor, hour meter, Hand-OFF-Auto selector switch, lamp test switch, alarm lights, overload relay, motor temperature protector relay, and electronic seal monitoring relay.
3. The contactor shall be a UL listed motor contactor having a guaranteed component life span, without maintenance or contact replacement, of one million operations. (Definite purpose contactors will not be allowed.)
4. The panel shall have an adjustable or non-adjustable 2 pole bimetallic temperature compensated UL listed overload relay meeting NEMA Class 10 tripping characteristics, and the auxiliary contact of the overload relay must be connected in series with the motor contactor coil to switch off the contactor in event of overload. The panel shall also have lightning protection, elapsed time meter for each pump, and any other items required for proper control of the centrifugal type grinder pump unit.

5. The enclosure shall contain an inner back panel for mounting of the internal components. The enclosure shall be fully gasketed, hinged, NEMA 4X design of fiberglass, primed and painted gray, with combination stainless steel closing latch and locking hasp.
6. The control panel shall be fitted with an integral 60 watt amber tamperproof polycarbonate flashing alarm light on the top. The light unit shall be as furnished by (or equal):
 - a. Ohio Electric Control, Inc. 1661 Cleveland Road Ashland, Ohio 44805 Telephone: (419) 289-1553
 - b. Electromate Corp. 7531 Salisbury Road Jacksonville, Florida 32216 Telephone: (904) 731-9270
7. The lamp shall be medium base type and be easily replaceable from within the enclosure. The light shall be provided with a lamp test switch mounted within the panel. The alarm light shall be a flashing type activated by both moisture in the pump seal chamber and high water in the wet well and shall go out when the conditions ceases.
8. Inside the control enclosure shall be a red neon glow lamp high water indication and an amber neon glow lamp for moisture leak detection. The flashing light on the enclosure top shall flash when either or both lights within the enclosure are activated due to a failure.
9. A silkscreen or phenolic nameplate shall be provided above each component with the name of the component inscribed or failure inscribed when labeling the indicator lights.
10. A "Hand-Off-Auto" selector switch shall be provided within the control panel for operating the pump manually when in "Hand", pump disable when in "OFF", and normal operation when in the "Auto" position. The selector switch shall not disable the alarms under any condition.
11. A main disconnect switch shall be provided with padlocking device to de-energize the panel. Toggle switch shall not be considered. From the load side of this switch shall be a two-pole circuit breaker for motor short-circuit protection. Also, and in parallel with the above breaker shall be a circuit breaker for protection of the control circuit.
12. An electrical wiring diagram shall be supplied and attached to the inside of the panel enclosure. This diagram shall identify wire color, external connections to a numbered terminal block and shall be arranged in a functional sequence ladder type diagram.
13. The control panel enclosure shall be provided with a padlock. This lock shall be of the solid rustless case design, with a hardened steel shackle and zinc coating.

14. *Control Panel Supports:* The control panel support for Property Owner installations, where the building has existing electrical service, shall consist of 3" x 3" x 3/16" gauge structural steel tubing (minimum yield strength 46,000 psi), all horizontal support channels and panel connection hardware, coated with baked on epoxy ASA 61 paint. The length of pipe shall be embedded in a concrete foundation.
15. *House Feed:* Shall be 240 volt, 10 gauge THW wire with ground and color coded with 30 amp breakers.

4.3 INSTALLATION

A. *General:*

1. A complete inspection of the sewer facility from the building wall to the sewer system connection point must be performed by the Authority or its representative before backfilling can proceed. This shall include, but not be limited to, the following: grinder pump station, gravity feed line, low pressure line, valves, and connection. This inspection shall be after the pressure testing procedure is completed.

B. *Grinder Pump Basins:*

1. Grinder pump basins shall be installed such that the top of the basin is six (6) inches above finished grade.
2. Grinder pump basins shall be placed on a minimum of six (6) inches of AASHTO No. 8 crushed aggregate.
 - a. Remaining portions around basin shall be backfilled with PA DOT 2A coarse aggregate or approved soil.
3. Grinder pump basins shall be installed level and plumb.
4. Grinder pump basins shall be lowered into excavated area using the lifting hooks provided on each side of the basins.
5. A minimum of 3/4 cubic yards of 3,000 psi concrete shall be placed around the bottom of basins to prevent basins from floating due to elevated ground water. No concrete shall be placed under the basin.
6. The gravity sewer line entering the grinder pump station shall not be more than four (4) feet below grade.

C. *Grinder Pumps:*

1. Extreme caution shall be exercised when placing pump into basin to prevent damage to pump and appurtenances.
2. Pump electrical cord shall not be used to lower pump into the basin.

SECTION 5 - BORING, JACKING, OR TUNNELING

5.1 GENERAL

- A. The Contractor shall familiarize himself with all procedures and requirements of the governing agency having jurisdiction over the highway or railway involved, and shall furnish all materials, equipment, and work necessary to perform the work in accordance with those procedures and requirements.
- B. Plans and descriptions of the arrangement to be used shall be submitted to the Authority for approval, and no work shall proceed until such approval is obtained.
- C. When water is known or expected to be encountered, pumps of sufficient capacity to handle the flow shall be maintained at the site. When dewatering, close observation shall be maintained to detect any settlement or displacement of roadway embankment, etc.
- D. Classification of Materials:
 - 1. Where rock is encountered during the boring of an encasing conduit which is such that in the judgment of the Authority and the representative of the highway or railway that the boring or jacking of the encasing conduit cannot be continued, discontinue boring and jacking. Construct the remaining portion of the pipe line across the highway or railway by an open cut method meeting with the approval of the Authority and the representative of the highway or railway.

5.2 MATERIALS

5.2.1 *Steel Casing Pipe:*

- A. *Steel Pipe:* Seamless pipe, ASTM A53, minimum 20' length.
 - 1. 35,000 psi minimum yield strength.
 - 2. Full circumference welded joints.
 - 3. Asphalt coated.
 - 4. Minimum Wall Thickness: .375.
 - 5. Steel Casing piping diameter shall be at least 6 inches larger than the outside diameter of the pipe bell, or as required by the owner of the right-of-way or entity issuing the permit.

5.2.2 *Miscellaneous Material:*

A. *Casing Spacer:* Contractor shall provide the following types:

1. Constructed of two piece solid fusion shell of epoxy coated carbon steel, 14 gauge thickness; runners made from ultra high molecular weight (UHMW) polymer and attached to T-304 stainless steel risers; fasteners shall be T-304 stainless steel.
 - a. *Acceptable Manufacturers:*
 - 1) Advance Products & Systems, Inc. (APS), Model CCS, Centered Position.
 - 2) Cascade Waterworks Mfg. Co.
 - 3) Or LSA Approved.

B. *End Seals:* Rubber with T-304 stainless steel bands.

5.3 INSTALLATION

A. *Approach Trench:* Excavate approach trench using methods specified in Section 6.

B. *Boring:*

1. Push the pipe into the fill with a boring auger rotating within the pipe to remove the spoil. When augers, or similar devices are used for pipe emplacement, the front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe so that there will be no unsupported excavation ahead of the pipe. The auger and cutting head arrangements shall be removable from within the pipe in the event an obstruction is encountered.
2. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than one-half inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or poor material.
3. The use of water or other liquids to facilitate casing emplacement and soil removal is prohibited.

C. *Jacking:*

1. Jacking shall be conducted without handmining ahead of the pipe and without the use of any type of boring, augering, or drilling equipment.

2. Bracing and backstops shall be so designed and jacks of sufficient rating used so that the jacking can be progressed without stoppage except for adding lengths of pipe.
3. Accurately place guide timbers on line and grade.
4. The vertical face of the excavation shall be supported as necessary to prevent sloughing.
5. Use piling boards and bulkheads as required if subgrade conditions in the heading are unstable.
6. Jacking and excavation within the pipe shall proceed simultaneously with the ground being cut no more than 2 inches above subgrade at the bottom.
7. The use of water or other liquids to facilitate casing placement and spoil removal is prohibited.
8. If voids develop or if jacked hole diameter is more than 1-inch greater than the outside diameter of the encasing conduit place grout to fill voids in manner approved by the regulatory agencies.
9. Check conduit alignment in a manner and at times required by Authority. Check alignment and grade at least once per shift as the work progresses.
10. Completely bulkhead heading at interruptions in jacking operation.
11. Completely weld joints around the circumference between sections of steel pipe encasing.

D. *Casing Cradles:*

1. Secure cradle to the carrier pipe such that movement along carrier pipe barrel will not occur when carrier pipe is inserted into casing pipe.
2. Size cradle such that bell of the carrier pipe does not rest on casing and adequate clearance exists at top of cradle for ease of inserting the carrier pipe into the casing.
3. Placement and spacing of cradles shall be in accordance with manufacturers recommendations or as indicated on the Standard Details. Candles should be placed a maximum of 5 feet apart at cemented couplings and a maximum of 7 feet spacing on pipe.

SECTION 6 - TRENCHING AND BACKFILLING

6.1 MATERIALS:

- A. *Backfill Material:* Excavated material free of cinders, ashes, refuse, vegetable, or organic material, boulders, rocks, stone, or other material which, in the opinion of the Authority, is unsuitable. Backfill material shall conform to the requirements established under "Classification of Backfill Materials", specified below.
- B. *Aggregate Backfill and Bedding:* Fine aggregates and coarse aggregates conforming to PDT Sections 703.1 and 703.2. Aggregate Backfill requirements established under "Classification of Backfill Materials", specified below.
- C. *Classification of Backfill and Bedding Materials:*
 - 1. *Pipe Bedding:* AASHTO No. 8 Coarse Aggregate.
 - 2. *Initial Backfill:* AASHTO No. 8 Coarse Aggregate.
 - 3. *Aggregate Backfill (To Restoration Depth):* PennDOT No. 2A Coarse Aggregate.
 - 4. *Backfill Material (To Restoration Depth):* Excavated material approved by the Authority and containing no stones larger than eight inches in maximum dimension. A maximum of 20% of the backfill volume may be stones so long as the stones are evenly distributed within the material.
- D. *Underground Warning Tape:*
 - 1. Printed polyethylene tape, 3 inches minimum width, magnetic, green for sanitary sewers, 1 inch minimum lettering, printed with name of utility buried below, and suitable for installation in all soil types. Tape must be placed above all force mains, low pressure sewers, and pressure lateral sewers.

6.2 INSTALLATION

6.2.1 General:

- A. *Width of Trench:* Pipe trenches shall be sufficiently true in alignment to permit the pipe to be laid in the approximate center of the trench. The trench shall be wide enough to provide a free working space on each side of the pipe; however, the trench width at least 12 inches above the top of the outside barrel of the pipe shall not exceed the dimensions in the following table.

MAXIMUM TRENCH WIDTHS - 12" ABOVE TOP OF PIPE

Nominal Diameter (Inches)	Pipe Aggregate Backfill Temporary Pavement (Width Inches)	Final Pavement Restoration (Width Inches)
3.0 and smaller	12	36
4	24	48
6	24	48
8	24	48
10	28	52
12	30	54
14	32	56
15	33	57
16	34	58
18	36	60

1. Where sheeting and shoring are used, the maximum allowable width of trench as shown in the preceding table shall be measured between the closest interior faces of the sheeting or shoring as placed. Whenever, for any reason, the maximum trench width is exceeded below the top of the pipe, the Contractor may be ordered by the Authority to cradle or encase the pipe in concrete in order to insure the structural integrity of the pipe.
2. If the maximum width of trench specified above cannot be maintained, the Contractor shall install temporary sheeting.
3. Where lines are to be constructed on rights-of-way or easements in open areas, the maximum width of trench at the top specified

hereinbefore may be exceeded only if the construction is kept entirely within the limits of the right-of-way or easements and can be carried on without damage to adjoining property. The angle of slope shall be the angle at which the trench bank will stand without sliding and in no case shall the angle of slope be steeper than one-half horizontal to one vertical.

4. In locations other than rights-of-way or easements, the Authority may, as warranted by working conditions, and where permitted by the Pennsylvania Department of Labor and Industry requirements, waive the requirements that the maximum width of trench at the top shall not exceed the dimensions specified hereinbefore.

B. *Length of Trench:*

1. No trench shall be opened more than 100 feet in advance of the pipe lines laid.
2. The Contractor shall limit all trench openings to a distance commensurate with all rules of safety.
3. If the work is stopped either totally or partially, the Contractor shall refill the trench and temporarily repave over the same and the trench shall not be opened until he is ready to proceed with the construction of the pipeline.

C. *Pumping and Draining:* The Contractor shall remove by pumping, draining, or otherwise, any water which may accumulate in the trenches and other excavations and shall build all dams and do all other work necessary to keep the trenches or other excavation as free from water as possible.

1. Where it is impractical to completely drain the trench, special pipe or jointing materials may be authorized.
2. While the pipelines are being laid, the Contractor shall have sufficient pumping machinery ready for immediate use.
3. All surface waters shall be prevented from entering the open ditches or excavations by proper grading of the surface in the vicinity of the excavation.

D. *Accommodations of Drainage:* The Contractor shall keep gutters, sewers, drains and ditches open at all times so that the flow of storm or other waters shall not be obstructed. If the material excavated from the trenches must temporarily extend over gutters or other waterways, it shall be the

duty of the Contractor to plank or bridge over the gutters so that the flow of water is not impeded.

E. *Maintenance of Traffic:*

1. Work shall be conducted so as to cause a minimum of inconvenience to pedestrian and vehicular traffic and to private and public properties along the line of work. It shall be the duty of the Contractor, at all times, to maintain crossing, walks, sidewalks, and other roadways open to traffic and in a satisfactory condition, and to keep all fire hydrants, water valves, fire alarm boxes, and mail boxes accessible for use. Whenever it is necessary to maintain pedestrian traffic over open trenches, a timber bridge at least three feet in width and equipped with side railings shall be provided. When the excavated material will encroach upon sidewalks or private property, planking shall be placed in order to keep the sidewalk or private property clear of excavated material.
2. In important thoroughfares, highways, or in narrow streets, the material excavated from the trench shall be removed from the site of the work in order to provide suitable space for traffic. The Contractor shall bring back as much of the approved material as necessary to properly refill the trench; or he shall furnish such other suitable materials as may be necessary to properly refill the trench.
3. When it is necessary to haul soft or wet materials over public streets, the Contractor shall provide suitable vehicles and shall conform to all laws and ordinances relevant to such hauling.
4. Maintenance and protection of traffic on Township streets and State Highways shall be in strict accordance with PennDOT Form 408, Section 900; and Title 67, Chapter 203. The Contractor shall modify the sign locations daily in order to protect that section of highway to be disturbed during that same day.
5. When working in other public rights of way, maintenance of traffic shall be as directed by the governing authority.
6. Whenever the Contractor, during the progress of the excavation, shall uncover service pipes or lines, which because of injury or age are in poor condition, he shall immediately notify the proper authority in order that steps may be taken for replacement or repair. Locations of repairs, and the procedures of repairs that have been made shall be recorded by the Contractor.

7. The Contractor shall sustain in their places, and protect from direct or indirect injury, all pipes, conduits, tracks, walls, buildings, and other structures or property in the vicinity of his work, whether above or below the ground, or that may appear in the trench. He shall at all times have a sufficient quantity of timber and plank, chains, ropes, etc., on the ground and shall use them as necessary for sheeting his excavations and for sustaining or supporting any structures that are uncovered, undermined, endangered, threatened, or weakened.
8. Pipes and underground conduits exposed as a result of the Contractor's operations shall be adequately supported along their entire exposed length by timber or planking, installed in such manner that the anchorage of the supporting members will not be disturbed or weakened during the backfilling operation. Backfill of selected material shall be carefully rammed and tamped under and around the supports and all supports shall be left in place as a guard against breakage of the supported structure due to trench settlement.
9. Where necessary, in order to keep one side of the street or roadway free from any obstruction or to keep the material piled alongside of the trench from falling on private property outside the right-of-way, a safe and suitable fence shall be placed alongside the trench.

6.2.2 *Pipe Bedding and Trench Backfill:*

- A. *Bedding:* The trench shall be excavated to a depth of six (6) inches below the outside diameter of the pipe barrel, or deeper if required by the Authority. The resultant subgrade shall be undisturbed, or compacted as approved by the Authority if disturbed. The bedding shall then be prepared by placing a thoroughly compacted aggregate pipe bedding and initial backfill material, as specified in Section 6, in 3-inch (uncompacted thickness) layers to 12-inches above top of pipe. Bedding shall provide uniform and continuous bearing and support for the pipe at every point between bell holes.
- B. *Special Bedding:*
 1. *Concrete Cradle and Concrete Encasement:* If concrete cradle and/or encasement are required by the Authority, the trench shall be excavated to a depth of six (6) inches below the outside of the barrel of pipes. All of this excavation may be done by machine.
 2. *Unstable Subgrade:* Where the bottom of the trench at subgrade is found to be unstable or to include ashes, cinders, any type of

refuse, vegetable, or other organic material, or large pieces or fragments of inorganic material, the Contractor shall excavate and remove such unsuitable material.

Before pipe is laid, the subgrade shall be made by backfilling with aggregate material in 3-inch (uncompacted thickness) layers thoroughly tamped and the bedding prepared as hereinbefore specified.

3. *Special Foundations:* Where the bottom of the trench at the subgrade is found to consist of material which is unstable to such a degree that it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, the Contractor shall construct a foundation for the pipe, consisting of piling, timbers or other materials, in accordance with plans prepared by the Authority.
4. *Excavation in Fill:* When the pipe is laid in fill, the compacted embankment shall be brought to a height of at least 9 inches above the proposed top of the pipe before the trench is excavated.

C. *Backfilling Methods:*

1. *General:* Backfilling shall not be done in freezing weather except by permission of the Authority, and it shall not be done with frozen material. Do not backfill when the material already in the trench is frozen.

In State Highways all backfill shall be in accordance with the requirements of PennDOT Chapter 459.

2. *Pipe Bedding Beneath and to Centerline of Pipe:* All trenches shall be backfilled by hand, from the bottom of the trench to the centerline of the pipe with bedding material placed in layers of 3 inches (uncompacted thickness) and compacted by tamping. Bedding material shall be deposited in the trench for its full width on each side of the pipe and fittings simultaneously.
3. *Initial Backfill Over Pipe:* From the centerline of the pipe and fittings to a depth of one (1) foot above the top of the pipe, the trench shall be backfilled by hand or by approved mechanical methods. The Contractor shall use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe. The backfill shall be placed in 4-inch layers (uncompacted thickness) and compacted by tamping.

4. *Aggregate Backfill to Restoration Depth (State and Township Roads including Driveways):* From one (1) foot above the top of the pipe to restoration depth, the trench shall be backfilled by hand or by approved mechanical methods. Backfill in this section of the trench shall be coarse aggregate material subject to limitations specified and consolidated by tamping in four (4) inch layers or other approved mechanical methods unless otherwise specified. Any consolidation method utilizing water such as jetting or puddling shall not be permitted. Consolidation shall proceed from the center of the trench to the sides to prevent arching.
5. *Backfill Material to Restoration Depth (Lawns, Meadows and Cultivated Fields):* From one (1) foot above the top of the pipe to restoration depth, the trench shall be backfilled by hand or by approved mechanical methods. Backfill in this section of the trench shall be excavated material subject to limitations specified and consolidated by tamping in eight (8) inch layers or other approved mechanical methods unless otherwise specified. Any consolidation method utilizing water, such as jetting or puddling shall not be permitted. Consolidation shall proceed from the center of the trench to the sides to prevent arching.
6. *Underground Warning Tape:* For the purposes of early warning and identification of buried pipes during future trenching or other excavation, provide continuous identification tapes in trenches. Install in accordance with printed recommendations of the tape manufacturer, and as modified herein. Bury tape at a depth of 24 inches maximum below grade.

Provide in trenches for utilities as indicated in Section 6.1.D. of these Rules and Regulations.

7. *Compacting:* During the course of backfilling and compacting work, the Authority may, at any location or depth of trench, make tests to determine whether the Contractor's compaction operations are sufficient to meet specified requirements. Compact trench backfill as follows:
 - a. All trench excavation and backfill within State Highway right-of-way will be subject to inspection by representatives of the Commonwealth of Pennsylvania, Department of Transportation, and the work must be performed in accordance with the requirements of that department.
 - b. Use mechanical tampers to compact backfill materials in trench refill operations to produce a density of backfill at the bottom of each layer of not less than 90 percent of

maximum density obtained at optimum moisture content as determined by AASHTO T 99.

6.2.3 *Restoration and Clean-Up of Surface:*

- A. *Replacement of Structures by Contractor:* The Contractor shall restore (unless otherwise stipulated) all sidewalks, curbing, gutters, shrubbery, fences, poles, sod, markings, traffic lines, mail boxes, or other property and surface structures removed or disturbed as a part of the work to a condition equal to that before the work began, furnishing all labor and materials incidental thereto.
- B. *Pavement Restoration of State and Township Roads:* Shall be in accordance with the Authority's Standard Details. Township roads shall be restored as directed by the governing township.

SECTION 7 - PAVING AND SURFACING

7.1 GENERAL

- A. All work within the right-of-way of State highways shall be performed in strict accordance with the requirements of PennDOT Title 67, Chapter 459.
- B. Permanent replacement of street roadway and shoulder pavement will not be permitted until at least 90 days after temporary pavement has been placed. Permanent replacement pavement must be placed before 120 days after the required temporary pavement has been placed.

7.2 MATERIALS

- A. Bituminous materials and pavement shall be as shown on the standard details and be in strict accordance with PennDOT Publication 408.

7.3 INSTALLATION

7.3.1 *General:*

- A. Saw cut and remove existing pavement to neat lines from the centerline of the trench.
- B. Initial pavement removal will be to the width indicated on Section 6 of these specifications in the table titled "Maximum Trench Widths - 12" Above Top of Pipe."
- C. Prior to permanent pavement restoration, saw cut and remove trench edge pavement one foot from each edge of trench.
- D. *Temporary Pavement:* Install temporary pavement over areas where the pavement has been removed. Install temporary pavement to 2 inches thickness after compaction, with top surface flush with surface of adjacent pavement, and maintain until permanent restoration is made.
- E. *Replacement of Permanent Pavement:* All street paving, shoulders, driveways, and parking areas, including subgrade, and base must be restored as specified herein. Such restoration is for that area removed or broken in the execution of the work or that subsequently fails as a result thereof.
- F. Location of types and thicknesses of the temporary and replacement pavements are as indicated in the standard details.

- G. *Unimproved Roads, Driveways, and Parking Areas:* Restore to a condition equal to its original undisturbed condition using same type and quality of materials. Grade slope and roll the entire width of the road.
- H. *Cement Concrete Curbs:* Replace curbs to dimension, shape and workmanship as the original curb. Construction methods as specified in PDT Section 630.
- I. *Cement Concrete Sidewalks:* Replace cement concrete sidewalk removed or disturbed with a 4-inch thick coarse aggregate bed and a 4-inch thick concrete surface; width to match existing. Construct bed and concrete surface as specified in PDT Section 676.

7.3.2 *Clean-Up and Maintenance:*

- A. During construction, surface of all areas including, but not limited to, roads, streets, and driveways shall be maintained on a daily basis to produce a safe, desirable, and convenient condition.
- B. All unsatisfactory conditions resulting from the work shall be corrected.
- C. Continuously maintain temporary pavement until it is replaced with permanent pavement.
- D. Any subnormal or dangerous condition caused by the work, on any surface shall be repaired or corrected within two hours of observance or notification of its existence.

SECTION 8 - MAJOR FACILITIES

8.1 MAJOR FACILITIES

In cases where major facilities such as wastewater treatment facilities or major pumping stations are proposed, the Developer shall meet with the Authority prior to commencing design of these facilities to determine the specific criteria and standards to be used in the design. As with all other facilities, the Developer must receive approval of the design before commencing construction of the facilities.

SECTION 9 - MISCELLANEOUS

9.1 SAMPLING AND FLOW MEASUREMENT

- A. When required by the Authority, the owner of any unproved property serviced by the sewer system shall install at his expense a suitable control manhole together with such necessary meters and other appurtenances in the building sewer to facilitate observation, sampling and measurement of the waste. All materials, use, and installation must be approved by the Authority.

9.2 OIL AND GREASE INTERCEPTORS

- A. When sanitary sewage and/or industrial waste which is being discharged to the Leola Sewer Authority Sewage System contains oil and/or grease in excess of the limits established in the Leola Sewer Authority's Rate Resolution of December 17, 1985, oil and/or grease interceptors of appropriate size shall be installed. Semiautomatic interceptors made by Josam Manufacturing Co., Zurn, or equal or automatic interceptors made by Lowe Engineering Co., or equal, are acceptable.

HEAVY DUTY CAST IRON
FRAME AND COVER SUIT-
ABLE FOR HS25 LOADING

(4) 7/8" ϕ BOLT HOLES

2" RAISED LETTER
FLUSH W/ LID SURFACE

CONCEALED PICK HOLE
(2 REQUIRED)

GUSSETS (MINIMUM
6 REQUIRED)

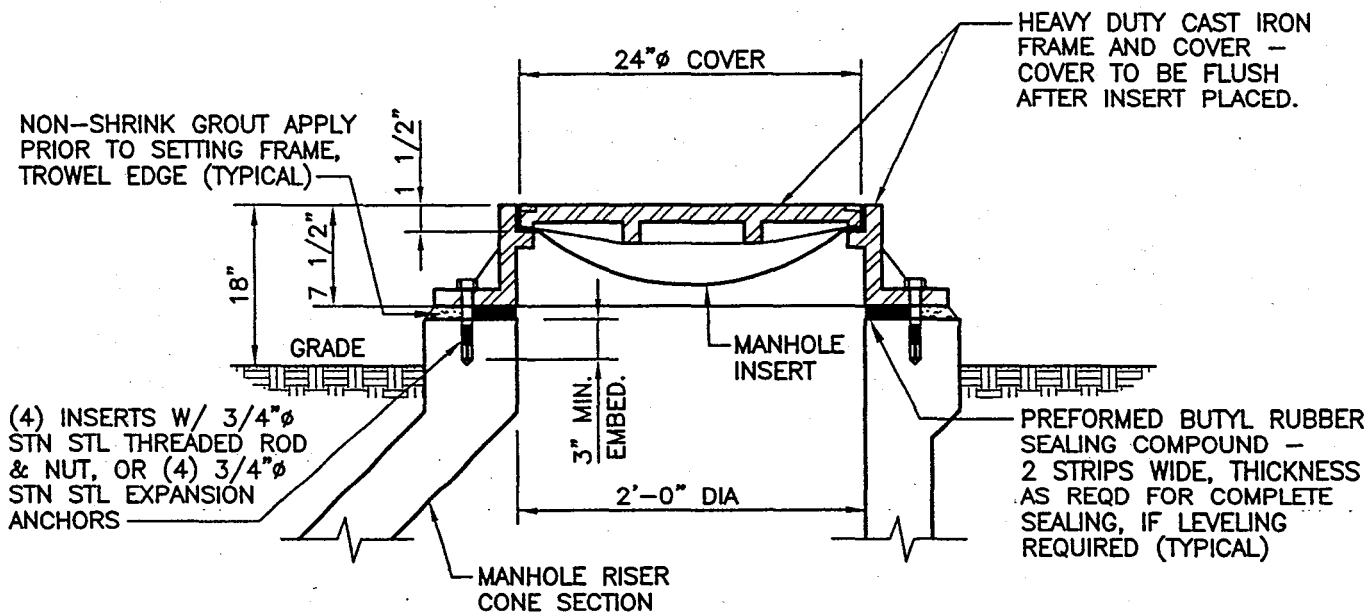
SANITARY

NOTES:

1. ANCHOR BOLT HOLES SHALL BE
DRILLED WITH A PERCUSSION OR
ROTARY HAMMER DRILL UTILIZING
A CARBIDE DRILL BIT. CORE
DRILLING, OR ROTATIONAL ONLY
DRILLING, OF ANY KIND, IS NOT
ALLOWED.

2. FRAME ANCHORS SHALL BE
TIGHTENED PRIOR TO CURING
OF NON-SHRINK GROUT.

COVER PATTERN



FIELD AREAS

Leola Sewer Authority

STANDARD DETAIL - GRAVITY & LOW PRESSURE SEWER SYSTEM

ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**FLAT TOP OR STANDARD MANHOLE
FRAME & COVER W/O GRADE RINGS**

DATE:

MARCH 2001

DETAIL:

1

(4) 7/8"Ø BOLT HOLES

- 2" RAISED LETTER
(TYPICAL)

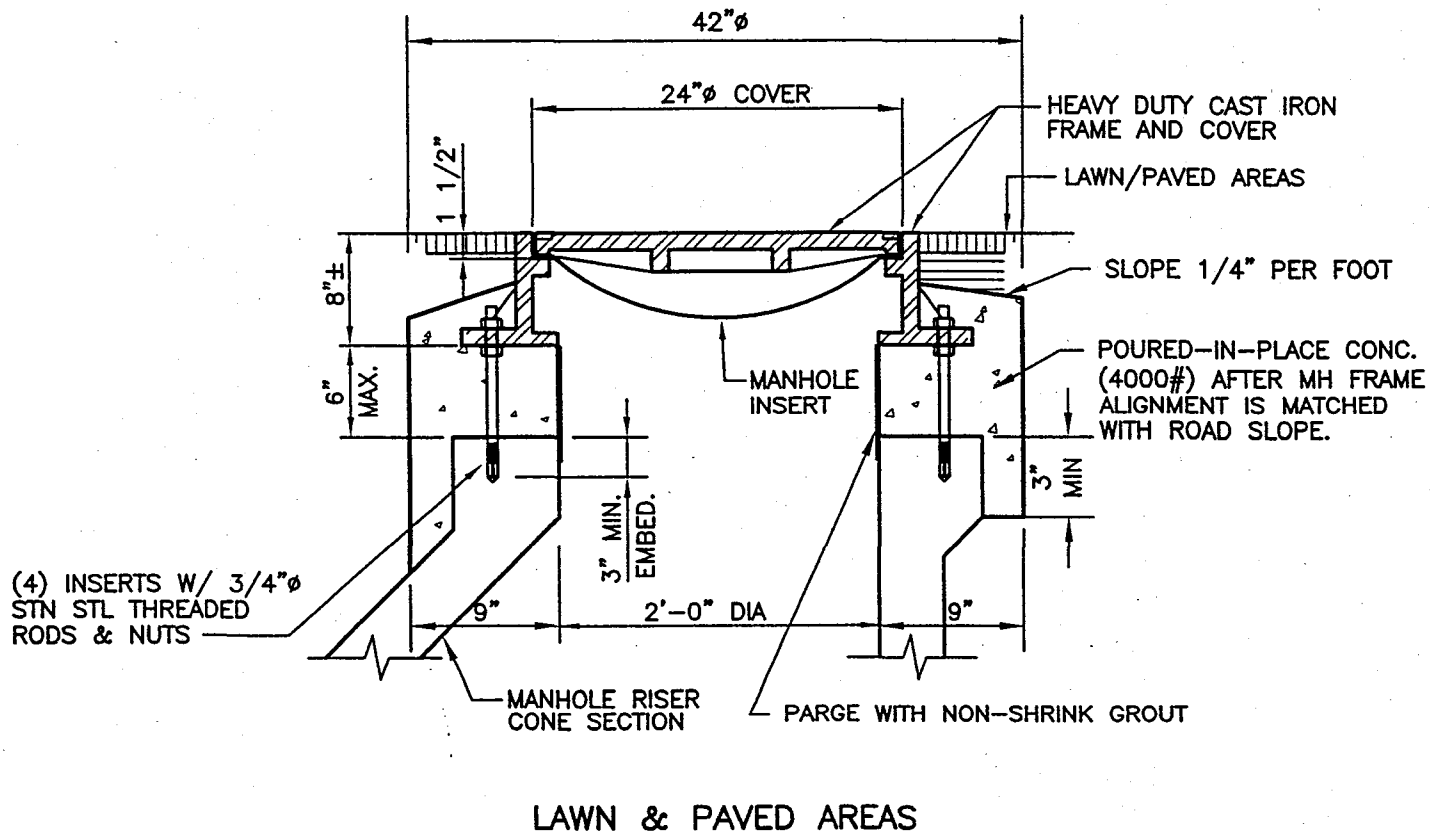
-CONCEALED PICK HOLE
(2 REQUIRED)

-GUSSETS (MINIMUM
6 REQUIRED)

NOTES:

- 1.) INSERT HOLES SHALL BE DRILLED WITH A PERCUSSION OR ROTARY HAMMER DRILL UTILIZING A CARBIDE DRILL BIT. CORE DRILLING, OR ROTATIONAL ONLY DRILLING, OF ANY KIND, IS NOT ALLOWED.
- 2.) FRAME ANCHORS SHALL BE TIGHTENED PRIOR TO POURING OF CONCRETE RISER.

COVER PATTERN



Leola Sewer Authority

STANDARD DETAIL - GRAVITY SEWER SYSTEM

ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**FLAT TOP OR STANDARD MANHOLE FRAME &
COVER WITH POURED-IN-PLACE CONC. RISER**

DATE: _____

MARCH 2001

DETAIL:

2

HEAVY DUTY CAST IRON
FRAME AND COVER SUIT-
ABLE FOR HS25 LOADING

(4) 7/8" ϕ BOLT HOLES

2" RAISED LETTER
FLUSH W/ LID SURFACE

CONCEALED PICK HOLE
(2 REQUIRED)

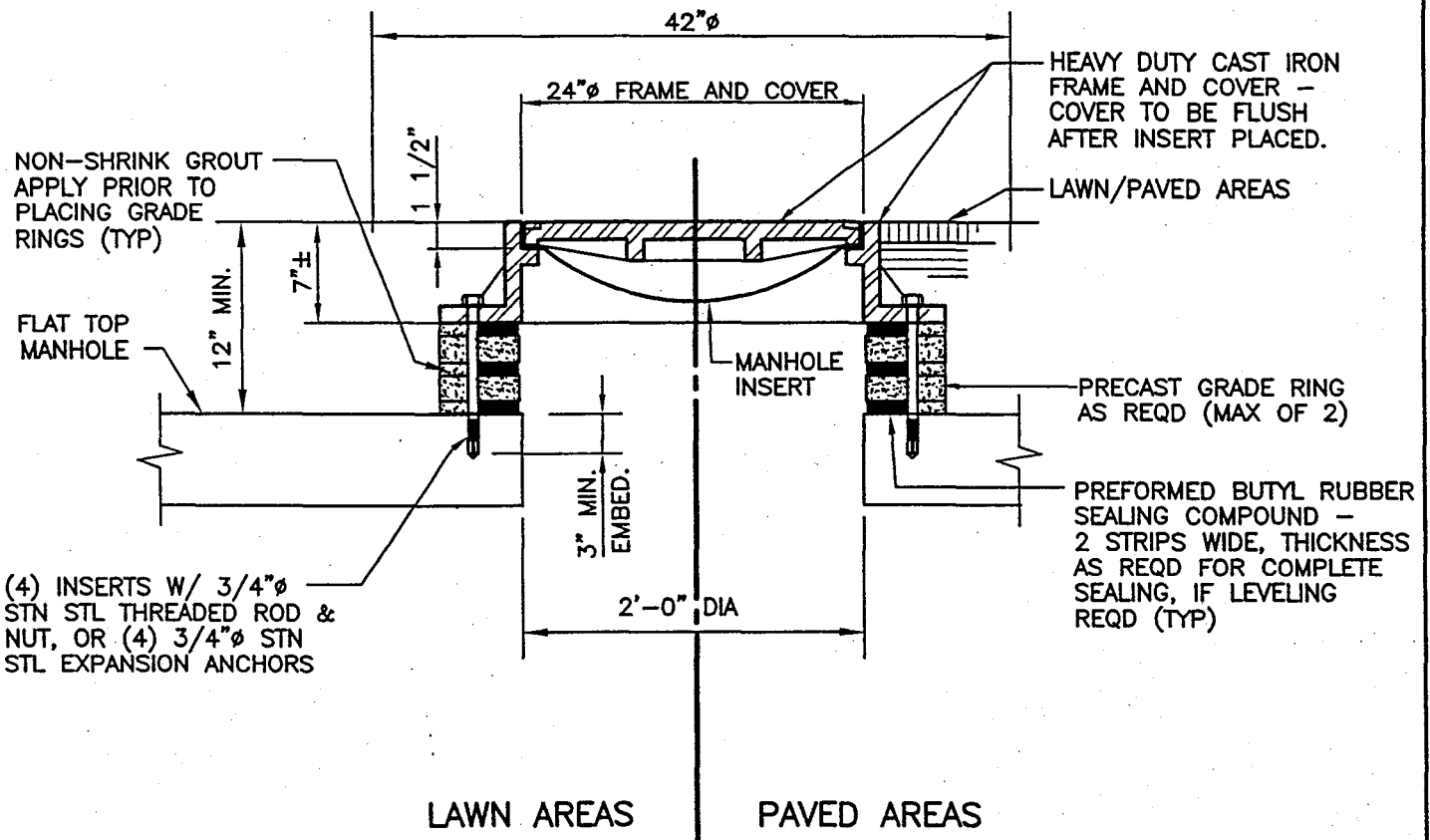
GUSSETS (MINIMUM
6 REQUIRED)

SANITARY

NOTES:

1. INSERT HOLES SHALL BE DRILLED WITH A PERCUSSION OR ROTARY HAMMER DRILL UTILIZING A CARBIDE DRILL BIT. CORE DRILLING, OR ROTATIONAL ONLY DRILLING, OF ANY KIND, IS NOT ALLOWED.
2. FRAME ANCHORS SHALL BE TIGHTENED PRIOR TO POURING OF CONCRETE RISER.

COVER PATTERN



Leola Sewer Authority

STANDARD DETAIL - LOW PRESSURE SEWER SYSTEM

**FLAT TOP MANHOLE FRAME & COVER
WITH GRADE RINGS**

ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

DATE:
MARCH 2001

DETAIL:
2A

HEAVY DUTY CAST IRON
FRAME AND COVER,
WATERTIGHT, SUITABLE
FOR HS25 LOADING

(4) 7/8"Ø BOLT HOLES

2" RAISED LETTER
(TYPICAL)

CONCEALED PICK HOLE
(2 REQUIRED)

GUSSETS (MINIMUM
6 REQUIRED)

SANITARY

NOTES:

- 1.) ANCHOR BOLT HOLES SHALL BE DRILLED WITH A PERCUSSION OR ROTARY HAMMER DRILL UTILIZING A CARBIDE DRILL BIT. CORE DRILLING, OR ROTATIONAL ONLY DRILLING, OF ANY KIND, IS NOT ALLOWED.
- 2.) FRAME ANCHORS SHALL BE TIGHTENED PRIOR TO CURING OF NON-SHRINK GROUT.

COVER PATTERN

NON-SHRINK GROUT APPLY
PRIOR TO PLACING FRAME,
TROWEL EDGE (TYPICAL)

24"Ø COVER

HEAVY DUTY CAST IRON
FRAME AND COVER

1 1/2"
8"±
18"
GRADE
3" MIN. EMBED.

(4) INSERTS W/ 3/4"Ø
STN STL THREADED ROD
& NUT, OR (4) 3/4"Ø
STN STL EXPANSION
ANCHORS

MANHOLE RISER
CONE SECTION

PREFORMED BUTYL RUBBER
SEALING COMPOUND -
2 STRIPS WIDE, THICKNESS
AS REQD FOR COMPLETE
SEALING, IF LEVELING
REQD (TYP)

FIELD AREAS

NOTE: PROVIDE WATERTIGHT MANHOLE FRAME & COVER
IN SWALES, GUTTERS AND FLOOD PRONE AREAS.

Leola Sewer Authority

STANDARD DETAIL - GRAVITY SEWER SYSTEM

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**WATERTIGHT MANHOLE
FRAME & COVER W/O GRADE RINGS**

DATE:
MARCH 2001

DETAIL:
3

HEAVY DUTY CAST IRON
FRAME AND COVER,
WATERTIGHT, SUITABLE
FOR HS25 LOADING

(4) 7/8"Ø BOLT HOLES

2" RAISED LETTER
(TYPICAL)

CONCEALED PICK HOLE
(2 REQUIRED)

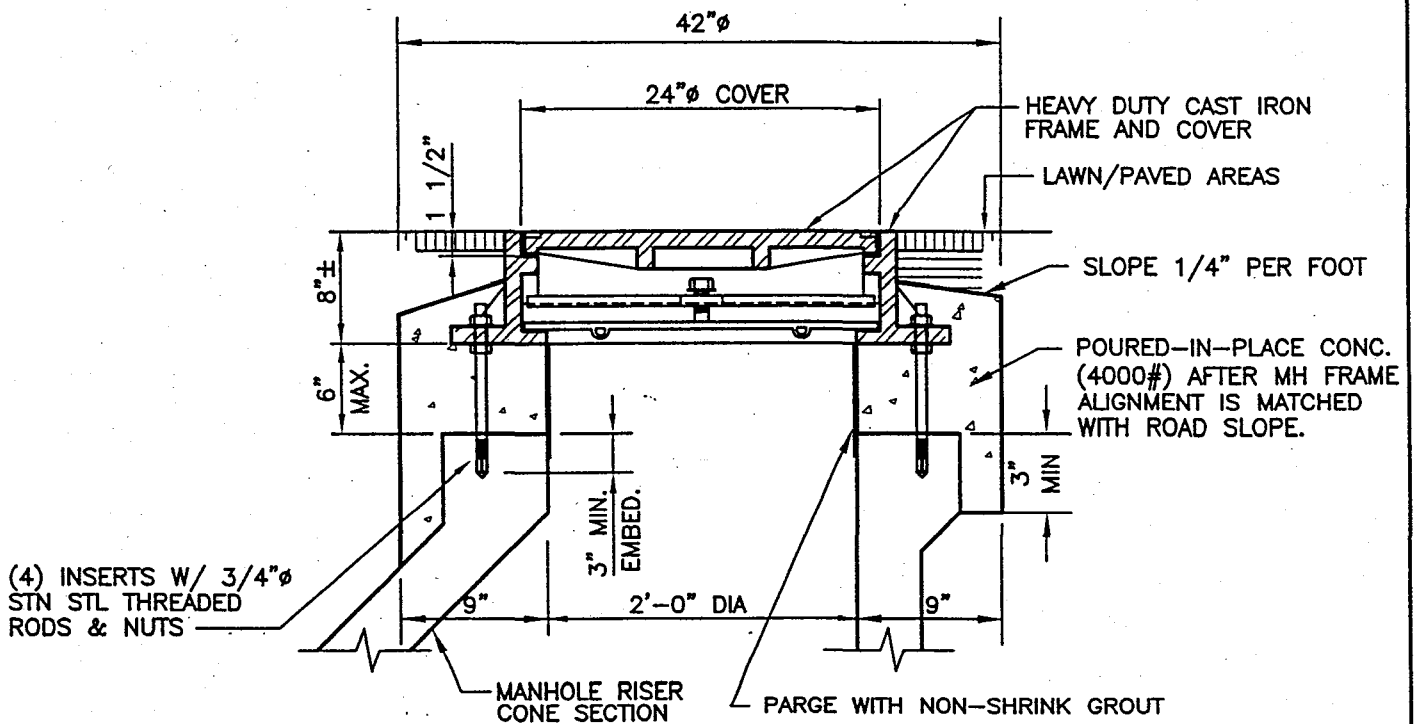
GUSSETS (MINIMUM
6 REQUIRED)

NOTES:

1.) INSERT HOLES SHALL BE
DRILLED WITH A PERCUSSION OR
ROTARY HAMMER DRILL UTILIZING
A CARBIDE DRILL BIT. CORE
DRILLING, OR ROTATIONAL ONLY
DRILLING, OF ANY KIND, IS NOT
ALLOWED.

2.) FRAME ANCHORS SHALL BE TIGHTENED
PRIOR TO POURING OF CONCRETE
RISER.

COVER PATTERN



LAWN AND PAVED AREAS

NOTE: PROVIDE WATERTIGHT MANHOLE FRAME & COVER
IN SWALES, GUTTERS, AND FLOOD PRONE AREAS.

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STANDARD DETAIL - GRAVITY SEWER SYSTEM

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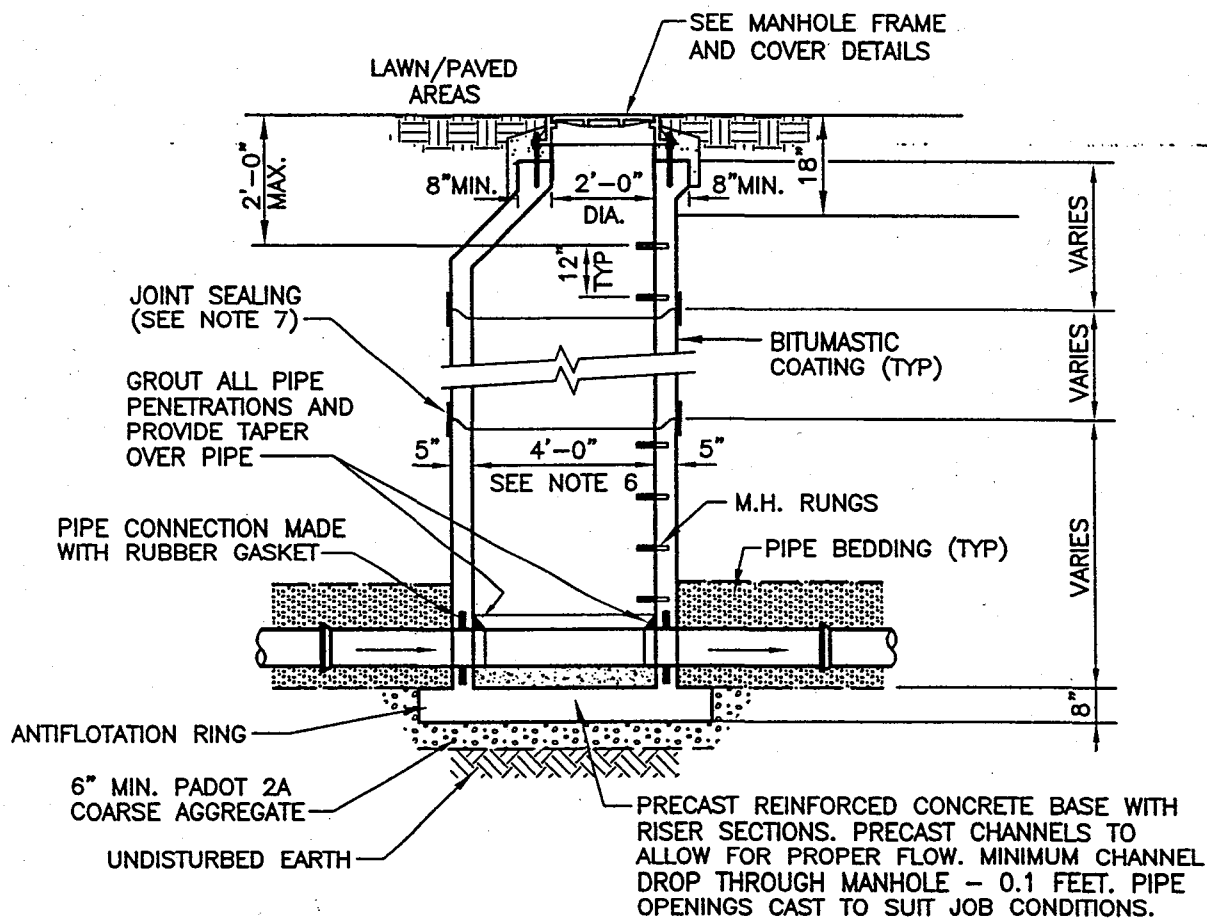
**WATERTIGHT MANHOLE FRAME & COVER
WITH POURED-IN-PLACE CONC. RISER**

DATE:
MARCH 2001

DETAIL:
4

1. ADJUST TO GRADE WITH POURED-IN-PLACE CONCRETE RISER. SEE FRAME & COVER DETAILS.
2. MECHANICALLY VIBRATED PRECAST CONCRETE SHALL CONFORM TO A.S.T.M. SPEC. C-478.
3. IF INCOMING INVERT EXCEEDS OUTGOING INVERT BY GREATER THAN OR EQUAL TO 6", SEE INSIDE SPLASH/INSIDE DROP MANHOLE DETAILS.
4. FOR MANHOLES WHERE TOP OF RIM TO INVERT DISTANCE IS LESS THAN 5'-0", USE FLAT TOP MANHOLE IN LIEU OF CONE TOP.

5. FILL ALL LIFTING HOLES WITH NON-SHRINK GROUT.
6. LARGER DIAMETER MANHOLE REQUIRED ON INSIDE DROP AND INSIDE SPLASH CONNECTION GREATER THAN 12", SEE DETAIL 15.
7. PROVIDE 2 RINGS OF PREFORMED BUTYL RUBBER SEALING COMPOUND (INSIDE & OUTSIDE) WITH 12" WIDE BAND OF EXTERNAL SEALING SYSTEM (OUTSIDE) AT ALL MANHOLE JOINTS.



Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

PRECAST MANHOLE 8' THRU 24' SEWERS



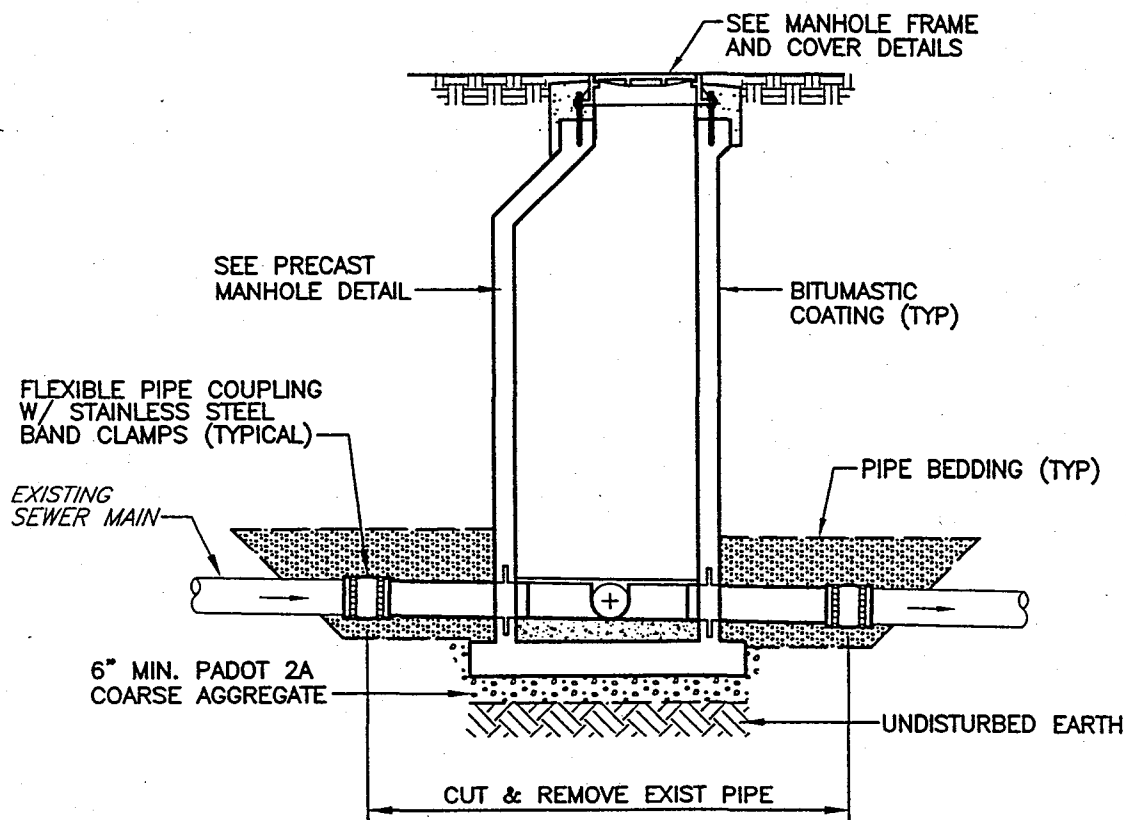
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Tel 717.569.7021

DATE: MARCH 2001

DETAIL: 5

NOTES:

1. INSTALL MANHOLE ON EXISTING SEWER MAIN AS FOLLOWS:
 - A. BYPASS FLOW
 - B. CUT EXISTING PIPE
 - C. INSTALL MANHOLE W/ PRECAST BASE, AS SHOWN ON DETAIL
2. DOGHOUSE MANHOLES MAY BE USED ONLY BY SPECIAL EXCEPTION FROM LEOLA SEWER AUTHORITY (LSA).



SECTION

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

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**NEW MANHOLE
ON EXISTING MAIN**

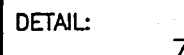
DATE:
MARCH 2001

DETAIL:
6

Dwg. Name: 00323061.DWG Last Revised: 04/05/01 11:05

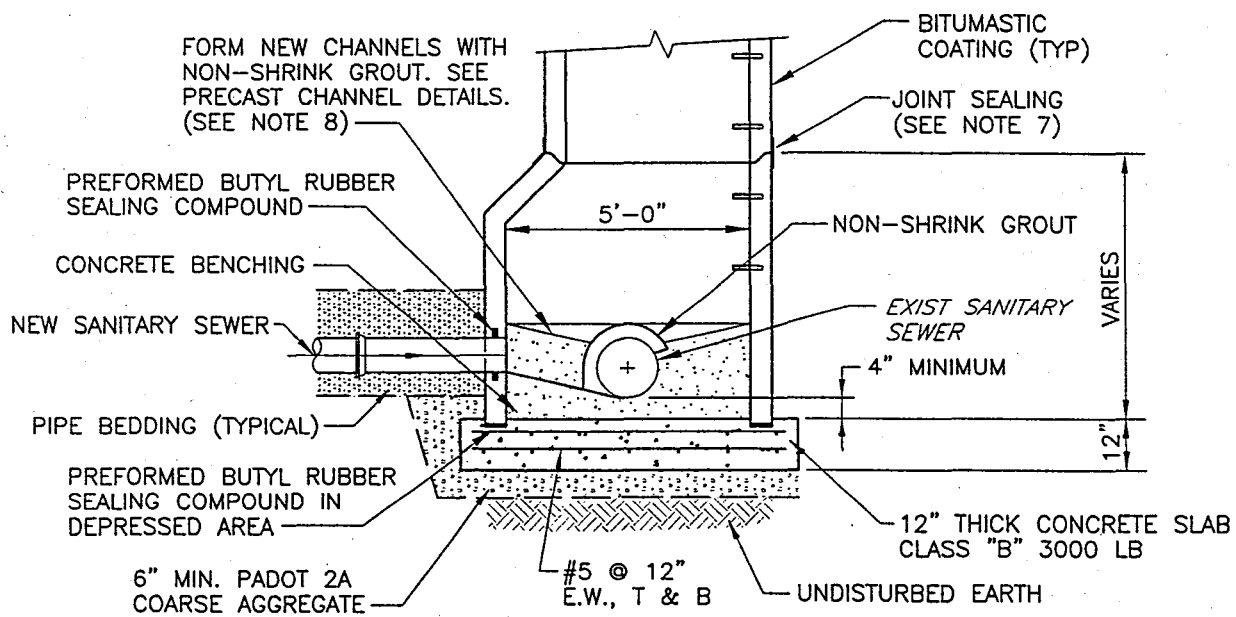
-
- The diagram illustrates the construction details for installing a new sanitary sewer line through an existing manhole structure. Key components and dimensions include:
- LAWN / PAVED AREAS**: Indicated at the top of the structure.
 - SEE MANHOLE FRAME AND COVER DETAILS**: Reference to the upper part of the assembly.
 - Dimensions**: Vertical clearance of 2'-0" MAX.; horizontal clearances of 8" MIN., 2'-0" DIA., and 8" MIN.;
 - JOINT SEALING (SEE NOTE 7)**: Located between the old and new pipe sections.
 - NEW SANITARY SEWER**: The newly installed pipe section.
 - NON-SHRINK GROUT**: Used around the base of the new pipe.
 - PREFORMED BUTYL RUBBER SEALING COMPOUND (TYPICAL)**: Applied at joints.
 - CONCRETE BENCHING - SEE PRECAST CHANNEL DETAILS**: A step in the wall where the pipe enters.
 - EXISTING SANITARY SEWER**: The original pipe being replaced or augmented.
 - PREFORMED BUTYL RUBBER SEALING COMPOUND IN DEPRESSED AREA**: Seals the gap between the old and new pipes.
 - #5 @ 12" E.W., T & B**: Reinforcement bars in the concrete slab.
 - 6" MIN. PADOT 2A COARSE AGGREGATE**: Material beneath the concrete slab.
 - UNDISTURBED EARTH**: The ground surrounding the foundation.
 - TRANSITION CHANNEL (SEE NOTE 8)**: Connects the two pipe sections.
 - SAW CUT TOP OF PIPE AFTER DOGHOUSE INSTALLED**: Instruction for modifying the existing pipe.
 - PLACE MANHOLE OVER EXISTING PIPE USING DOGHOUSE OPENINGS AS MANUFACTURED**: Instruction for aligning the new structure.
 - 12" THICK CONCRETE SLAB CLASS "B" 3000 LB**: The main structural floor.
 - Dimensions**: 5" CL (centerline) offset, 4"-0" width, 5" offset, 5'-0" length, 4" MIN. gap, 3" CL (centerline), 5" CL, and 6" ALL AROUND finish.
 - BITUMASTIC COATING (TYP)**: Protective coating on the interior walls.
- ### SECTION A-A

PRECAST DOGHOUSE MANHOLE DETAIL (BY SPECIAL EXCEPTION ONLY)



NOTES:

1. INSTALL MANHOLES ON EXISTING LINES BY BYPASSING FLOW, CUTTING PIPE & INSTALLING MANHOLE WITH PRECAST BASE. DOGHOUSE MANHOLES, AS SHOWN IN THIS DETAIL, MAY BE USED ONLY BY SPECIAL EXCEPTION FROM LEOLA SEWER AUTHORITY (LSA).
2. ADJUST TO GRADE WITH POURED-IN-PLACE CONCRETE RISER SEE MANHOLE FRAME & COVER DETAILS.
3. MECHANICALLY VIBRATED PRECAST CONC SHALL CONFORM TO A.S.T.M. SPEC. C-478.
4. IF INCOMING INVERT EXCEEDS OUTGOING INVERT BY GREATER THAN OR EQUAL TO 6", SEE INSIDE SPLASH/INSIDE DROP MANHOLE DETAILS.
5. FOR MANHOLES WHERE TOP OF RIM TO INVERT DISTANCE IS LESS THAN 5'-0", USE FLAT TOP MANHOLE IN LIEU OF CONE TOP.
6. FILL ALL LIFTING HOLES W/ NON-SHRINK GROUT.
7. PROVIDE 2 RINGS OF PREFORMED BUTYL RUBBER SEALING COMPOUND (INSIDE & OUTSIDE) WITH 12" WIDE BAND OF EXTERNAL SEALING SYSTEM (OUTSIDE) AT ALL MANHOLE JOINTS.
8. GROUT SMOOTH TRANSITION CHANNEL TO PREVENT HANG UP OF DEBRIS.



SECTION B-B

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

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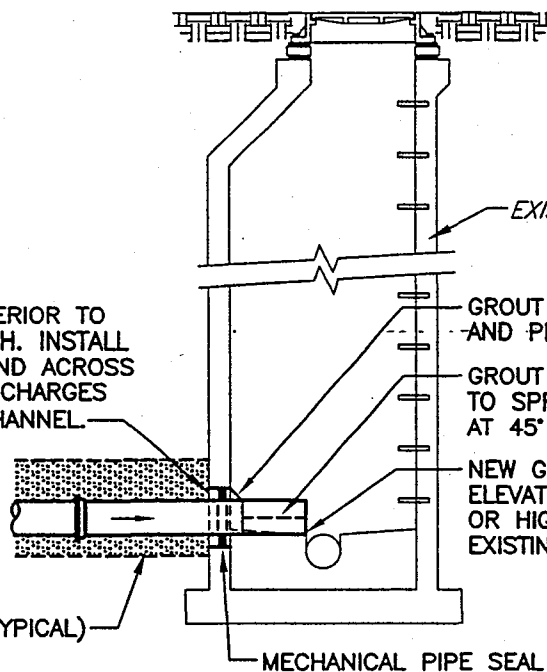
**PRECAST DOGHOUSE BOTTOM DETAIL
(BY SPECIAL EXCEPTION ONLY)**

DATE:
MARCH 2001

DETAIL:
8

CORE DRILL FROM EXTERIOR TO TOP OF EXISTING BENCH. INSTALL PIPE THROUGH WALL AND ACROSS BENCH SO SEWAGE DISCHARGES DIRECTLY INTO MAIN CHANNEL.

PIPE BEDDING (TYPICAL)



GROUT ALL PIPE PENETRATIONS AND PROVIDE TAPER OVER PIPE

GROUT LATERAL, BOTH SIDES, TO SPRING LINE AND TAPER AT 45° TO BENCH

NEW GRAVITY SEWER INVERT ELEVATION SHALL BE EQUAL OR HIGHER THAN TOP OF EXISTING MAIN

SECTION

NOTE: CROWN ELEVATION OF NEW PIPE SHALL MATCH OR BE HIGHER THAN CROWN ELEVATION OF EXISTING OUTGOING PIPE.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

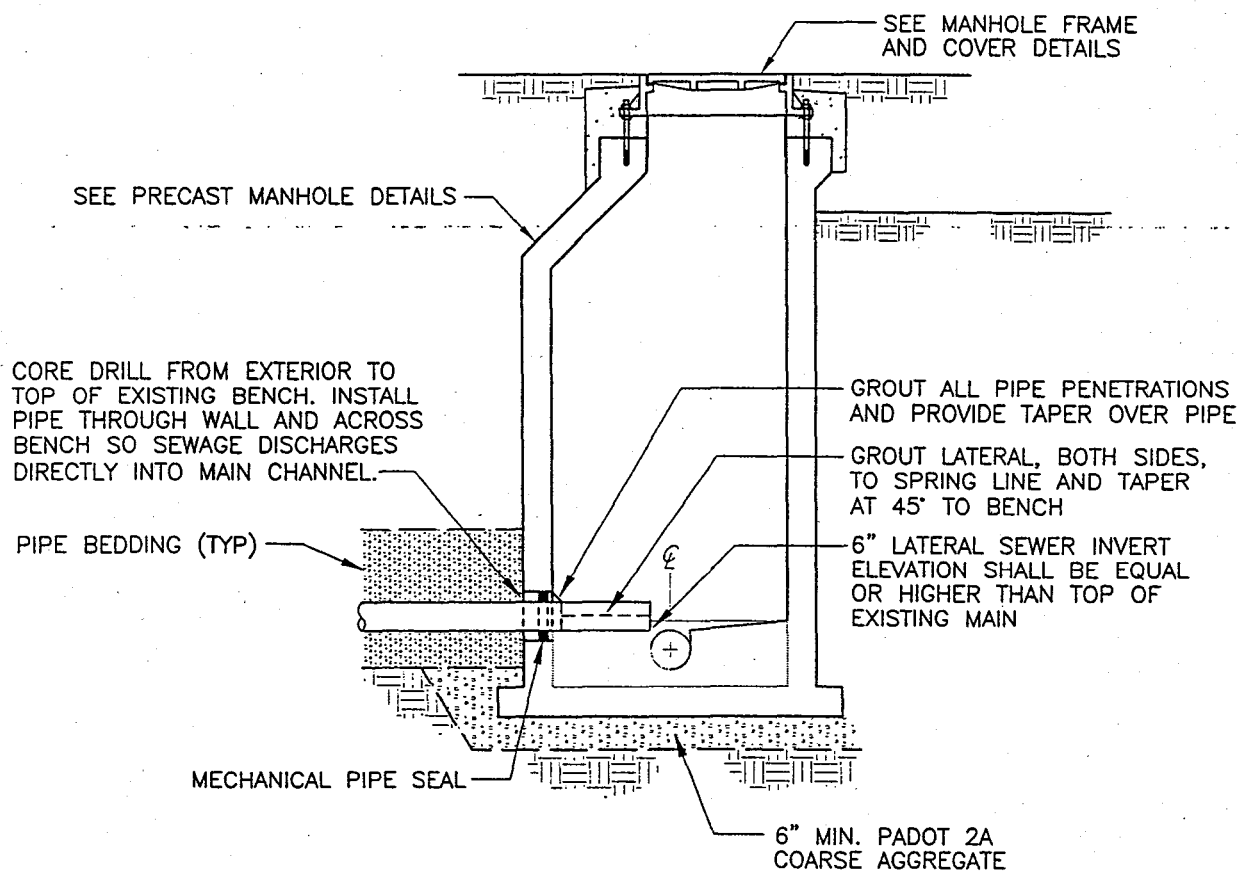
**GRAVITY SEWER CONNECTION
TO EXISTING MANHOLE**

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DATE:
MARCH 2001

DETAIL:
9



Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

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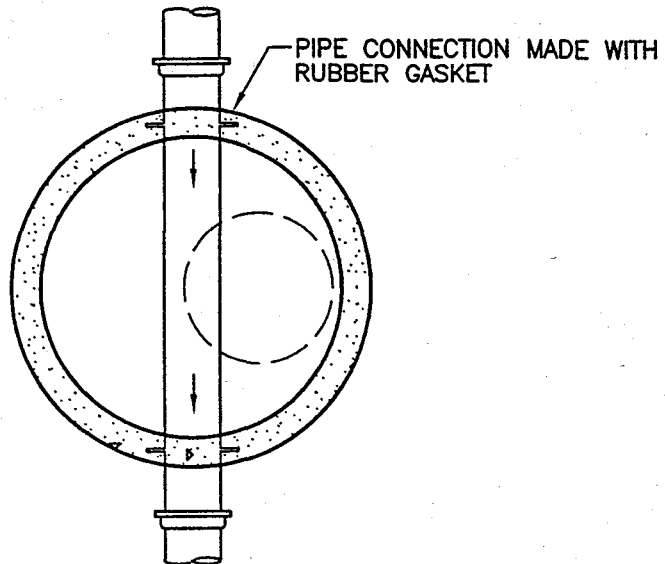
**6" LATERAL INTO NEW MANHOLE
(BY SPECIAL EXCEPTION ONLY)**

DATE:
MARCH 2001

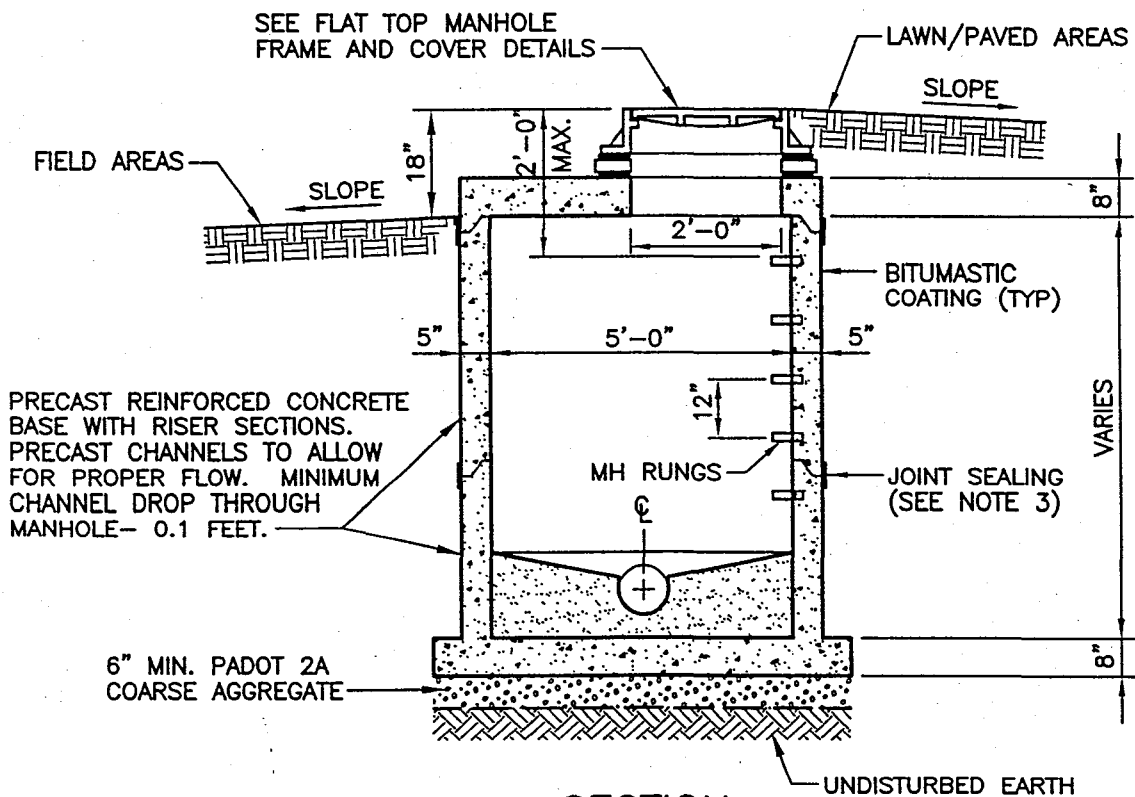
DETAIL:
10

NOTES:

1. ADJUST TO GRADE WITH CONCRETE GRADE RINGS (MAXIMUM VERTICAL ADJUSTMENT 6") SEE FRAME & COVER DETAILS.
2. MECHANICALLY VIBRATED PRECAST CONCRETE SHALL CONFORM TO A.S.T.M. SPEC. C-478.
3. PROVIDE 2 RINGS OF PREFORMED BUTYL RUBBER SEALING COMPOUND (INSIDE & OUTSIDE) WITH 12" WIDE BAND OF EXTERNAL SEALING SYSTEM (OUTSIDE) AT ALL MANHOLE JOINTS.
4. FILL ALL LIFTING HOLES WITH NON-SHRINK GROUT.



PLAN



SECTION

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

**SAMPLING MANHOLE
PLAN & SECTION**

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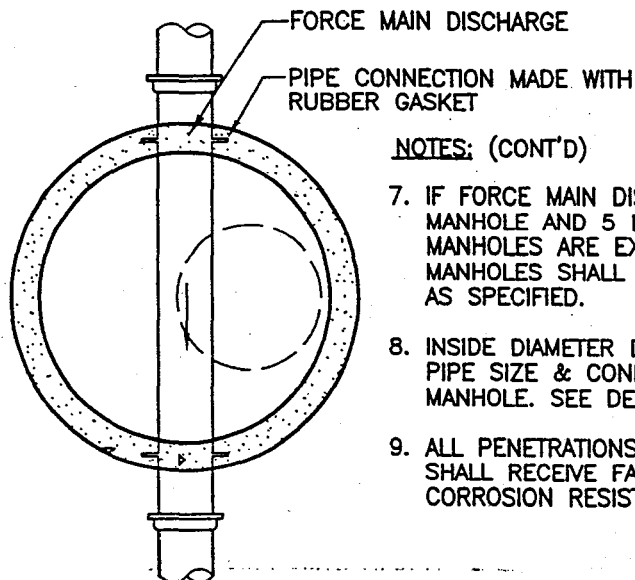
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DATE: MARCH 2001

DETAIL: 11

NOTES:

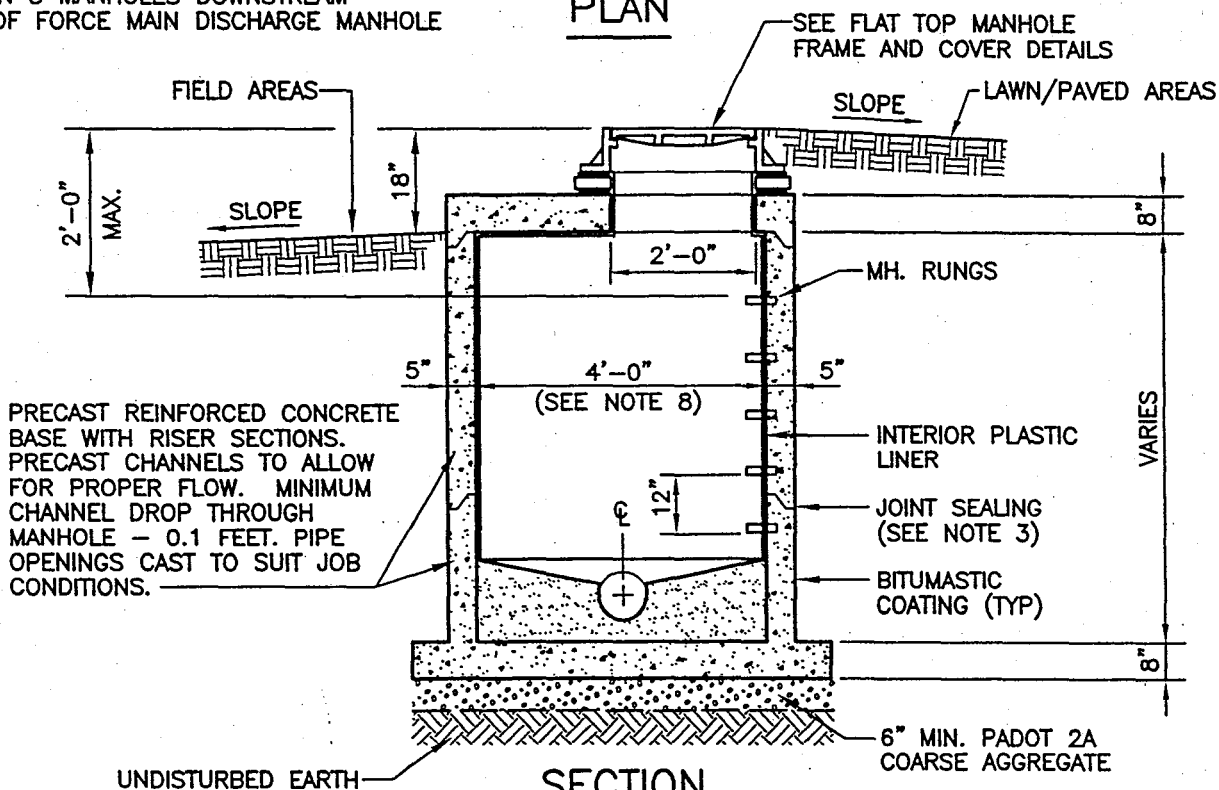
1. ADJUST TO GRADE WITH CONC. GRADE RINGS (MAX. VERT. ADJUST. 6"). SEE FRAME & COVER DETAILS.
2. MECHANICALLY VIBRATED PRECAST CONC. SHALL CONFORM TO A.S.T.M. C-478.
3. SEAL ALL JOINTS INSIDE & OUTSIDE WITH PREFORMED BUTYL RUBBER SEALING COMPOUND.
4. FILL ALL LIFTING HOLES WITH NON-SHRINK GROUT.
5. INTERIOR PLASTIC LINER TO PROVIDE CONTINUOUS, IMPERMEABLE LINING TO SHIELD PRECAST CONC. AGAINST DETERIORATION CAUSED BY CORROSIVE ATMOSPHERE.
6. PROVIDE INTERIOR PLASTIC LINER IN 5 MANHOLES DOWNSTREAM OF FORCE MAIN DISCHARGE MANHOLE



NOTES: (CONT'D)

7. IF FORCE MAIN DISCHARGE MANHOLE AND 5 DOWNSTREAM MANHOLES ARE EXISTING, MANHOLES SHALL BE COATED AS SPECIFIED.
8. INSIDE DIAMETER DETERMINED BY PIPE SIZE & CONFIGURATION IN MANHOLE. SEE DETAILS 13 & 15.
9. ALL PENETRATIONS THROUGH LINER SHALL RECEIVE FACTORY APPLIED CORROSION RESISTANT COATING.

PLAN



SECTION

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

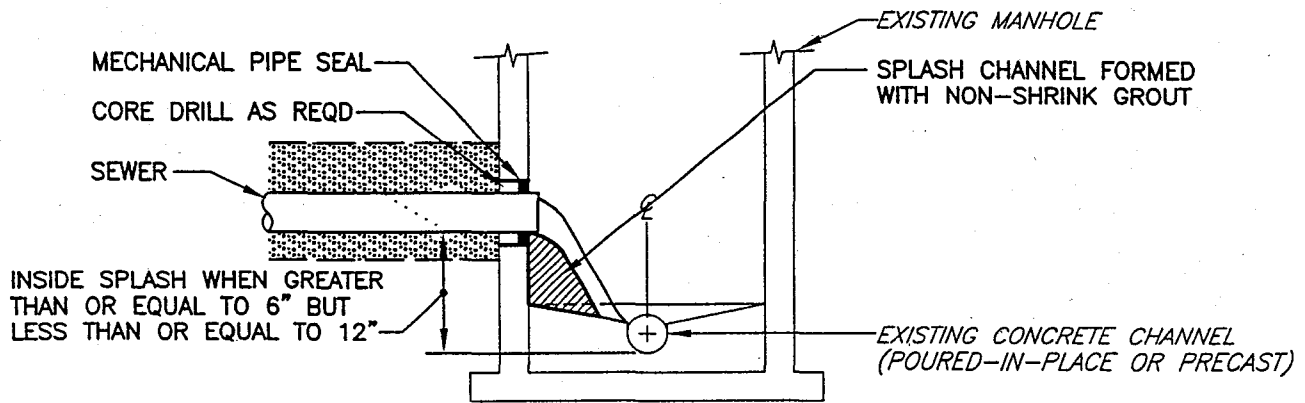
**PRECAST MANHOLE DETAIL
W/ FORCE MAIN DISCHARGE**

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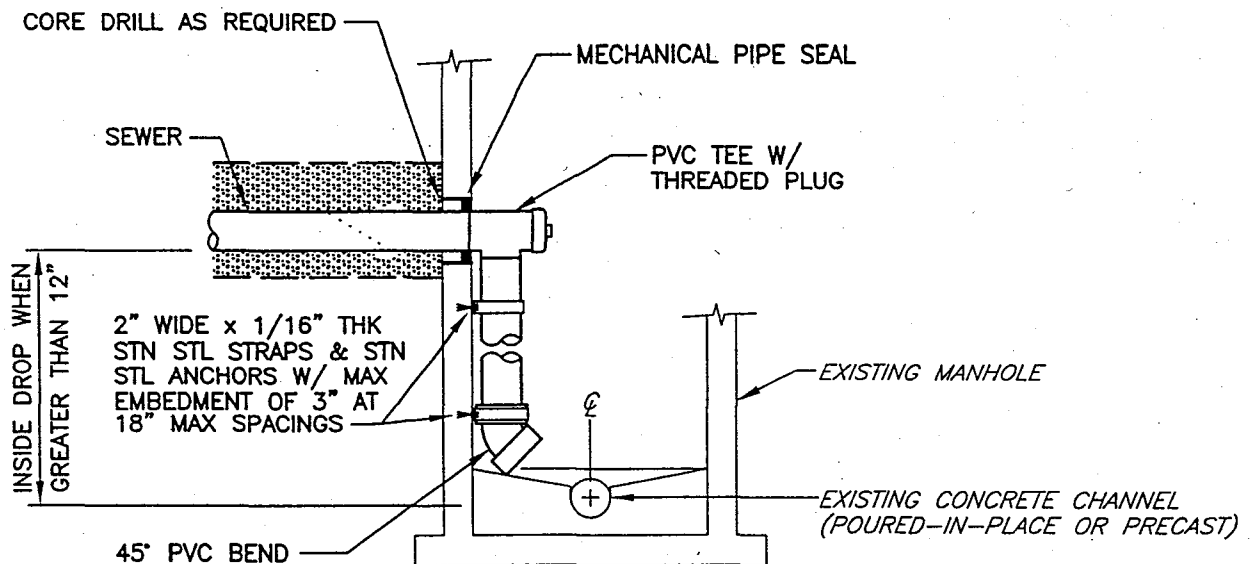
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DATE:
MARCH 2001

DETAIL:
12



SECTION INSIDE SPLASH



SECTION INSIDE DROP

(*) IN 4 FT DIA MANHOLES BY SPECIAL EXCEPTION ONLY

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

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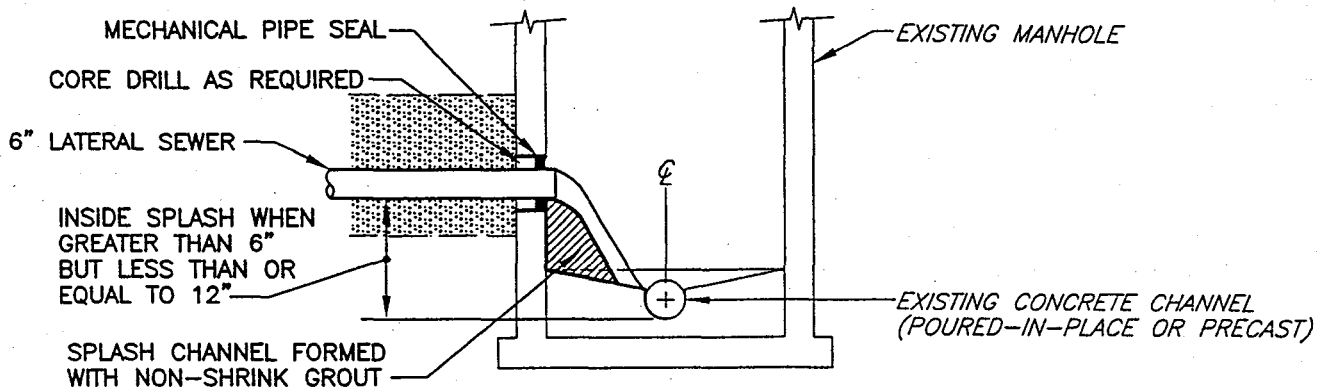
**INSIDE SPLASH/DROP 8'-10' CONNECTION
TO EXISTING MANHOLE (●)**

DATE:

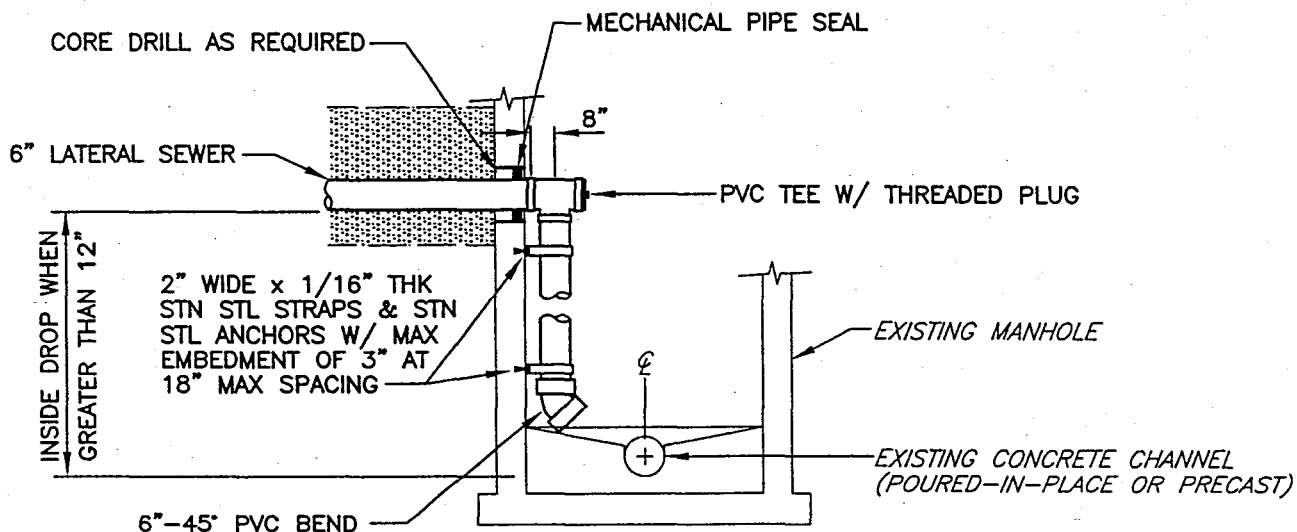
MARCH 2001

DETAIL:

13



**SECTION
INSIDE SPLASH**



**SECTION
INSIDE DROP**

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

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**INSIDE SPLASH/DROP - 6' LATERAL INTO
EXIST. MH (BY SPECIAL EXCEPTION ONLY)**

DATE: MARCH 2001

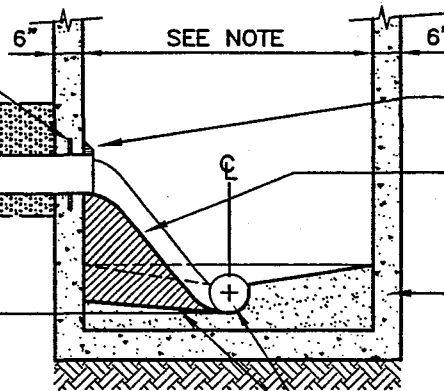
DETAIL: 14

PIPE CONNECTION MADE
WITH RUBBER GASKET

PIPE BEDDING
(TYP)

SEWER

INSIDE SPLASH
WHEN GREATER THAN
OR EQUAL TO 6" BUT
LESS THAN OR EQUAL
TO 2'-0"



SEE NOTE

NOTE:
MANHOLE DIAMETER SHALL BE 4'
WHEN SPLASH IS 6" TO 1'-0" AND
5' WHEN SPLASH IS 1'-0" TO
2'-0".

GROUT ALL PIPE PENETRATIONS
AND PROVIDE TAPER OVER PIPE

SPLASH CHANNEL FORMED
INTO PRECAST CHANNEL
WITH NON-SHRINK GROUT

PRECAST REINFORCED CONCRETE
BASE WITH RISER SECTIONS.
SEE PRECAST MANHOLE DETAILS.

PRECAST CHANNELS TO ALLOW
FOR PROPER FLOW.
SEE PRECAST CHANNEL DETAILS.

SECTION INSIDE SPLASH

PIPE CONNECTION MADE
WITH RUBBER GASKET

SEWER

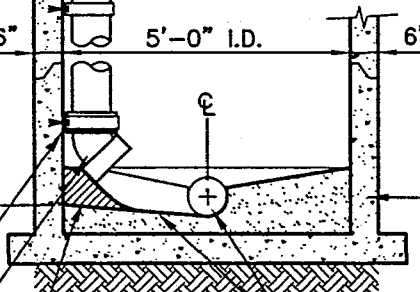
INSIDE DROP
WHEN GREATER
THAN 2'-0"

PVC TEE W/ THREADED
PLUG
6" 5'-0" I.D. 6"

2" WIDE x 1/16" THK
STN STL STRAPS & STN
STL ANCHORS W/ MAX
EMBEDMENT OF 3" AT 18"
MAX SPACINGS (TYP) -
ALSO PROVIDE STRAP
SPECIFICALLY FOR
45° BEND

45° PVC BEND

SPLASH CHANNEL FORMED
INTO PRECAST CHANNEL
WITH NON-SHRINK GROUT



PRECAST REINFORCED CONCRETE
BASE WITH RISER SECTIONS.
SEE PRECAST MANHOLE DETAILS.

PRECAST CHANNELS TO ALLOW
FOR PROPER FLOW.
SEE PRECAST CHANNEL DETAILS.

SECTION INSIDE DROP

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

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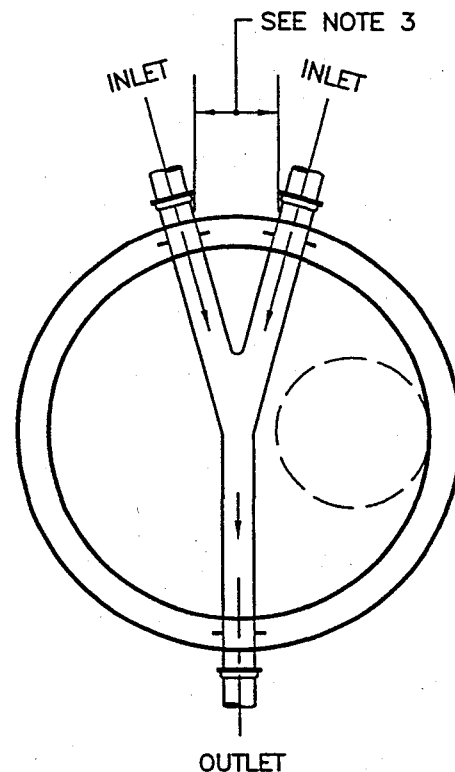
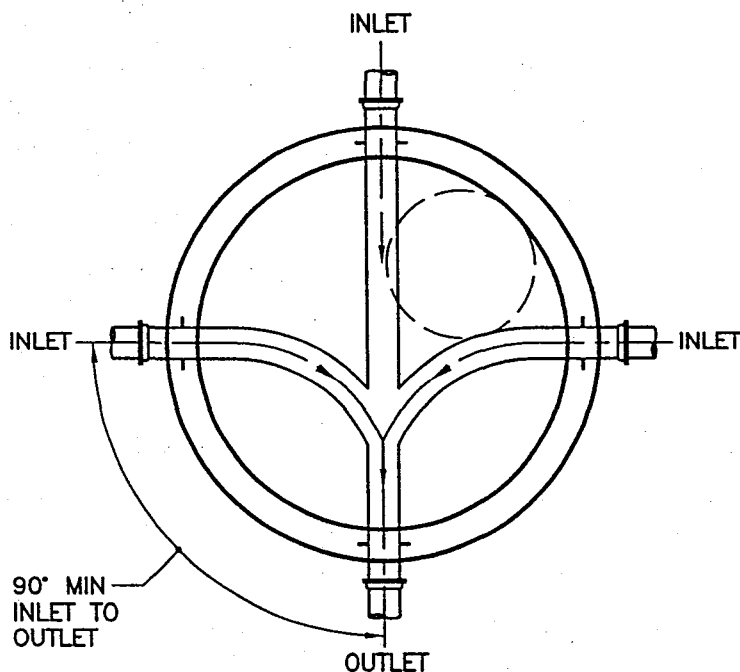
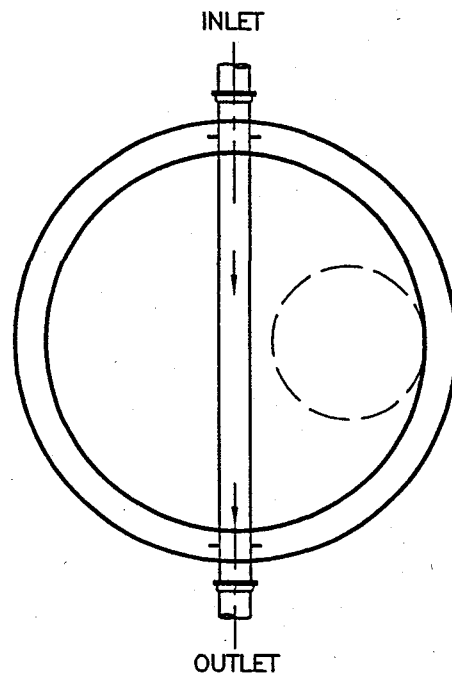
**MANHOLE DETAILS
INSIDE SPLASH/INSIDE DROP (8'-10')**

DATE:
MARCH 2001

DETAIL:
15

NOTES:

1. THREE INLET PIPES AND ONE OUTLET PIPE MAX INTO MANHOLE.
2. NO LATERALS INTO MANHOLES, EXCEPT BY SPECIAL EXCEPTION FROM LSA.
3. MINIMUM 12" SEPARATION FROM EDGE OF PIPE PENETRATION TO EDGE OF PIPE PENETRATION
4. MINIMUM CHANNEL DROP THROUGH MANHOLE:
 STRAIGHT THROUGH - 0.1 FEET
 BEND - 0.2 FEET
5. ALL CHANNELS SHALL BE PRECAST, UNLESS OTHERWISE SPECIFICALLY NOTED OR APPROVED.
6. THESE DETAILS APPLY TO PRECAST CHANNELS IN NEW MANHOLES, AND FIELD-FORMED CHANNELS IN EXISTING MANHOLES.
7. CHANNEL BENCH AT PIPE SHALL MATCH 3/4 CROWN ELEVATION OF PIPE AND RISE 1/2" PER FOOT TO THE MANHOLE WALLS.
8. CHANNELS SHALL MATCH THE CROSS-SECTIONAL DIMENSIONS OF THE PIPES ENTERING AND EXITING THE MANHOLE. SMOOTH TRANSITIONS SHALL BE PROVIDED BETWEEN CHANGES IN PIPE SIZE.



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STANDARD DETAIL - SEWER SYSTEM

PRECAST CHANNELS

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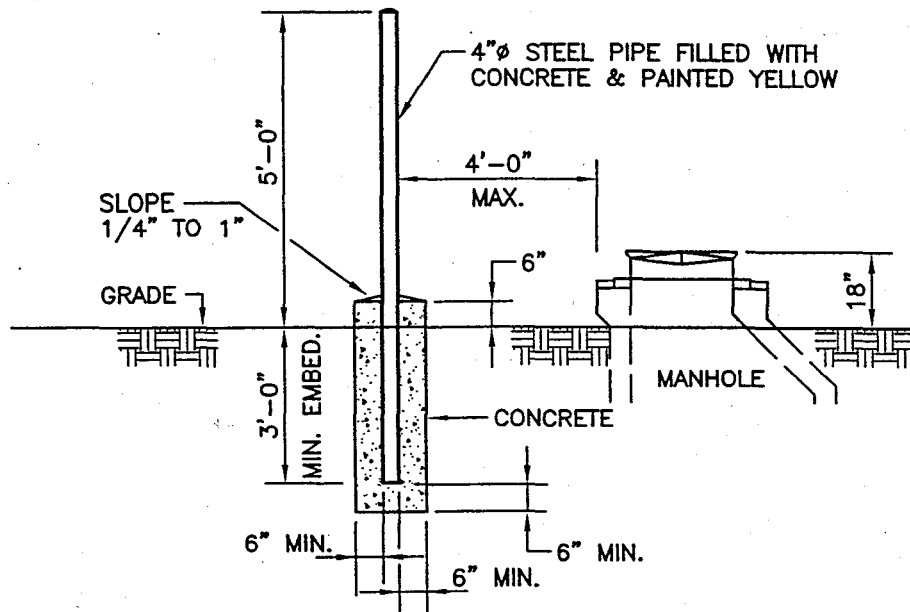
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 Tel 717.569.7021

DATE:
 MARCH 2001

DETAIL:
 16

NOTE:

1. INSTALL IN AREAS AS REQUIRED BY THE AUTHORITY OR NEEDED TO PROTECT EQUIPMENT FROM TRAFFIC.



ELEVATION

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

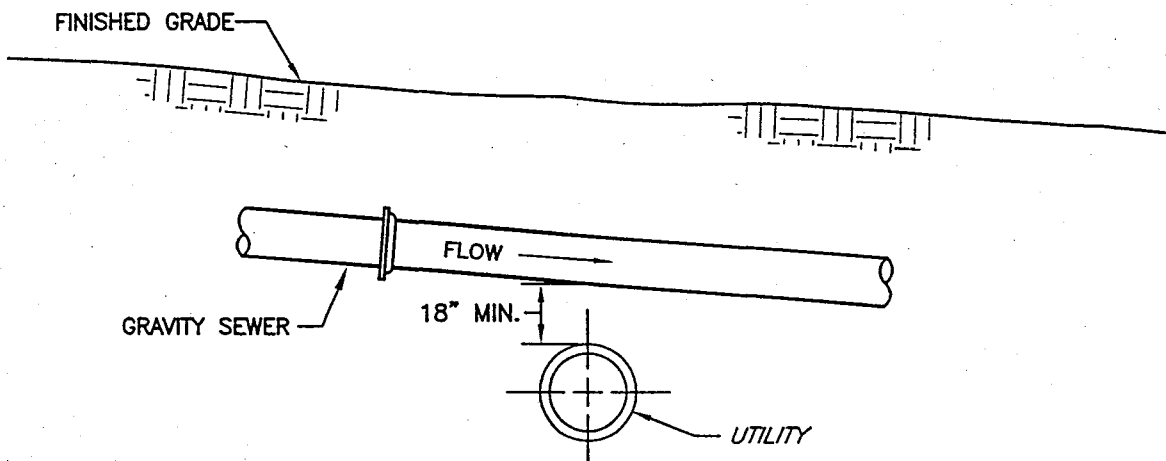
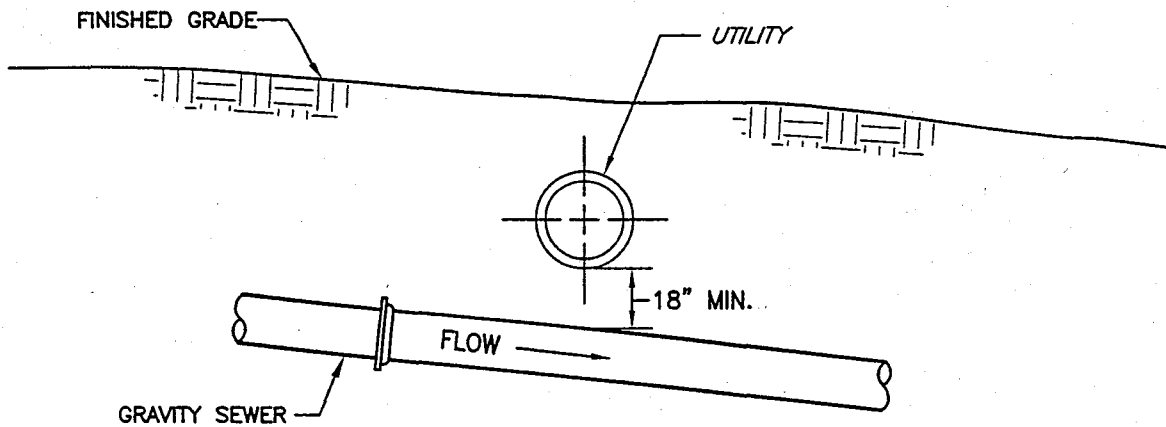
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PROTECTION POST

DATE: MARCH 2001

DETAIL: 17



NOTE: MAINTAIN SLOPE OF PROPOSED SEWER AT ALL CROSSINGS.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

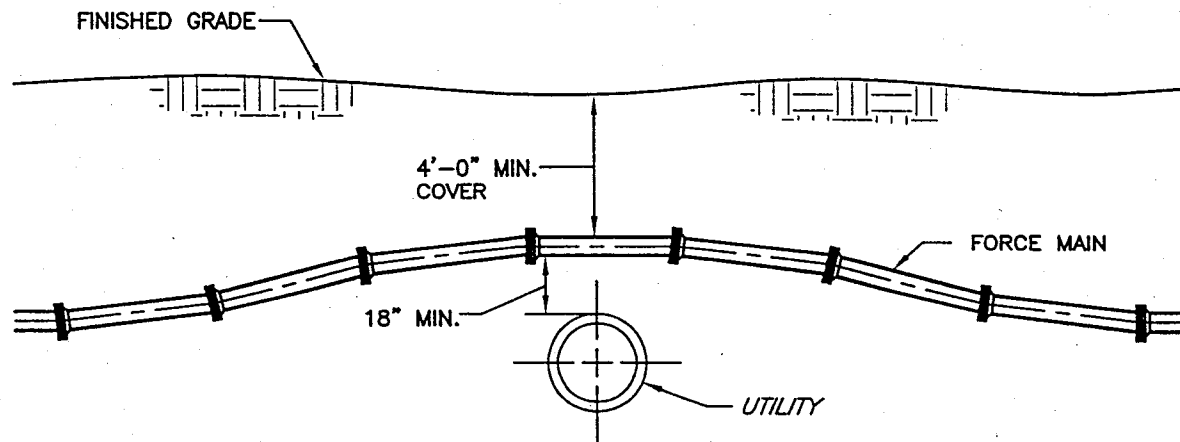
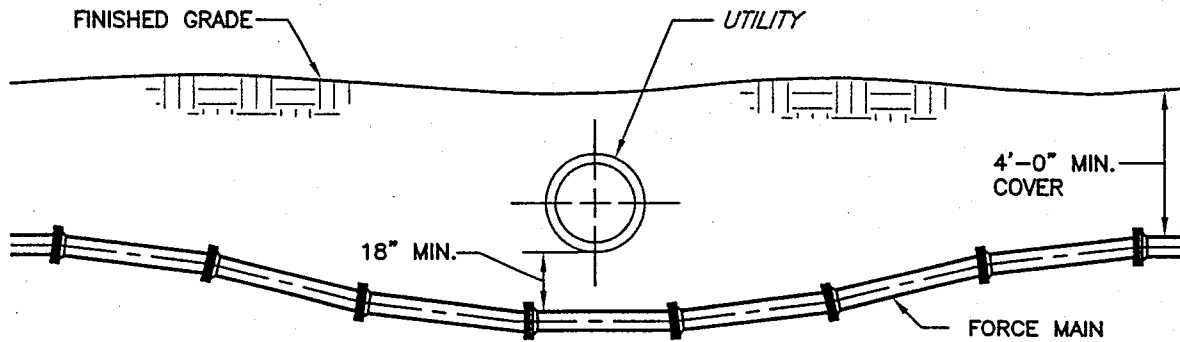
**GRAVITY SEWER CROSSING
UTILITIES DETAIL**

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Tel 717.569.7021

DATE:
MARCH 2001

DETAIL:
18



NOTE: PERFERRED DESIGN SHOULD HAVE NO INTERMEDIATE SAGS OR LOSS IN GRADE IN THE FORCE MAIN WHICH COULD TEND TO ACCUMULATE AIR OTHER THAN AT HIGH POINTS.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

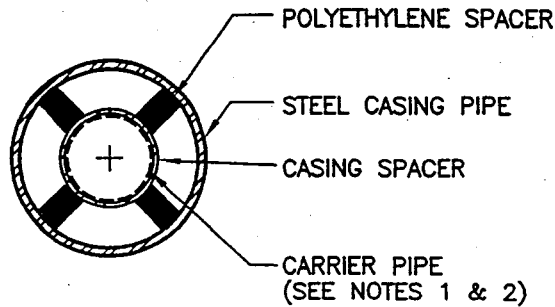
ARRO
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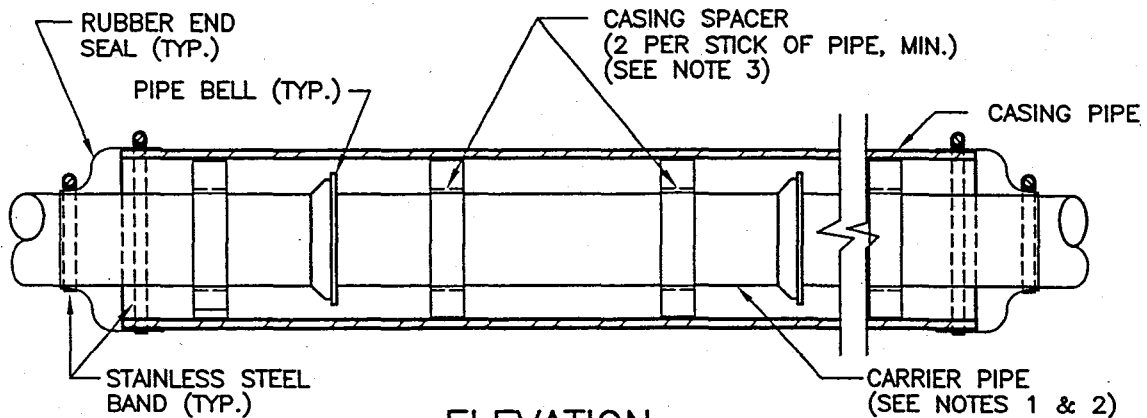
**FORCE MAIN CROSSING UTILITY DETAIL
(USING DEFLECTING JOINTS)**

DATE:
MARCH 20001

DETAIL:
19



SECTION



ELEVATION

NOTES:

- 1) FORCE MAIN PIPE SHALL BE RESTRAINED JOINT PIPE.
- 2) GRAVITY SEWER PERMITTED ONLY WHEN INSTALLATION IS BY OPEN CUT. OTHERWISE, SEE GRAVITY SEWER INSTALLATION VIA BORING/JACKING DETAIL.
- 3) 3 CASING SPACERS PER 20' STICK OF PIPE FOR PIPE LESS THAN 3" IN DIAMETER.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

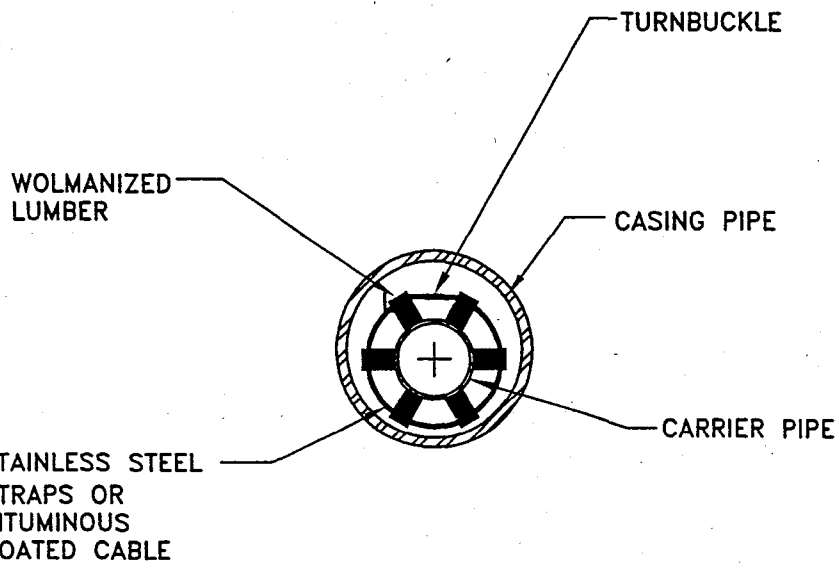
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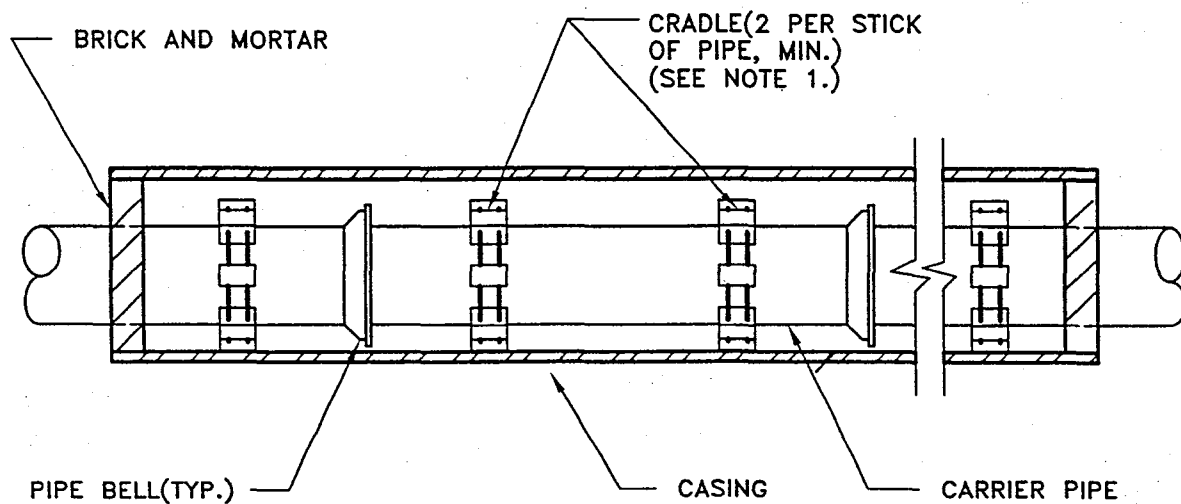
**CASING CRADLE DETAIL
(OPEN CUT OR FORCE MAIN)**

DATE:
MARCH 2001

DETAIL:
20



SECTION



NOTES:

- 1) 3 CASING SPACERS PER 20' STICK OF PIPE FOR PIPE LESS THAN 3" IN DIAMETER.

ELEVATION

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

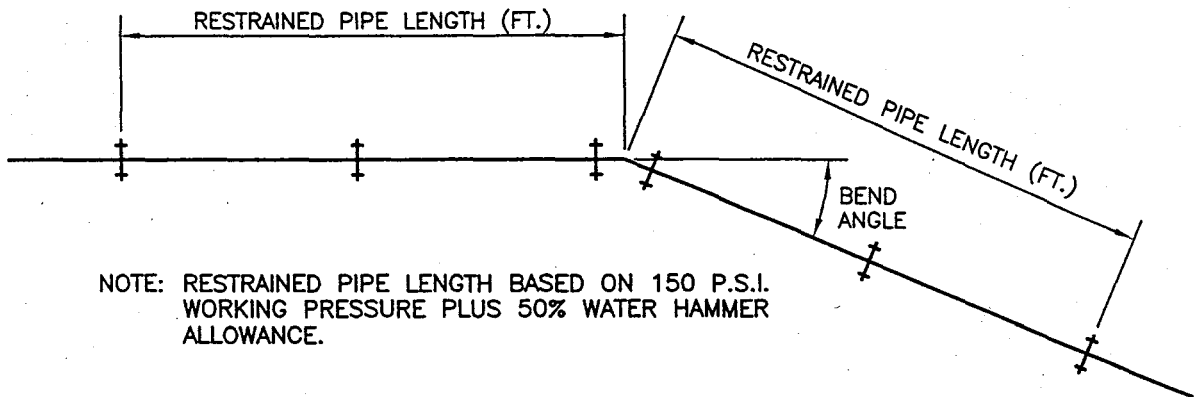
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Tel 717.569.7021

**STANDARD CASING CRADLE DETAIL
GRAVITY MAIN**

DATE:
MARCH 2001

DETAIL:
20A



HORIZONTAL RESTRAINED PIPE LENGTH SCHEDULE (DUCTILE IRON PIPE)				
PIPE DIAMETER	HORIZONTAL ELBOW DEFLECTION ANGLE			
	90°	45°	22 1/2°	11 1/4°
3" THRU 4"	19'	8'	4'	2'
6"	27'	11'	7'	3'
8"	35'	14'	8'	4'
10"	42'	17'	8'	5'
12"	49'	20'	10'	5'

VERTICAL RESTRAINED PIPE LENGTH SCHEDULE (DUCTILE IRON PIPE)			
PIPE DIAMETER	VERTICAL ELBOW DEFLECTION ANGLE		
	45°	22 1/2°	11 1/4°
3" THRU 4"	20'	10'	5'
6"	28'	14'	7'
8"	37'	18'	9'
10"	44'	21'	11'
12"	52'	25'	12'

NOTE: FOR PIPE SIZES GREATER THAN 12", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED RESTRAINED PIPE LENGTHS.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

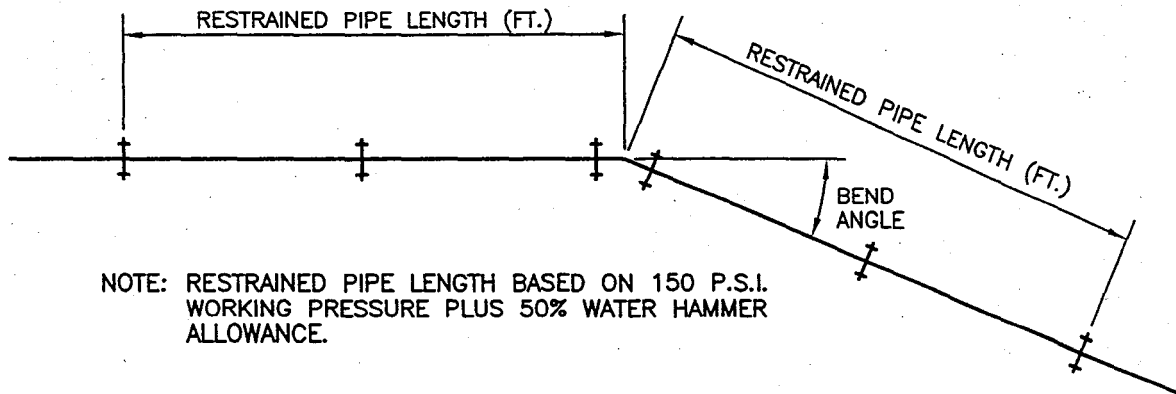
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Lancaster, Pennsylvania 17601
Tel 717.569.7021

**RESTRAINED PIPE LENGTH SCHEDULE
(DUCTILE IRON PIPE)**

DATE:
MARCH 2001

DETAIL:
21



NOTE: RESTRAINED PIPE LENGTH BASED ON 150 P.S.I. WORKING PRESSURE PLUS 50% WATER HAMMER ALLOWANCE.

HORIZONTAL RESTRAINED PIPE LENGTH SCHEDULE (PVC PIPE)				
PIPE DIAMETER	HORIZONTAL ELBOW DEFLECTION ANGLE			
	90°	45°	22 1/2°	11 1/4°
1 1/2" THRU 4"	27'	11'	6'	3'
6"	38'	15'	10'	4'
8"	49'	20'	11'	6'
10"	59'	24'	12'	7'
12"	69'	28'	14'	8'

VERTICAL RESTRAINED PIPE LENGTH SCHEDULE (PVC PIPE)			
PIPE DIAMETER	VERTICAL ELBOW DEFLECTION ANGLE		
	45°	22 1/2°	11 1/4°
1 1/2" THRU 4"	28'	14'	7'
6"	39'	20'	10'
8"	52'	25'	13'
10"	62'	29'	15'
12"	73'	35'	17'

NOTE: FOR PIPE SIZES GREATER THAN 12", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED RESTRAINED PIPE LENGTHS.

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STANDARD DETAIL - SEWER SYSTEM

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**RESTRAINED PIPE LENGTH SCHEDULE
(PVC PIPE)**

DATE: MARCH 2001

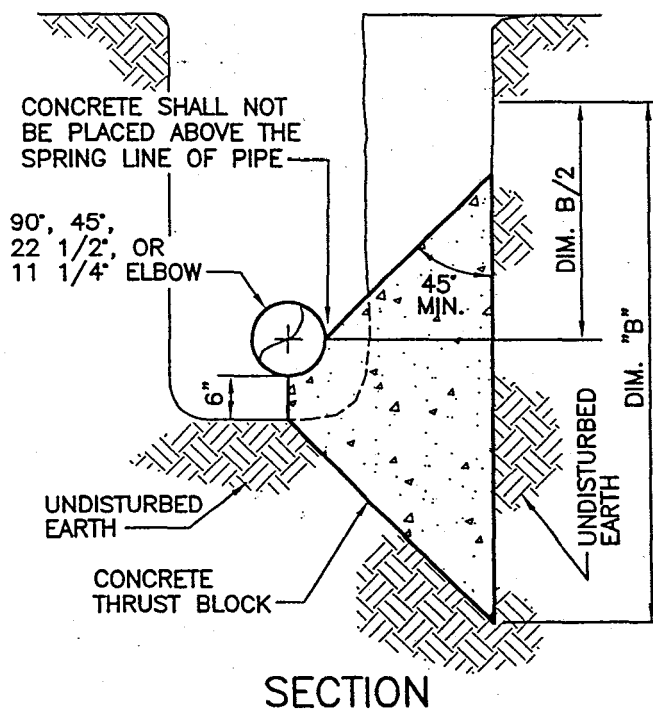
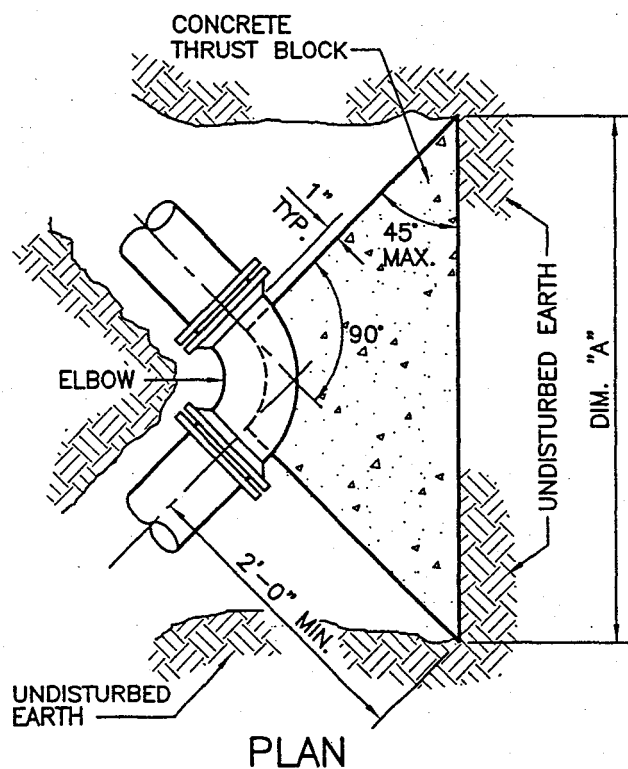
DETAIL: 21A

Dwg. Name: 00323080.DWG Last Revised: 04/05/01 11:59

THRUST BLOCK DIMENSION SCHEDULE - ELBOWS(*)					
PIPE DIAM.	DIM.	ELBOW DEFLECTION ANGLE			
		11 1/4°	22 1/2°	45°	90°
3" THRU 4"	A	12"	18"	24"	24"
	B	12"	12"	12"	18"
6"	A	18"	24"	30"	42"
	B	12"	18"	24"	30"
8"	A	24"	24"	42"	60"
	B	12"	24"	30"	36"
12"	A	30"	42"	54"	90"
	B	24"	30"	36"	48"

(*) THRUST BLOCK DESIGN BASED ON THE MINIMUM SOIL HORIZONTAL BEARING STRENGTH OF 3000 PSF AND 150 PSI WORKING PRESSURE PLUS 50% WATER HAMMER ALLOWANCE.

FOR PIPE SIZES GREATER THAN 12", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED THRUST BLOCK SIZES.



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**HORIZONTAL & VERTICAL UP RESTRAINT
THRUST BLOCKING DETAIL - ELBOWS (DIP)**

DATE: MARCH 2001

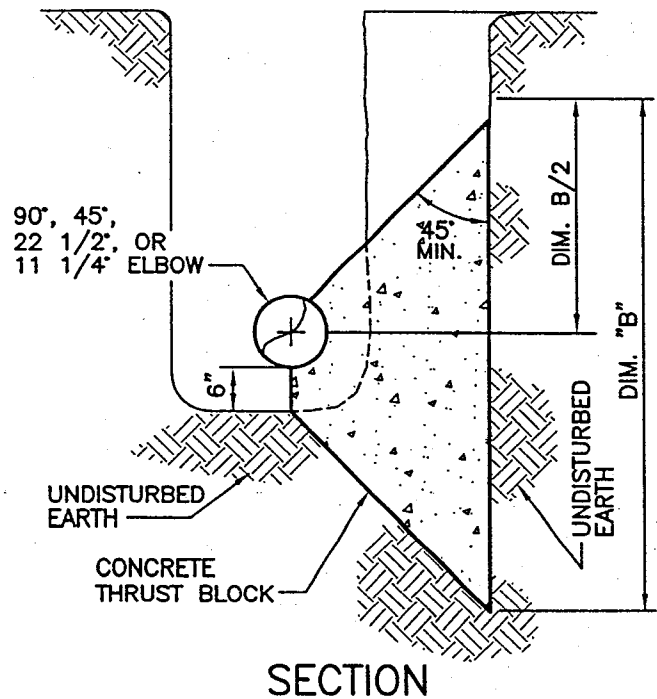
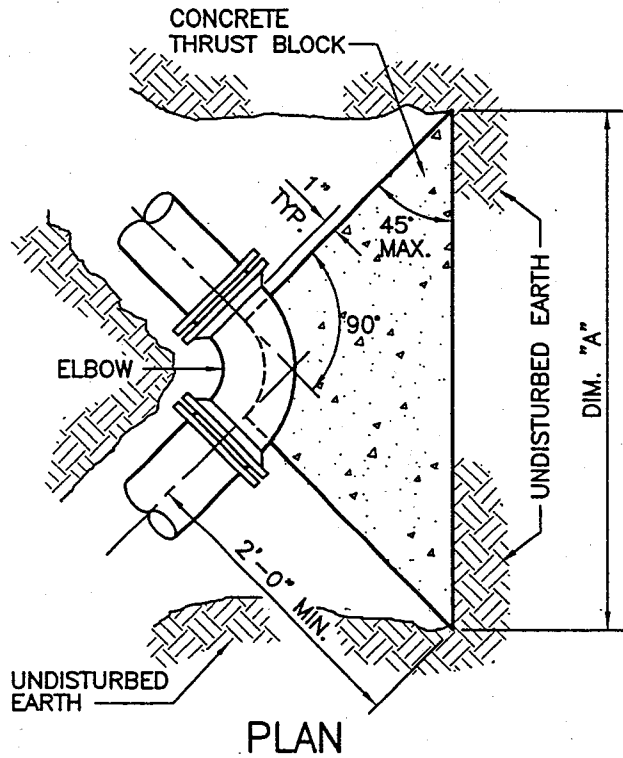
DETAIL: 22

THRUST BLOCK DIMENSION SCHEDULE -- ELBOWS(*)

PIPE DIAM.	DIM.	ELBOW DEFLECTION ANGLE			
		11 1/4'	22 1/2'	45°	90°
1 1/2" THRU 4"	A	16"	24"	36"	36"
	B	16"	16"	16"	24"
6"	A	24"	36"	42"	60"
	B	16"	24"	24"	42"
8"	A	36"	36"	42"	84"
	B	16"	36"	42"	42"
12"	A	42"	60"	76"	126"
	B	36"	42"	42"	66"

(*) THRUST BLOCK DESIGN BASED ON THE MINIMUM SOIL HORIZONTAL BEARING STRENGTH OF 3000 PSF AND 150 PSI WORKING PRESSURE PLUS 50% WATER HAMMER ALLOWANCE.

FOR PIPE SIZES GREATER THAN 12", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED THRUST BLOCK SIZES.



Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

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**HORIZONTAL & VERTICAL UP RESTRAINT
THRUST BLOCKING DETAIL - ELBOWS (PVC)**

DATE: MARCH 2001

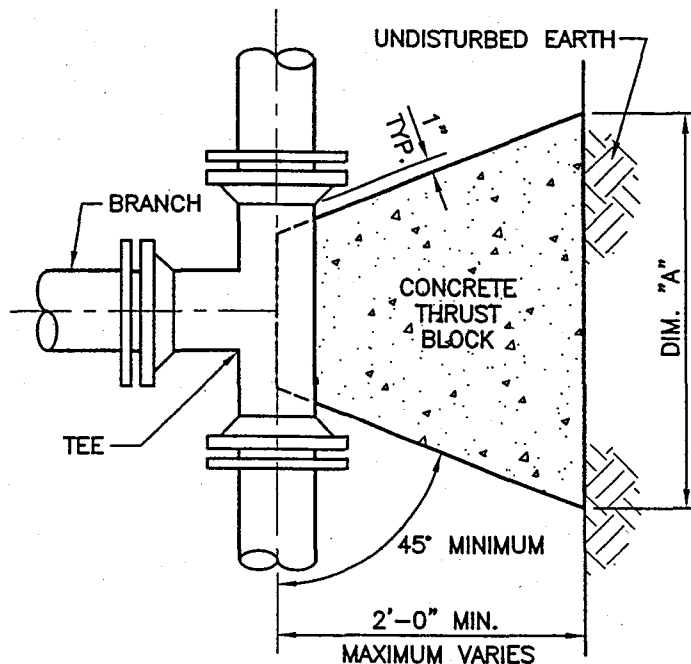
DETAIL: 22A

THRUST BLOCK DIMENSION SCHEDULE - ELBOWS(*)

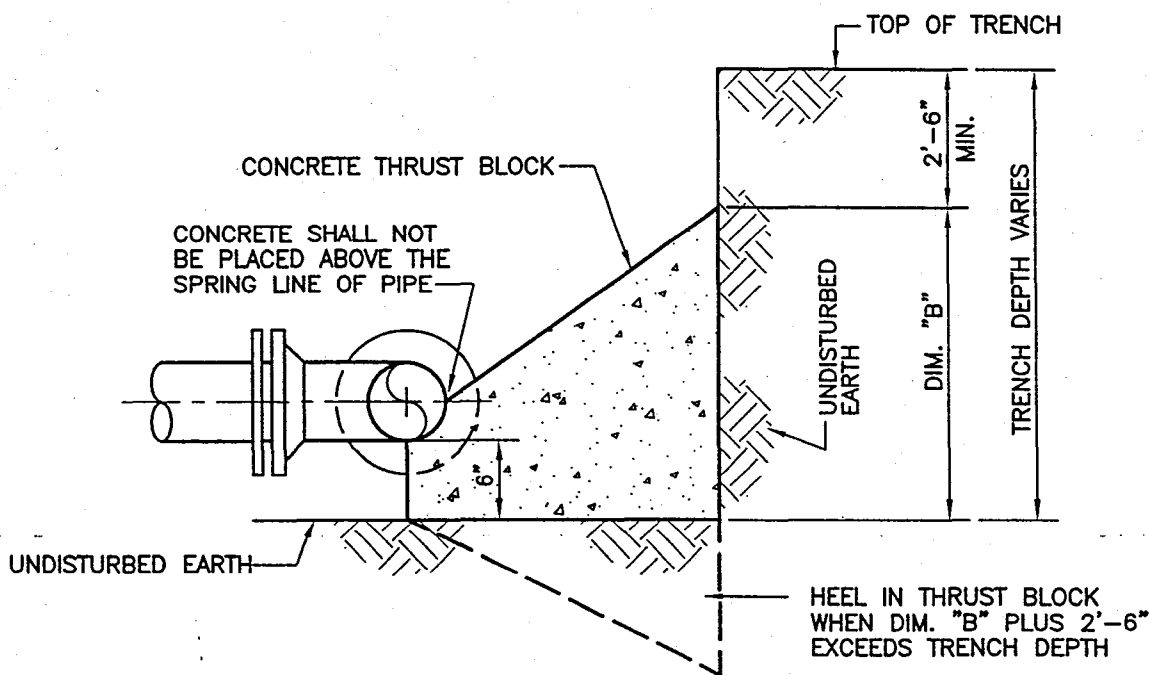
DIM.	BRANCH SIZE			
	3" - 4"	6"	8"	12"
A	36"	42"	60"	96"
B	18"	24"	30"	42"

(*) THRUST BLOCK DESIGN BASED ON THE MINIMUM SOIL HORIZONTAL BEARING STRENGTH OF 3000 PSF AND 150 PSI WORKING PRESSURE PLUS 50% WATER HAMMER ALLOWANCE.

FOR PIPE SIZES GREATER THAN 12", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED THRUST BLOCK SIZES.



PLAN



SECTION

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

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**HORIZONTAL RESTRAINT
THRUST BLOCKING DETAIL - TEES (DIP)**

DATE:
MARCH 2001

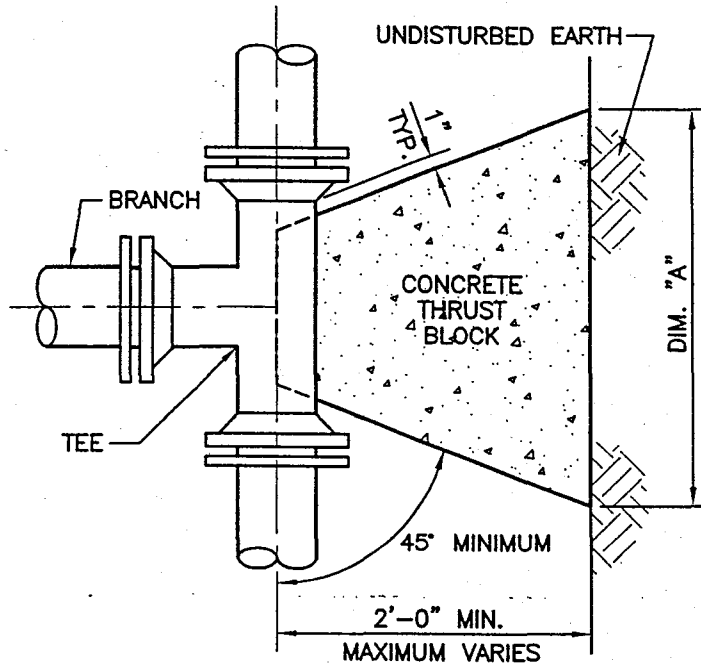
DETAIL:
23

THRUST BLOCK DIMENSION SCHEDULE - ELBOWS(*)

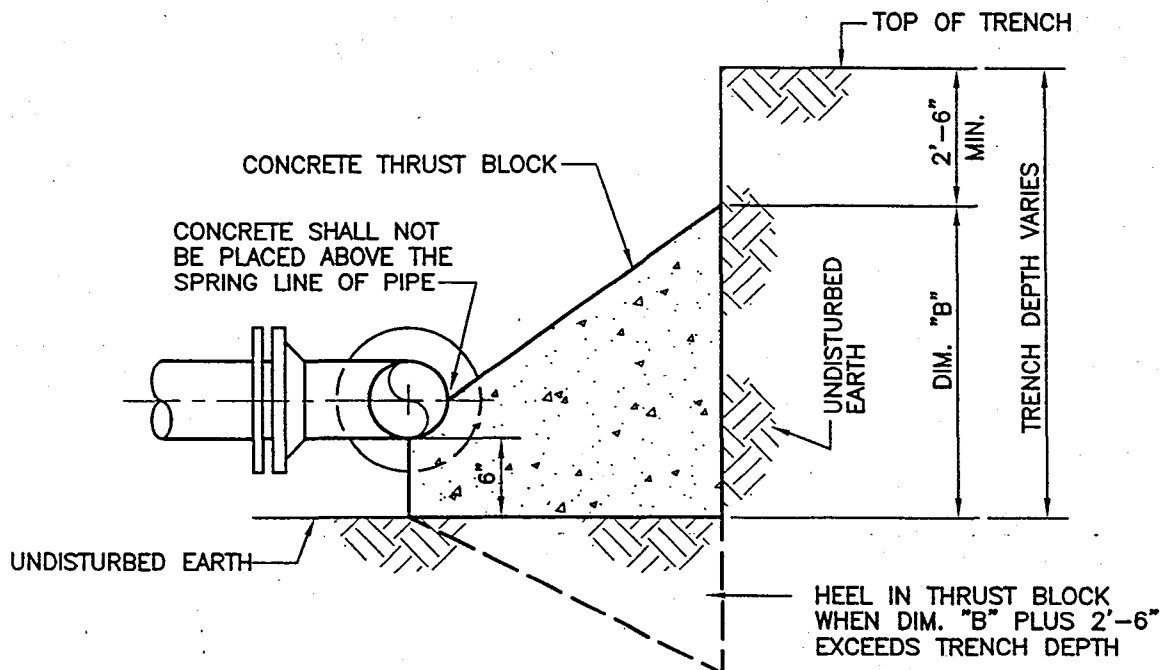
DIM.	BRANCH SIZE			
	3" - 4"	6"	8"	12"
A	36"	42"	60"	96"
B	18"	24"	30"	42"

(*) THRUST BLOCK DESIGN BASED ON THE MINIMUM SOIL HORIZONTAL BEARING STRENGTH OF 3000 PSF AND 150 PSI WORKING PRESSURE PLUS 50% WATER HAMMER ALLOWANCE.

FOR PIPE SIZES GREATER THAN 12", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED THRUST BLOCK SIZES.



PLAN



SECTION

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

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**HORIZONTAL RESTRAINT
THRUST BLOCKING DETAIL - TEES (DIP)**

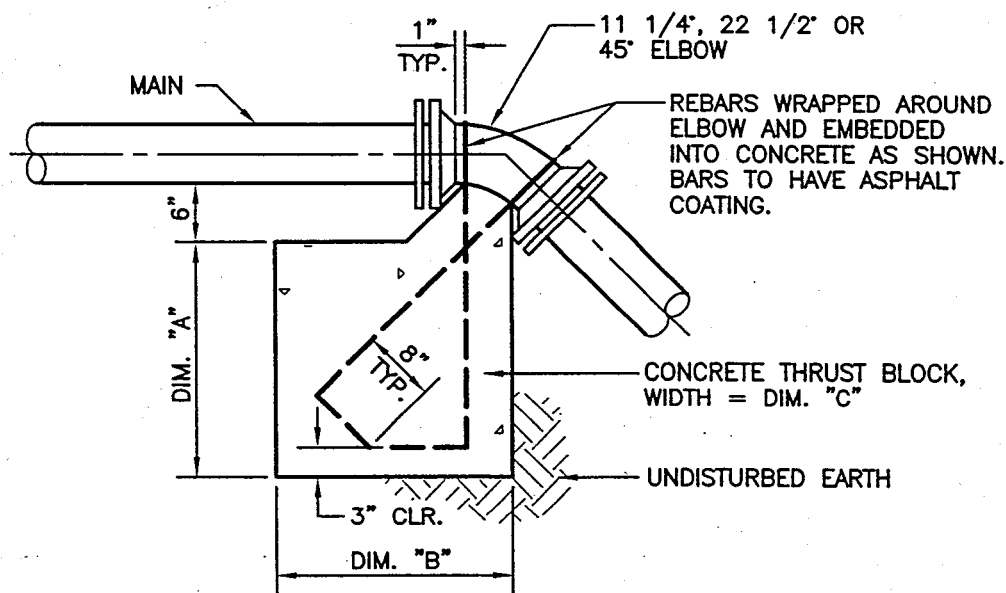
DATE:
MARCH 2001

DETAIL:
23A

THRUST BLOCK DIMENSION SCHEDULE - VERTICAL ELBOWS(*) (DUCTILE IRON PIPE)									
	3" - 6"	8"	12"	1 1/2" - 6"	8"	12"	1 1/2" - 6"	8"	12"
DIM.	11 1/4"	11 1/4"	11 1/4"	22 1/2"	22 1/2"	22 1/2"	45"	45"	45"
A	12"	18"	36"	18"	36"	54"	36"	48"	54"
B	18"	24"	36"	24"	36"	48"	36"	48"	54"
C	18"	24"	24"	24"	24"	30"	24"	30"	48"
REBAR	#4	#4	#6	#4	#4	#6	#4	#4	#6

(*) THRUST BLOCK DESIGN BASED ON THE MINIMUM SOIL HORIZONTAL BEARING STRENGTH OF 3000 PSF AND 150 PSI WORKING PRESSURE PLUS 50% WATER HAMMER ALLOWANCE.

FOR PIPE SIZES GREATER THAN 12", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED THRUST BLOCK SIZES.



SECTION

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

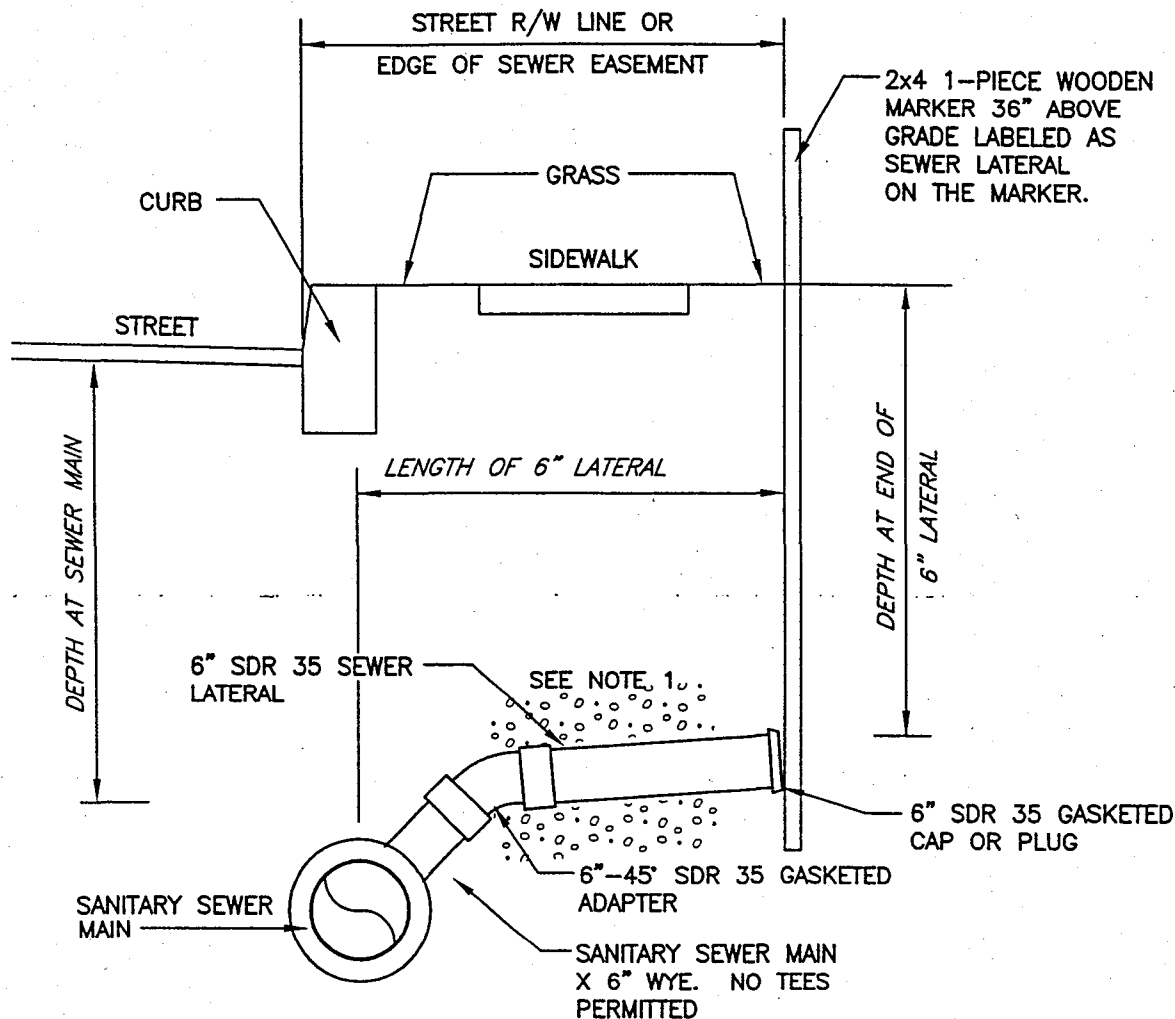
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**VERTICAL DOWN RESTRAINT
THRUST BLOCKING DETAIL - ELBOWS (DIP)**

DATE:
MARCH 2001

DETAIL:
24



NOTES:

- 1) PROVIDE 6" OF AASHTO NO. 8 (1B) STONE BELOW PIPE AND 12" ABOVE PIPE (TYPICAL ENTIRE LENGTH OF LATERAL).
- 2) MINIMUM SLOPE = 1% (1/8" PER FT.)
- 3) MINIMUM DEPTH OF COVER = 3 FT
- 4) PIPE MATERIALS:
LATERAL SEWERS—GASKETED PVC SDR 35
ADAPTERS—GASKETED PVC
- 5) DEVELOPER SHALL TEST AGAINST 6" SDR 35 GASKETED CAP OR PLUG.
- 6) DEVELOPER SHALL INSTALL THE LATERAL SEWER TO THE EDGE OF THE SEWER EASEMENT FOR SEWERS LOCATED IN AN EASEMENT OR TO THE STREET RIGHT-OF-WAY AS A MINIMUM, OR TO SUCH POINT, AS REQUIRED, TO CLEAR STREET SIDEWALKS AND UNDERGROUND UTILITIES.
- 7) INFORMATION NOTED IN ITALICS MUST BE FURNISHED ON AS BUILT PLANS. IN ADDITION TO STATION FROM DOWNSTREAM MH SHALL BE PROVIDED.

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STANDARD DETAIL - SEWER SYSTEM

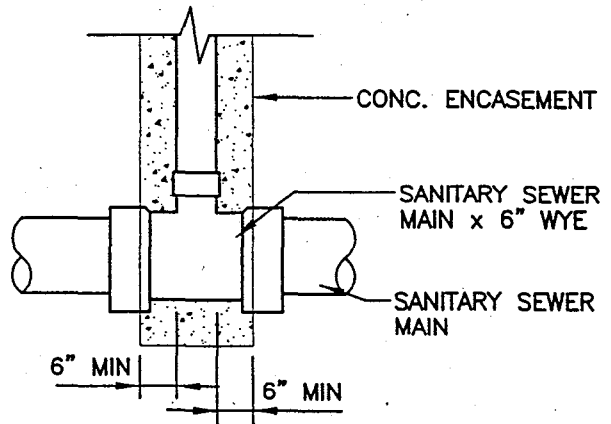
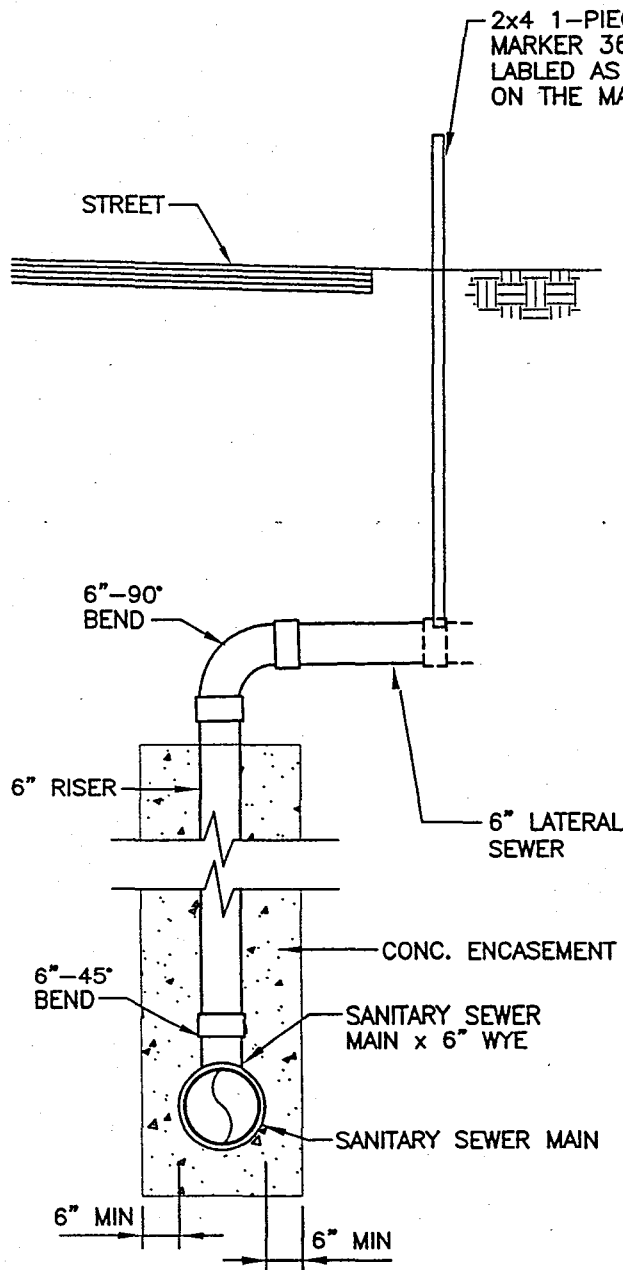
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**LATERAL SEWER INSTALLATION
BY DEVELOPERS**

DATE:
MARCH 2001

DETAIL:
25



NOTES:

- 1) PROVIDE 6" OF AASHTO NO. 8 (1B) STONE BELOW PIPE AND 12" ABOVE PIPE (TYPICAL ENTIRE LENGTH OF LATERAL).
- 2) MINIMUM SLOPE = 1% (1/8" PER FT.)
- 3) MINIMUM DEPTH OF COVER = 3 FT
- 4) PIPE MATERIALS:
LATERAL SEWERS—GASKETED PVC SDR 35
ADAPTERS—GASKETED PVC
- 5) DEVELOPER SHALL TEST AGAINST 6" SDR 35 GASKETED CAP OR PLUG.
- 6) DEVELOPER SHALL INSTALL THE LATERAL SEWER TO THE EDGE OF THE SEWER EASEMENT FOR SEWERS LOCATED IN AN EASEMENT OR TO THE STREET RIGHT-OF-WAY AS A MINIMUM, OR TO SUCH POINT, AS REQUIRED, TO CLEAR STREET SIDEWALKS AND UNDERGROUND UTILITIES.
- 7) INFORMATION NOTED IN ITALICS MUST BE FURNISHED ON AS BUILT PLANS. IN ADDITION TO STATION FROM DOWNSTREAM MH SHALL BE PROVIDED.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

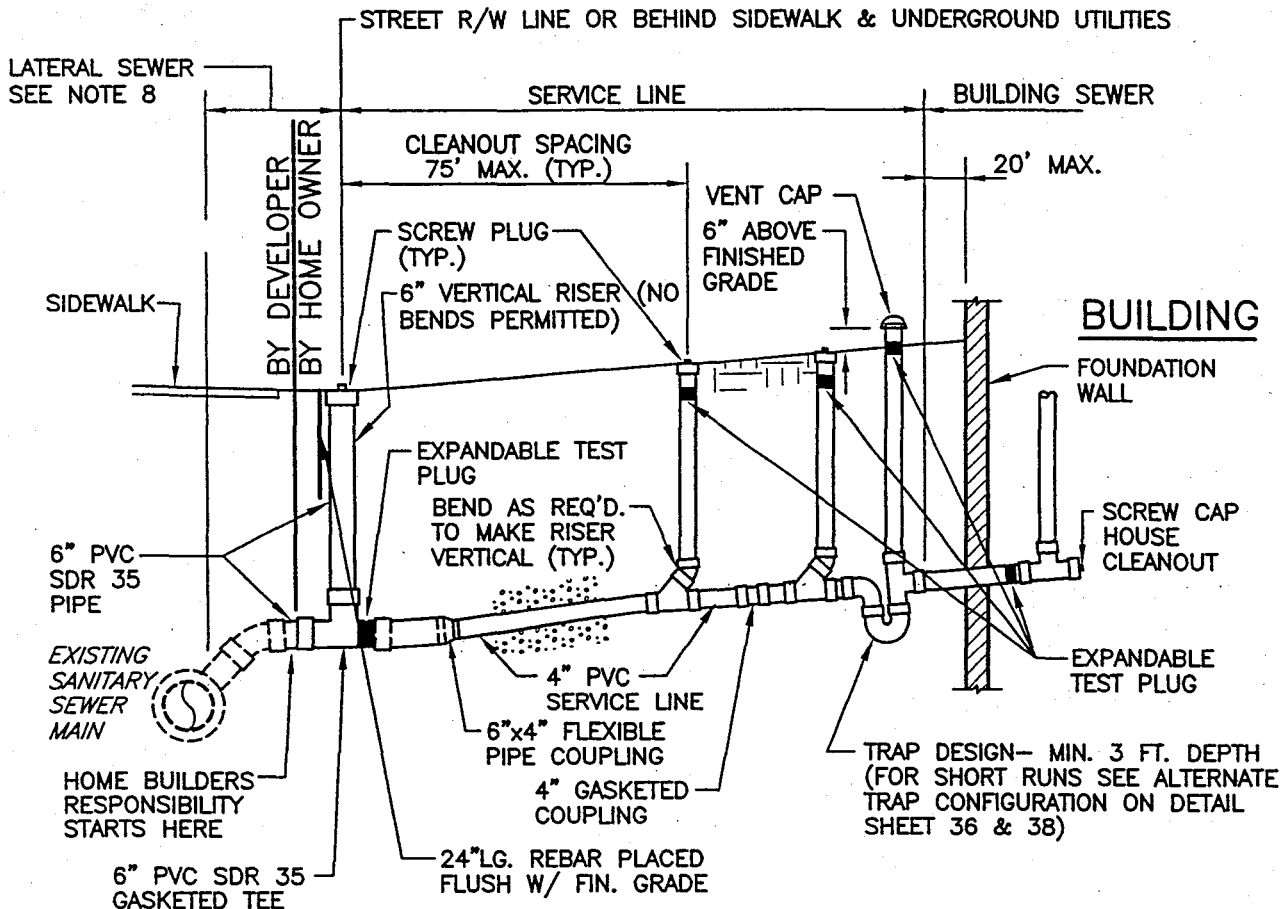
**DROP LATERAL SEWER INSTALLATION
BY DEVELOPER**

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DATE:
MARCH 2001

DETAIL:
26



NOTES:

- 1) PROVIDE 6" OF AASHTO NO. 8 (1B) STONE BELOW PIPE AND 12" ABOVE PIPE (TYPICAL ENTIRE LENGTH OF LATERAL).
- 2) MINIMUM SLOPE = 1% (1/8" PER FT.)
- 3) MINIMUM DEPTH OF COVER = 3 FT
- 4) PIPE MATERIALS:
 SERVICE LINE - 4" PVC SCH 40- SOLVENT WELD JOINTS W/ CLEANER
 4" GASKETED SCH 40 COUPLING
 6" GASKETED SDR 35 TEE
 4"x6" FERNCO ADAPTER
 ONE PIECE SCH 40 U-BEND
 - CAST IRON
- 5) TO CONDUCT AIR TESTING OF SERVICE LINE, INSTALL EXPANDABLE PLUGS AT LOCATIONS SHOWN. AIR TEST SHALL BE 6 LBS. FOR 6 MINS. AT COMPLETION AIR TESTING, INSTALL RISER ON 6" LATERAL SEWER TEE.
- 6) NO SEWER SERVICE LINE VENT CAPS SHALL BE INSTALLED WITHIN A 100-YR FLOOD PLAIN OR WITHIN FLOOD PRONE AREAS.
- 7) NO VENT CAPS OR CLEANOUTS SHALL BE INSTALLED IN DRIVEWAYS OR OTHER PAVED AREAS, UNLESS SPECIFICALLY APPROVED BY LSA.
- 8) THE LATERAL SEWER SHALL BE INSTALLED TO THE EDGE OF THE SEWER EASEMENT FOR SEWERS LOCATED IN AN EASEMENT OR TO THE STREET RIGHT-OF WAY AS A MINIMUM; OR TO SUCH A POINT AS REQUIRED TO CLEAR STREET SIDEWALKS AND UNDERGROUND UTILITIES.
- 9) SET 6" TEST TEE AT 1% SLOPE TO PERMIT VERTICAL RISER INSTALLATION W/ NO BENDS.
- 10) 6" TEST TEE SHALL BE POSITIONED SO THAT THE RISER IS LOCATED IN GRASSED AREAS, NOT IN SIDEWALKS OR PAVED AREAS.

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STANDARD DETAIL - SEWER SYSTEM

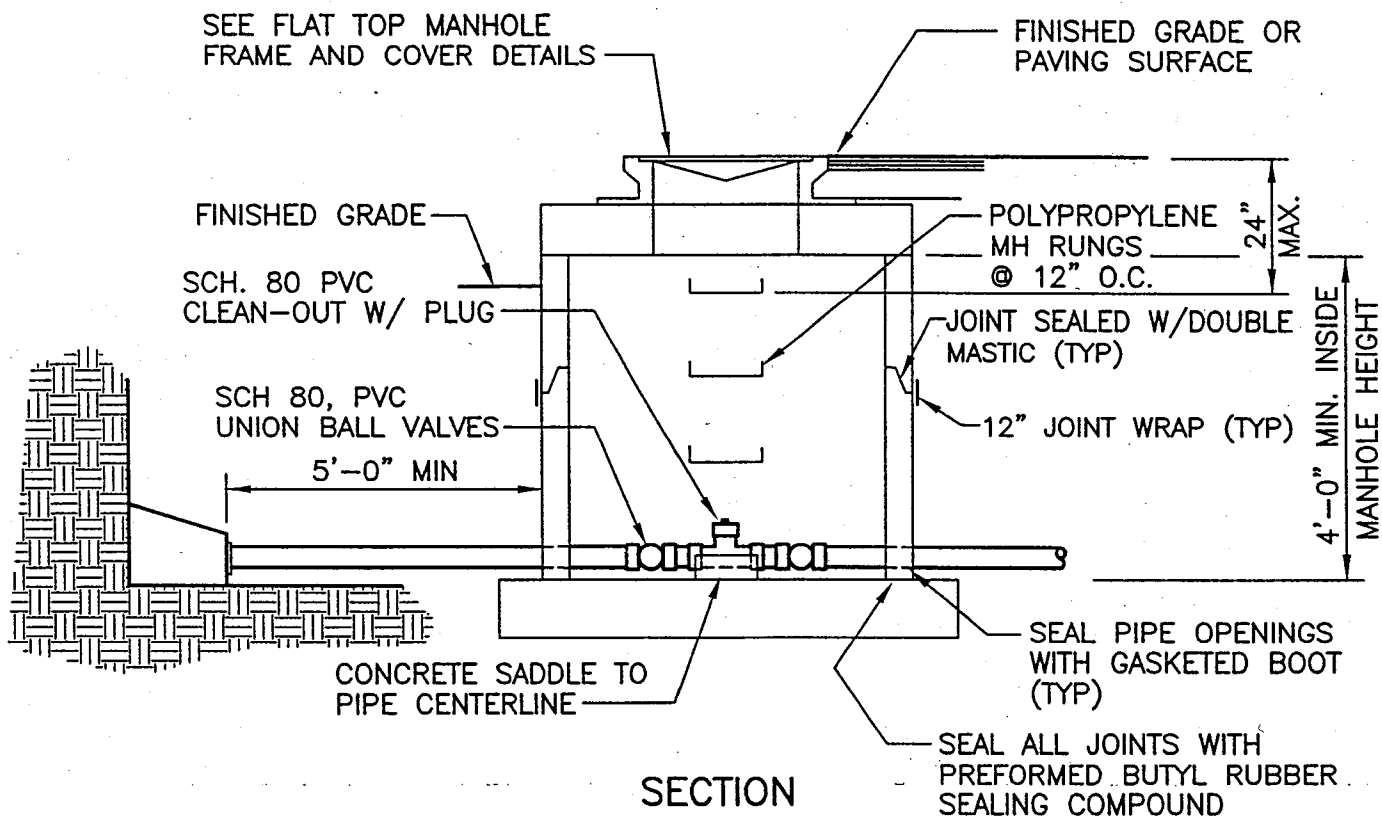
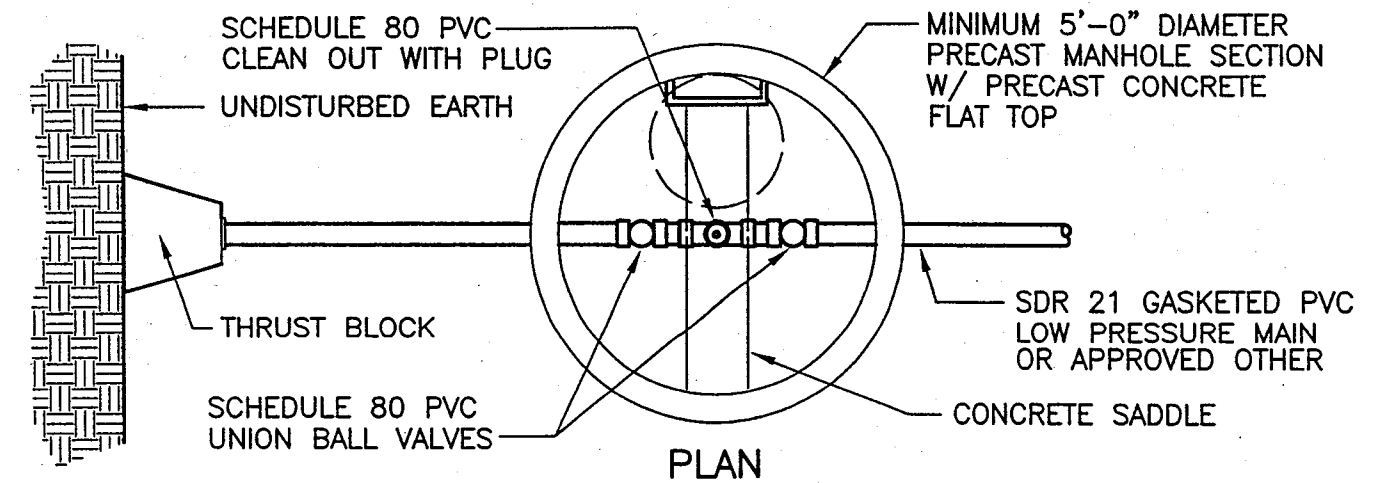
**GRAVITY SERVICE LINE
INSTALLATION DETAIL**

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DATE:
MARCH 2001

DETAIL:
27



NOTE:

ALL PIPE AND FITTINGS BETWEEN VALVES SHALL BE SCHEDULE 80 PVC.

Leola Sewer Authority

STANDARD DETAIL - LOW PRESSURE SEWER SYSTEM

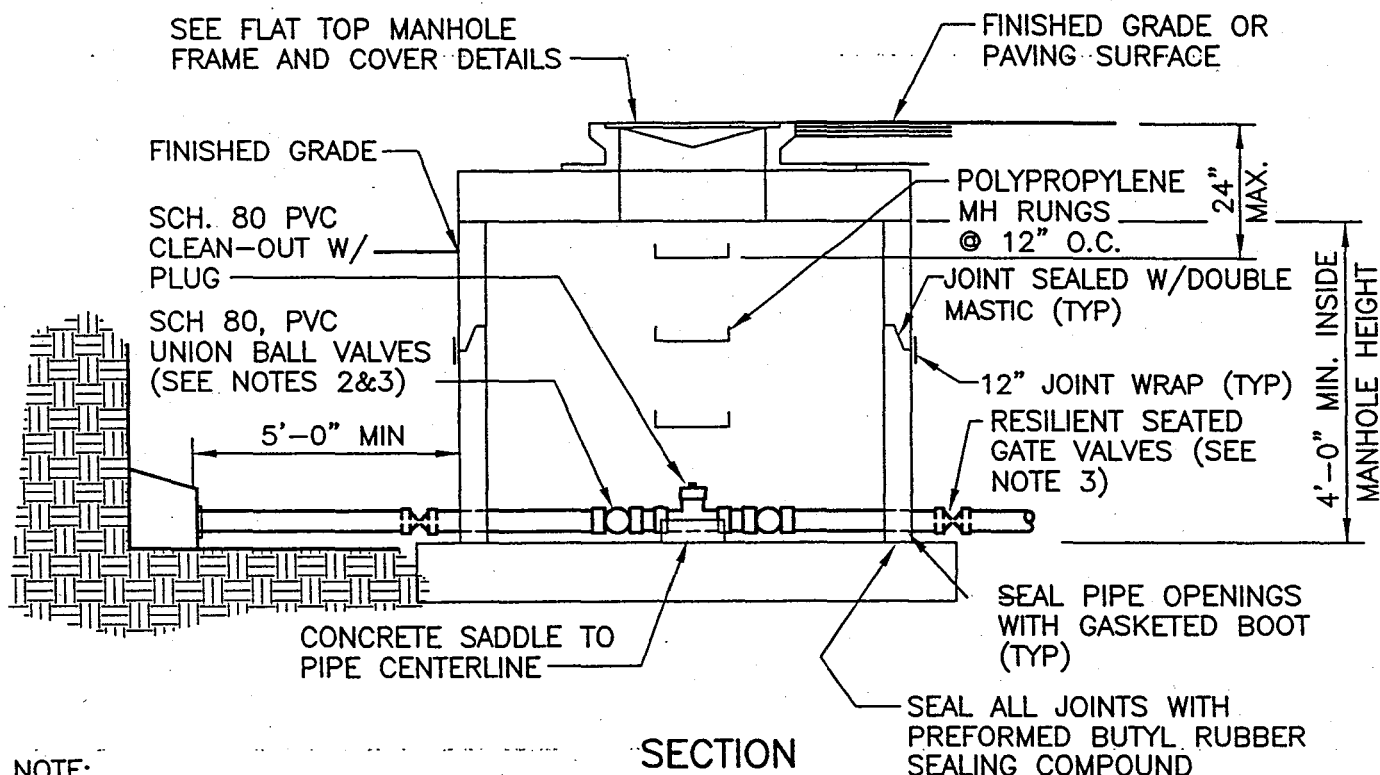
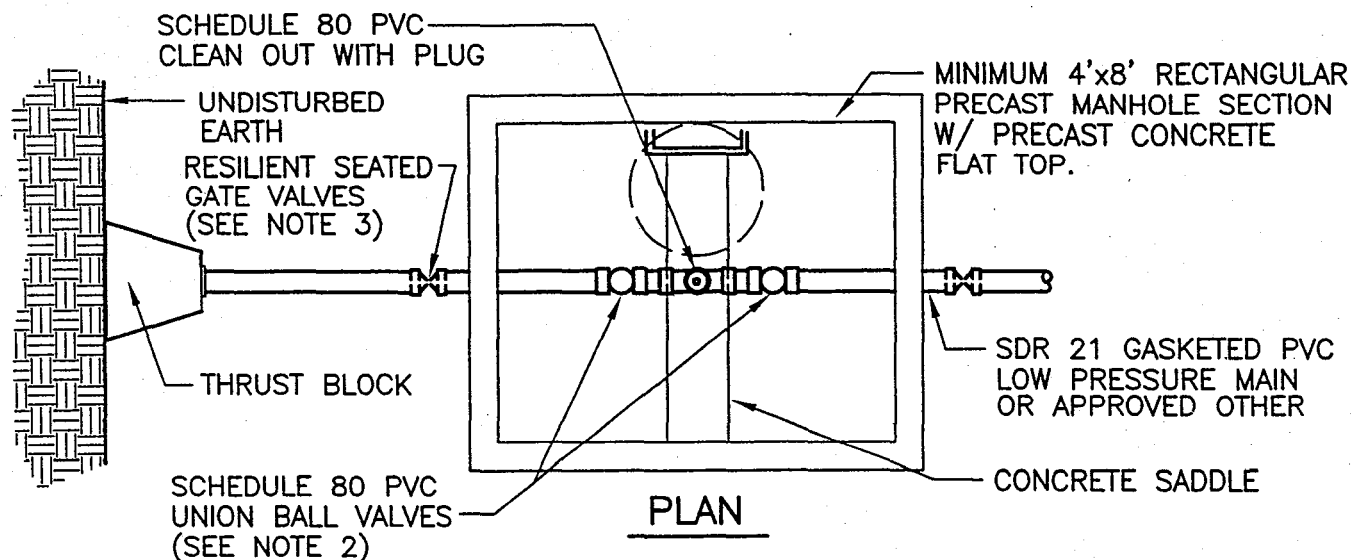
**TERMINAL C.O. MANHOLE
TYPE 1**

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Tel 717.569.7021

DATE: MARCH 2001

DETAIL: 28



NOTE:

1. ALL PIPE AND FITTINGS BETWEEN VALVES SHALL BE SCHEDULE 80 PVC.
2. 3" THRU 4" SEWER MAINS REQUIRE TRUE UNION BALL VALVES WITH FLANGED SPOOL PIECES WITHIN THE VAULT.
3. 6" AND LARGER SEWER MAINS REQUIRE BURIED RESILIENT SEATED GATE VALVES IN LIEU OF BALL VALVES.

Leola Sewer Authority

STANDARD DETAIL - LOW PRESSURE SEWER SYSTEM

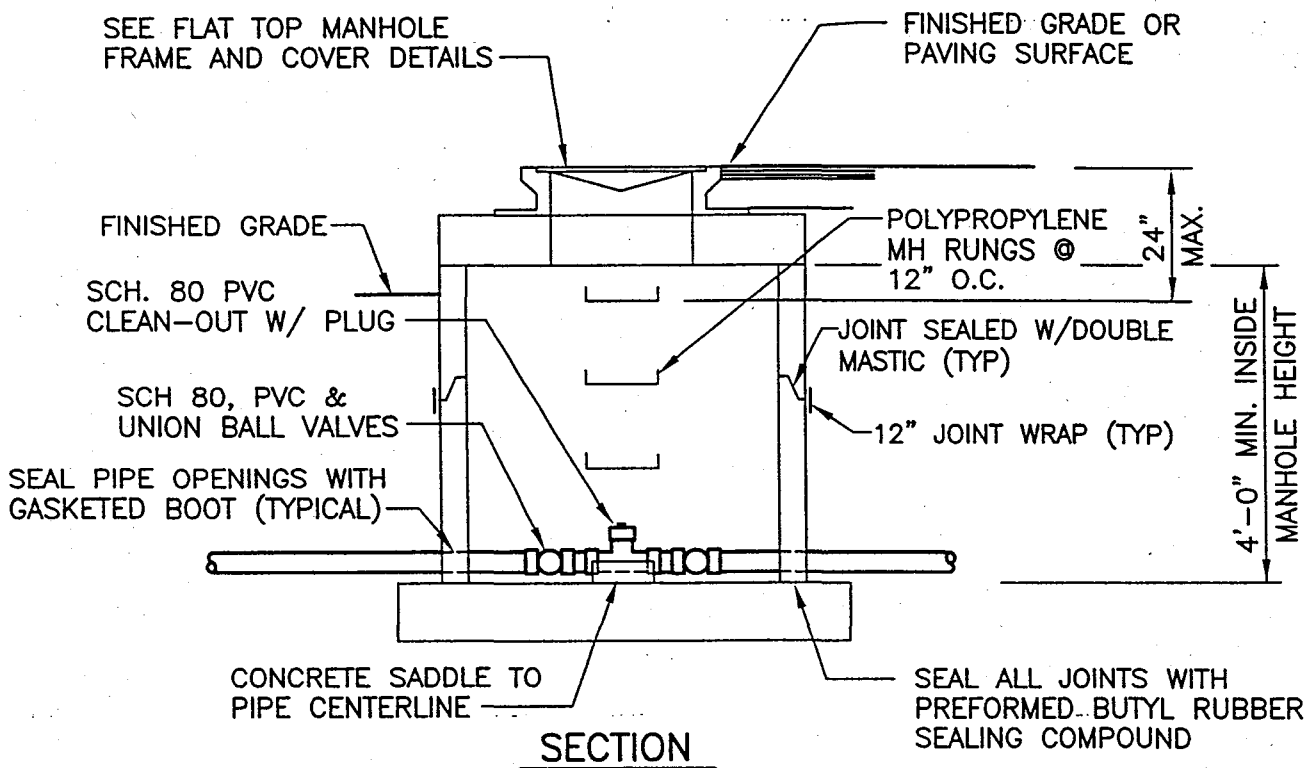
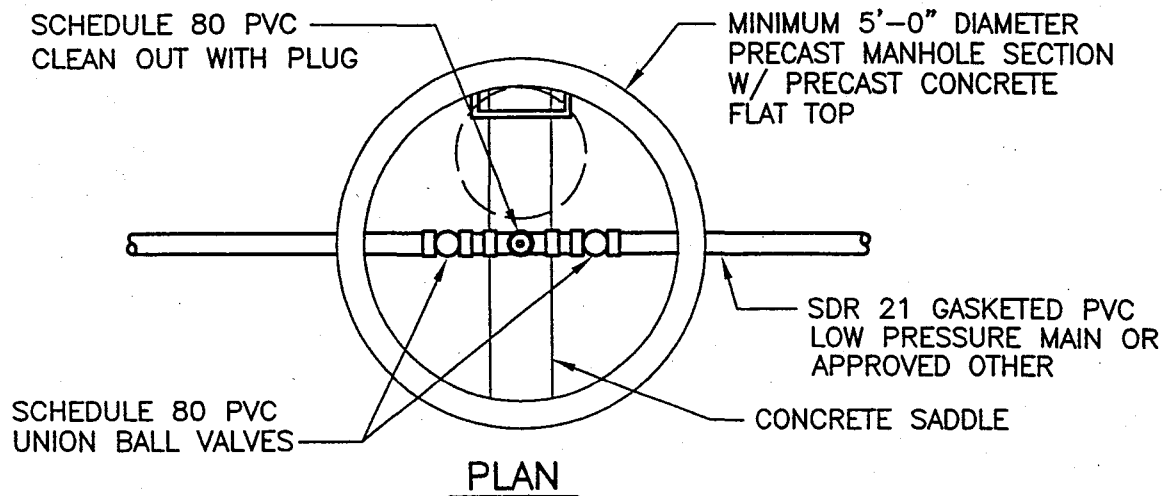
**TERMINAL C.O. MANHOLE
TYPE 4**

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DATE:
MARCH 2001

DETAIL:
28A



NOTE:

1. ALL PIPE AND FITTINGS BETWEEN VALVES SHALL BE SCHEDULE 80 PVC.

Leola Sewer Authority

STANDARD DETAIL - LOW PRESSURE SEWER SYSTEM

**VALVE AND C.O. MANHOLE
TYPE 1A**

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DATE: MARCH 2001

DETAIL: 29

SCHEDULE 80 PVC
CLEAN OUT WITH PLUG

RESILIENT SEATED
GATE VALVES
(SEE NOTE 3)

MINIMUM 4'x8' RECTANGULAR
PRECAST MANHOLE SECTION
W/ PRECAST CONCRETE
FLAT TOP.

SDR 21 GASKETED PVC
LOW PRESSURE MAIN
OR APPROVED OTHER

SCHEDULE 80 PVC
UNION BALL VALVES
(SEE NOTE 2)

CONCRETE SADDLE

PLAN

SEE FLAT TOP MANHOLE
FRAME AND COVER DETAILS

FINISHED GRADE OR
PAVING SURFACE

FINISHED GRADE

SCH. 80 PVC
CLEAN-OUT W/
PLUG

SCH 80, PVC
UNION BALL VALVES
(SEE NOTES 2&3)

SEAL PIPE OPENINGS
WITH GASKETED BOOT
(TYPICAL)

POLYPROPYLENE
MH RUNGS
@ 12" O.C.

24" MAX.

JOINT SEALED W/DOUBLE
MASTIC (TYP)

12" JOINT WRAP (TYP)

RESILIENT SEATED
GATE VALVES (SEE
NOTE 3)

4'-0" MIN. INSIDE
MANHOLE HEIGHT

CONCRETE SADDLE TO
PIPE CENTERLINE

SEAL PIPE OPENINGS
WITH GASKETED BOOT
(TYP)

SEAL ALL JOINTS WITH
PREFORMED BUTYL RUBBER
SEALING COMPOUND

SECTION

NOTES:

1. ALL PIPE AND FITTINGS BETWEEN VALVES SHALL BE SCHEDULE 80 PVC.
2. 3" THRU 4" SEWER MAINS REQUIRE TRUE UNION BALL VALVES WITH FLANGED SPOOL PIECES WITHIN THE VAULT.
3. 6" AND LARGER SEWER MAINS REQUIRE BURIED RESILIENT SEATED GATE VALVES IN LIEU OF BALL VALVES.

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STANDARD DETAIL - LOW PRESSURE SEWER SYSTEM

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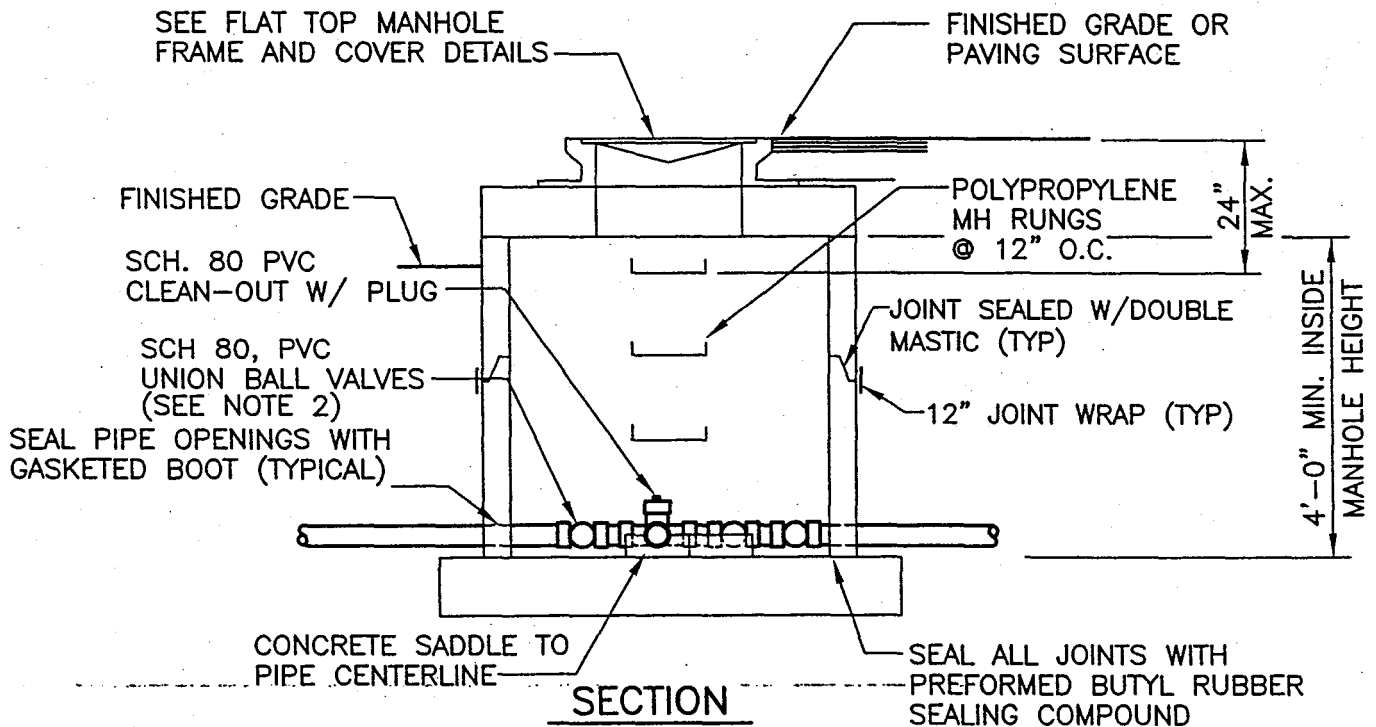
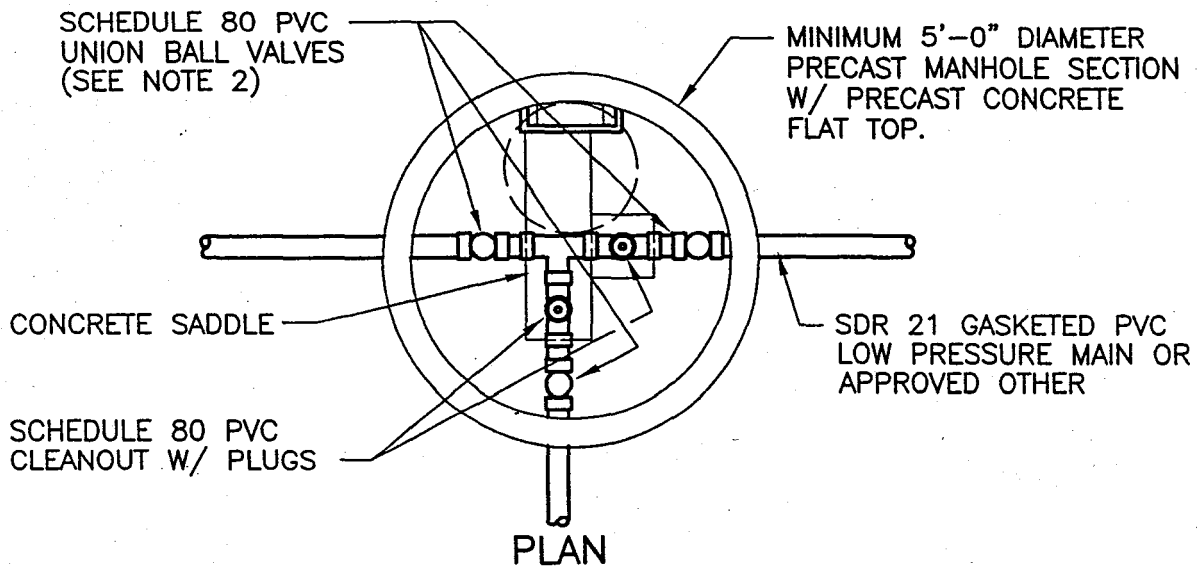
**TERMINAL C.O. MANHOLE
TYPE 5**

DATE:

MARCH 2001

DETAIL:

29A



NOTES:

1. ALL PIPE AND FITTINGS BETWEEN VALVES SHALL BE SCHEDULE 80 PVC.
2. 3" THRU 4" SEWER MAINS REQUIRE TRUE UNION BALL VALVES WITH FLANGED SPOLL PIECES WITHIN THE VAULT.

Leola Sewer Authority

STANDARD DETAIL - LOW PRESSURE SEWER SYSTEM

**VALVE AND C.O. MANHOLE
TYPE 2**

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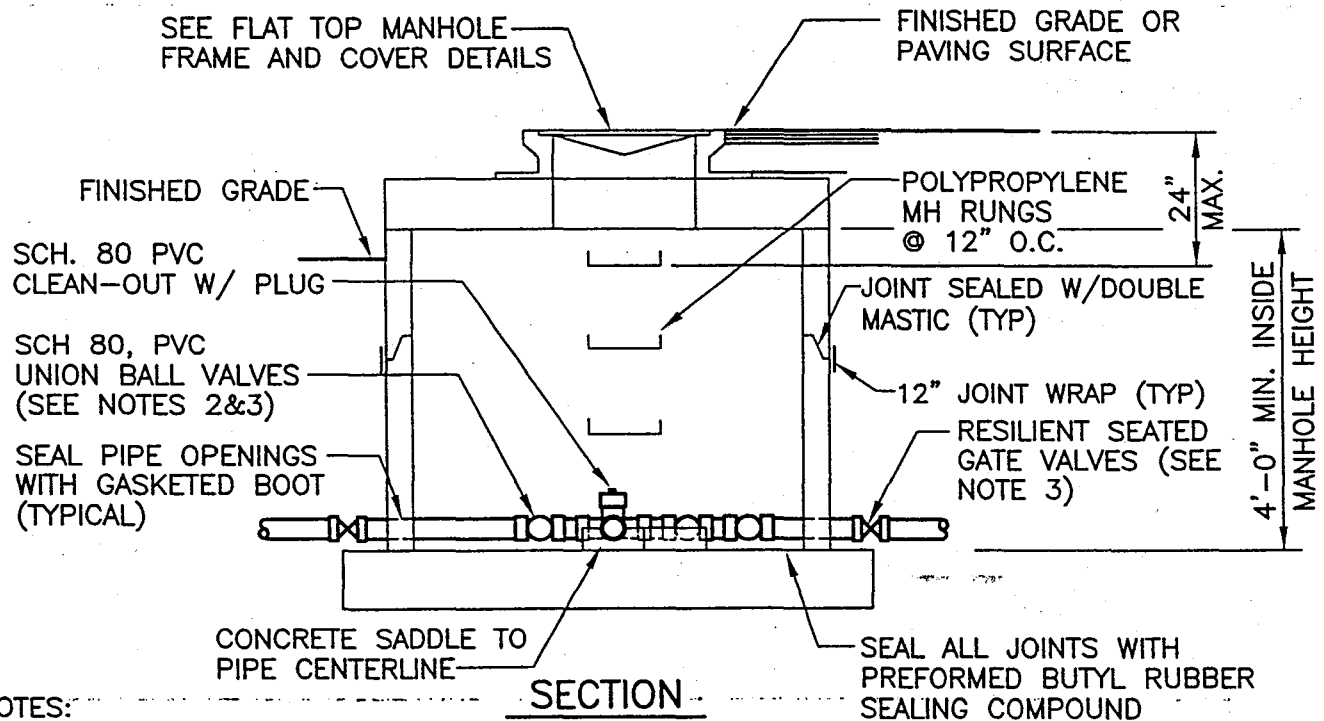
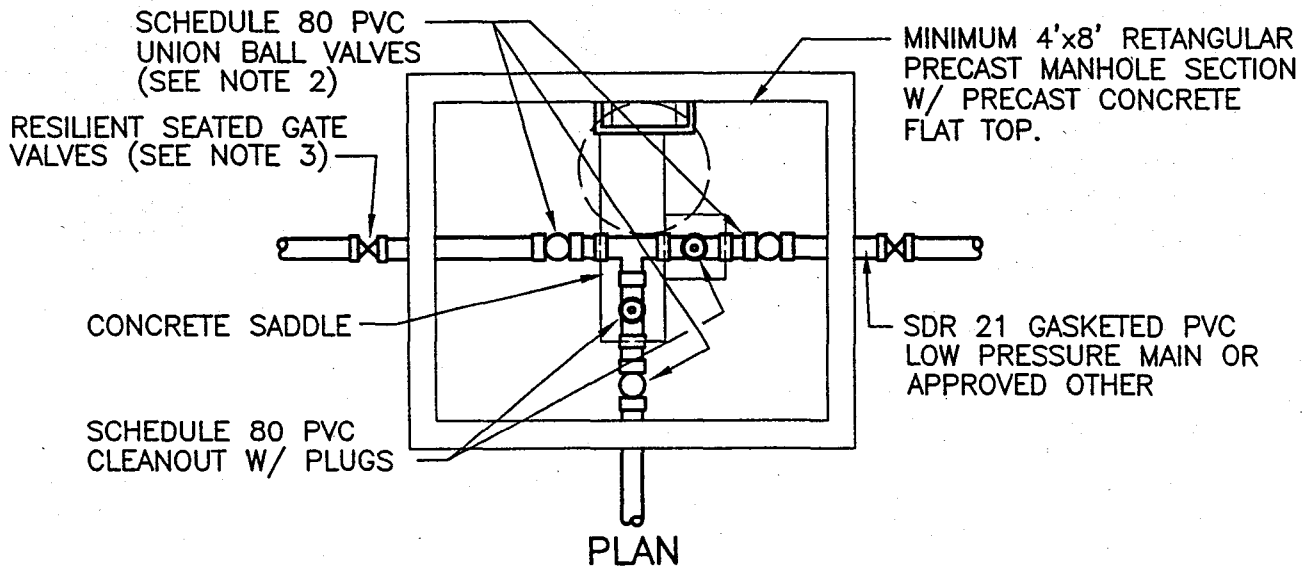
270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

DATE:

MARCH 2001

DETAIL:

30



NOTES:

1. ALL PIPE AND FITTINGS BETWEEN VALVES SHALL BE SCHEDULE 80 PVC.
2. 3" THRU 4" SEWER MAINS REQUIRE TRUE UNION BALL VALVES WITH FLANGED SPOOL PIECES WITHIN THE VAULT.
3. 6" AND LARGER SEWER MAINS REQUIRE BURIED RESILIENT SEATED GATE VALVES LIEU OF BALL VALVES.

Leola Sewer Authority

STANDARD DETAIL - LOW PRESSURE SEWER SYSTEM

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Tel 717.589.7021

**VALVE AND C.O. MANHOLE
TYPE 6**

DATE:
MARCH 2001

DETAIL:
30A

SCHEDULE 80 PVC
UNION BALL VALVES
(SEE NOTE 2)

MINIMUM 5'-0" DIAMETER
PRECAST MANHOLE SECTION
W/ PRECAST CONCRETE
FLAT TOP

CONCRETE SADDLE

SDR 21 GASKETED PVC
LOW PRESSURE MAIN OR
APPROVED OTHER

SCHDULE 80 PVC
CLEANOUTS WITH PLUGS

PLAN

SEE FLAT TOP MANHOLE
FRAME AND COVER DETAILS

FINISHED GRADE OR
PAVING SURFACE

FINISHED GRADE

SCH. 80 PVC
CLEAN-OUT W/ PLUG
SCH 80, PVC
UNION BALL VALVES
(SEE NOTE 2)

SEAL PIPE OPENINGS WITH
GASKETED BOOT (TYPICAL)

POLYPROPYLENE
MH RUNGS
@ 12" O.C.

JOINT SEALED W/DOUBLE
MASTIC (TYP)

12" JOINT WRAP (TYP)

CONCRETE SADDLE
TO PIPE CENTERLINE

(4) 4" LONG #5 DOWEL
BAR PINS, EPOXY GROUTED
2" INTO MANHOLE BASE

SECTION

SEAL ALL JOINTS WITH
PREFORMED BUTYL RUBBER
SEALING COMPOUND

4'-0" MIN. INSIDE
MANHOLE HEIGHT

24" MAX.

NOTES:

1. ALL PIPE AND FITTINGS BETWEEN VALVES SHALL BE SCHEDULE 80 PVC.
2. 3" THRU 4" SEWER MAINS REQUIRE TRUE UNION BALL VALVES WITH FLANGED SPOOL PIECES WITHIN THE VAULT.

Leola Sewer Authority

STANDARD DETAIL - LOW PRESSURE SEWER SYSTEM

**VALVE AND C.O. MANHOLE
TYPE 3**

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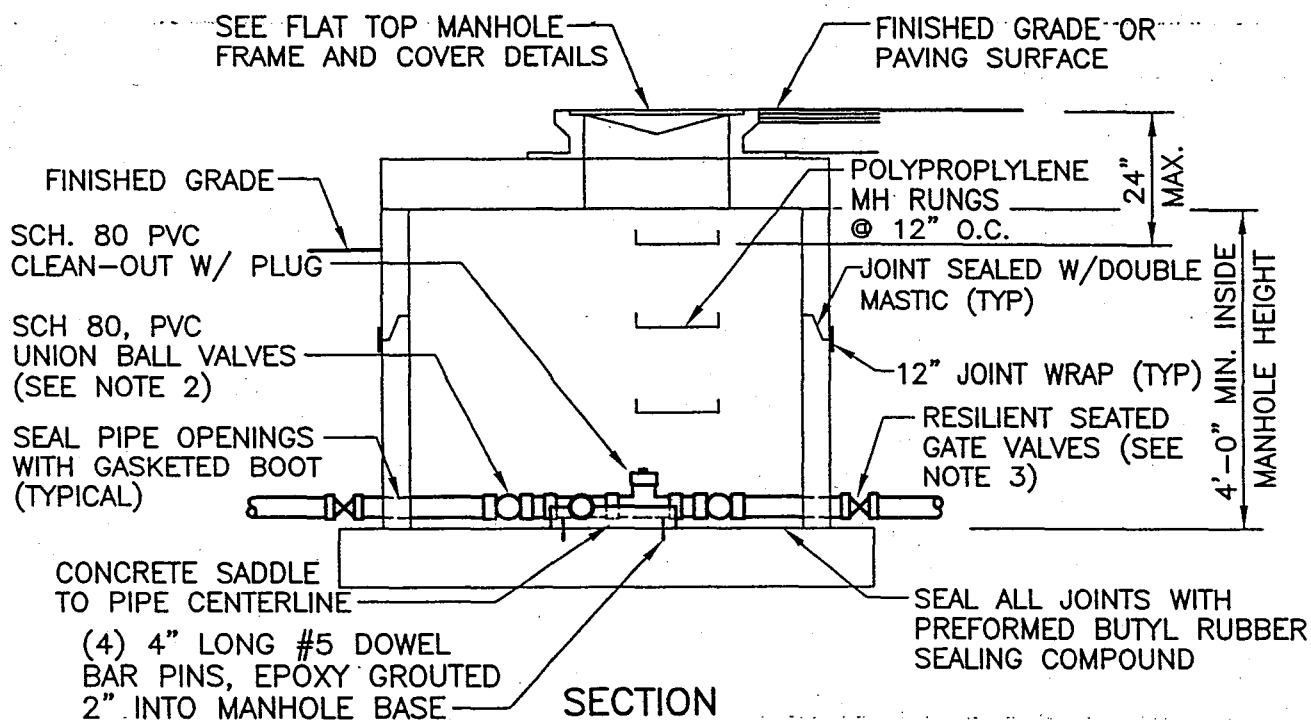
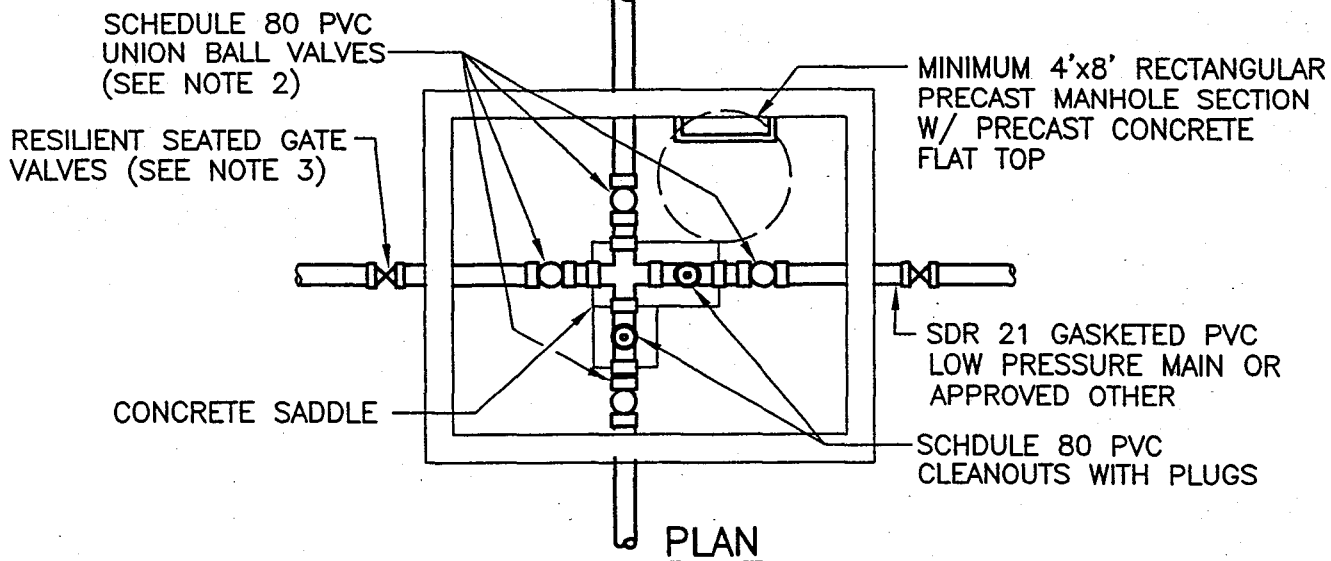
270 Granite Run Drive
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Tel 717.569.7021

DATE:

MARCH 2001

DETAIL:

31



NOTES:

1. ALL PIPE AND FITTINGS BETWEEN VALVES SHALL BE SCHEDULE 80 PVC.
2. 3" THRU 4" SEWER MAINS REQUIRE TRUE UNION BALL VALVES WITH FLANGED SPOOL PIECES WITHIN THE VAULT.
3. 6" AND LARGER SEWER MAINS REQUIRE W/ BURIED RESILIENT SEATED GATE VALVES IN LIEU OF BALL VALVES.

Leola Sewer Authority

STANDARD DETAIL - LOW PRESSURE SEWER SYSTEM

**VALVE AND C.O. MANHOLE
TYPE 7**

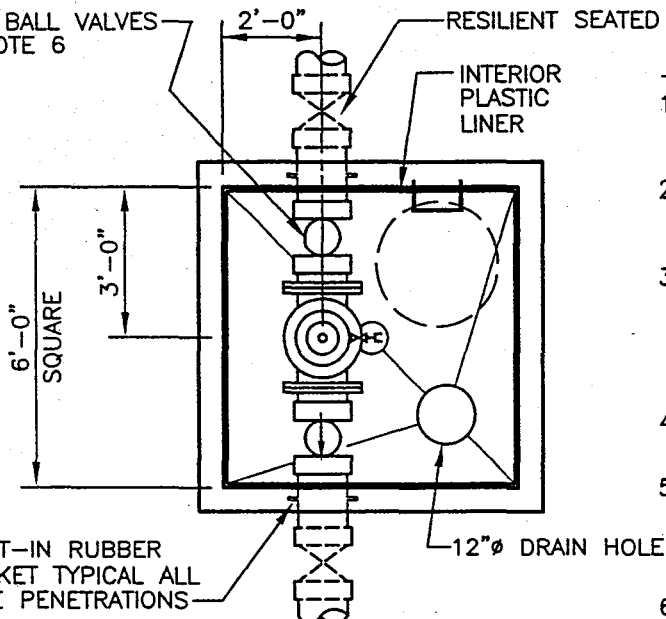
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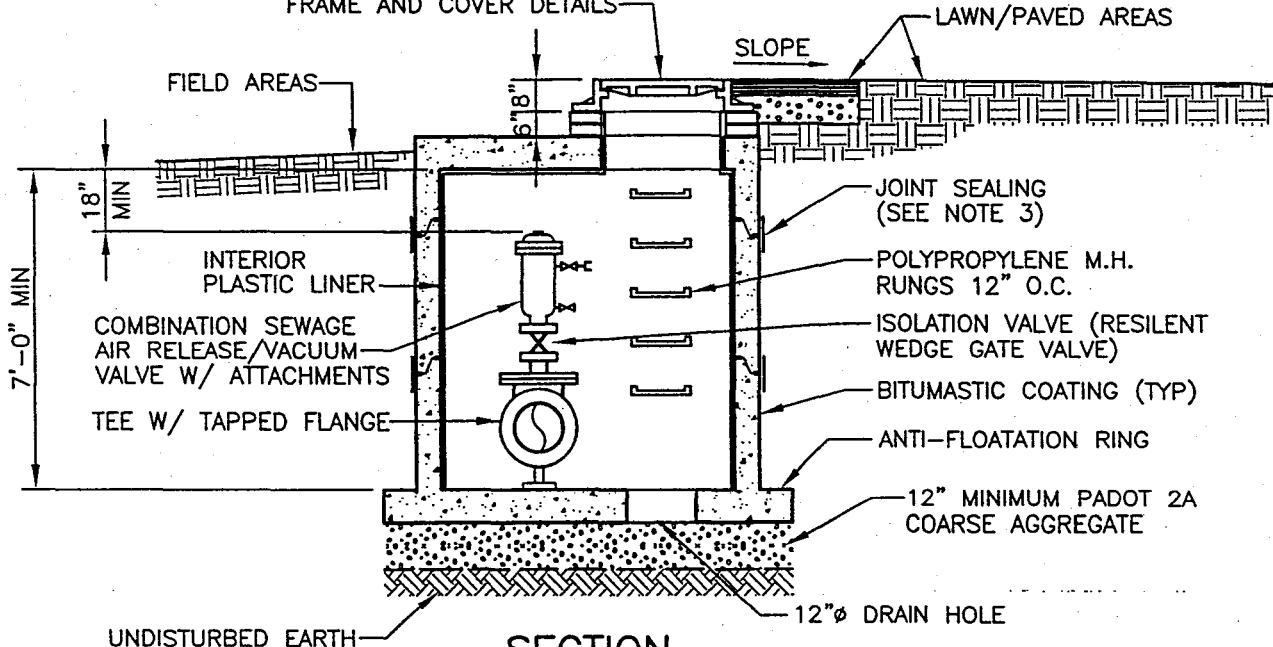
DETAIL:
31A

UNION BALL VALVES
SEE NOTE 6



PLAN

SEE FLAT TOP MANHOLE
FRAME AND COVER DETAILS



SECTION

SPECIAL NOTE: DEPTH OF MAIN MUST BE INCREASED FROM THE 3'-6" STANDARD TO ALLOW FOR INSTALLATION OF THE AIR RELEASE VALVE WITH 18 INCH MINIMUM CLEARANCE. THE PIPE SHALL BE CONTINUOUSLY RISING WITH THE AIR RELEASE VALVE AT THE HIGHEST ELEVATION POINT IN THE PIPING.

NOTES:

1. ADJUST TO GRADE WITH CONCRETE GRADE RINGS (MAXIMUM VERTICAL ADJUSTMENT 6") SEE FRAME & COVER DETAILS.
2. MECHANICALLY VIBRATED PRECAST CONCRETE SHALL CONFORM TO A.S.T.M. SPEC. C-478.
3. PROVIDE 2 RINGS OF PREFORMED BUTYL RUBBER SEALING COMPOUND (INSIDE & OUTSIDE) WITH 12" WIDE BAND OF EXTERNAL SEALING SYSTEM (OUTSIDE) AT ALL MANHOLE JOINTS.
4. FILL ALL LIFTING HOLES WITH NON-SHRINK GROUT.
5. INTERIOR PLASTIC LINER TO PROVIDE CONTINUOUS, IMPERMEABLE LINING TO SHIELD CONCRETE AGAINST DETERIORATION CAUSED BY CORROSIVE ATMOSPHERE.
6. PROVIDE & INSTALL (2) UNION BALL VALVES WITHIN VAULT ON MAIN SIZES OF 3" DIA. & LESS. ON MAIN SIZES 4" & LARGER PROVIDE (2) BURIED RESILIENT SEATED GATE VALVES IN LIEU OF BALL VALVES.

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STANDARD DETAIL - LOW PRESSURE SEWER SYSTEM

**COMBINATION AIR RELEASE/VACUUM
VALVE VAULT DETAIL**

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DATE:

MARCH 2001

DETAIL:

32

NOTE:
ALL PIPE AND FITTINGS BETWEEN
VALVES SHALL BE SCHEDULE 80 PVC

MINIMUM 5'-0" DIAMETER
PRECAST MANHOLE SECTION W/
PRECAST CONCRETE FLAT TOP
PROVIDE LARGER MANHOLE AS
REQUIRED TO ACCOMMODATE
LENGTHS FROM METER TO
ISOLATION VALVES

SCHEDULE 80 PVC
UNION BALL VALVES

- SDR 21 GASKETED PVC
LOW PRESSURE MAIN OR
APPROVED OTHER

PLACE VALVE A MINIMUM
FOUR PIPE DIAMETERS
DOWNSTREAM OF METER

- PLACE VALVE A MINIMUM
FOUR PIPE DIAMETERS
UPSTREAM OF METER

MIN. 1 FT. ABOVE FINISHED GRADE
30" SQ ALUM HATCH IN UNPAVED
AREAS. FOR INSTALLATION IN
PAVED AREAS, SEE FLAT TOP MANHOLE
FRAME AND COVER DETAILS_____

PLAN

- FINISHED GRADE OR
PAVING SURFACE

POLYPROPYLENE
MH RUNGS @
12" O.C.

FINISHED GRADE

SCH 80, PVC —
UNION BALL VALVE

SEAL PIPE OPENINGS WITH GASKETED BOOT (TYPICAL)

45°
BENDS

PIPE RISE
1.5 DIA. MIN

TWO 316 STAINLESS-
STEEL MECHANICAL
PIPE SUPPORTS, ONE
EACH SIDE OF METER

10'-0" MAX

SECTION

SEALED W/DOUBLE
IC (TYP)

2" JOINT WRAP (TYP)

SDR 21 PVC LOW
- PRESSURE MAIN

24"
MAX.

MIN COVER

**4'-0" MIN. INSIDE
MANHOLE HEIGHT**

PIPE RISE
1.5 DIA, MIN

SEAL ALL JOINTS WITH
PREFORMED BUTYL RUBBER
SEALING COMPOUND

10'-0" MAX

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STANDARD DETAIL - LOW PRESSURE SEWER SYSTEM



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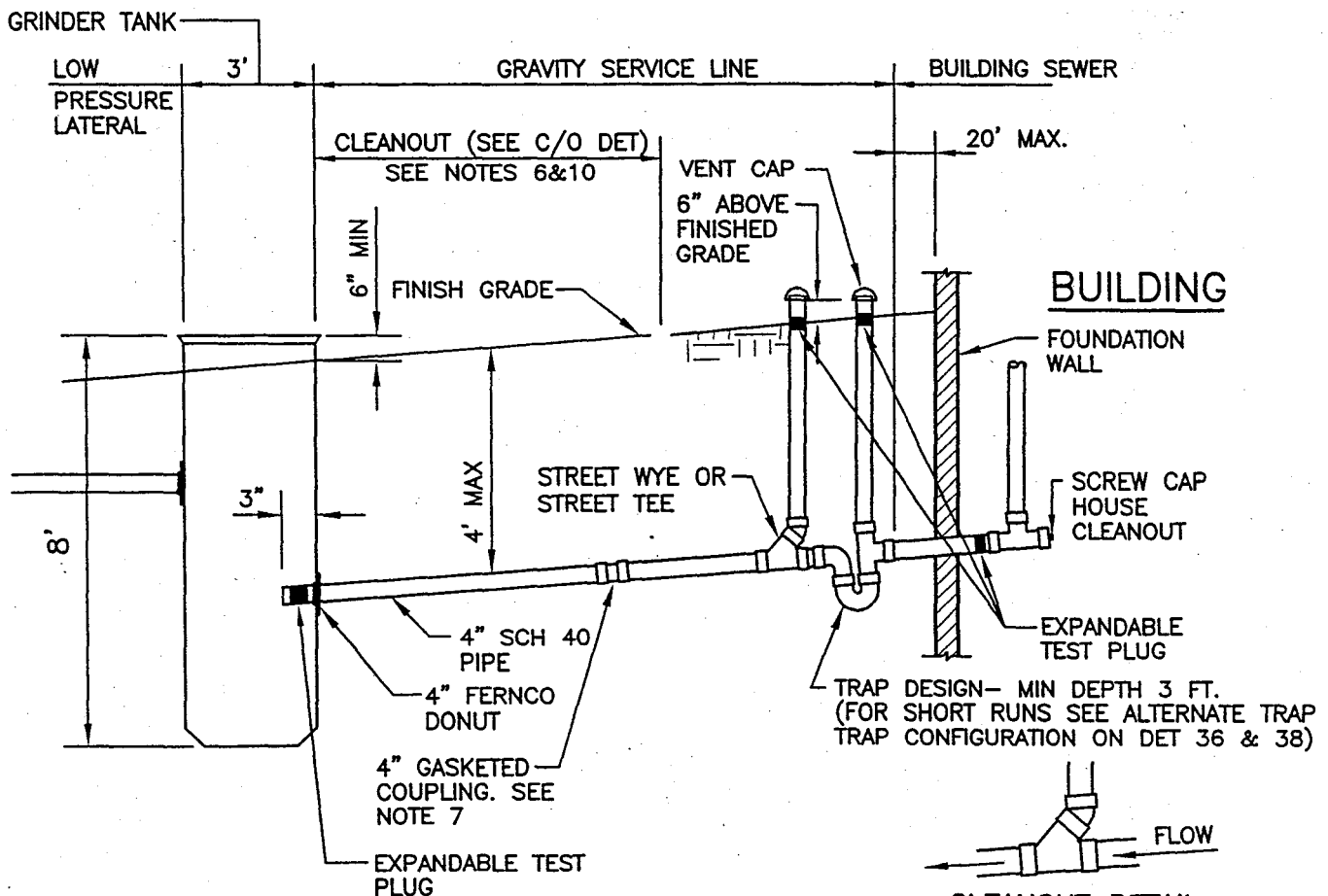
MARCH 2001

DETAIL:

33

METER VAULT

Dwg. Name: 00323074.DWG Last Revised: 04/05/01 12:30



NOTES:

- 1) PROVIDE 6" OF AASHTO NO. 8 (1B) STONE BELOW PIPE AND 12" ABOVE PIPE (TYPICAL ENTIRE LENGTH OF LATERAL).
- 2) MINIMUM SLOPE = 1% (1/8" PER FT.)
- 3) MINIMUM DEPTH OF COVER = 3 FT
- 4) PIPE MATERIALS:
 SERVICE LINE - 4" PVC SCH 40- SOLVENT WELD JOINTS W/ CLEANER
 - ONE PIECE SCH 40 U-BEND
 - CAST IRON
- 5) TO CONDUCT AIR TESTING OF SERVICE LINE, INSTALL EXPANDABLE PLUGS AT LOCATIONS SHOWN. AIR TEST SHALL BE 6 LBS. FOR 6 MINS.
- 6) CLEANOUT BETWEEN TRAP AND TANK IF SEWER SERVICE LINE IS LONGER THAN 75 FT.
- 7) 4" PVC SCH 40 GASKETED COUPLING USED CONNECT TO 20 FT. PIPE SECTIONS
- 8) NO SEWER SERVICE LINE VENT CAPS SHALL BE INSTALLED WITHIN A 100-YR FLOOD PLAIN OR WITHIN FLOOD PRONE AREAS.
- 9) NO VENT CAPS OR CLEANOUTS SHALL BE INSTALLED IN DRIVEWAYS OR OTHER PAVED AREAS, UNLESS SPECIFICALLY APPROVED BY LSA.
- 10) CLEANOUT-FEMALE ADAPTER AT FINISH GRADE W/ THREADED PLUG

CLEANOUT DETAIL

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

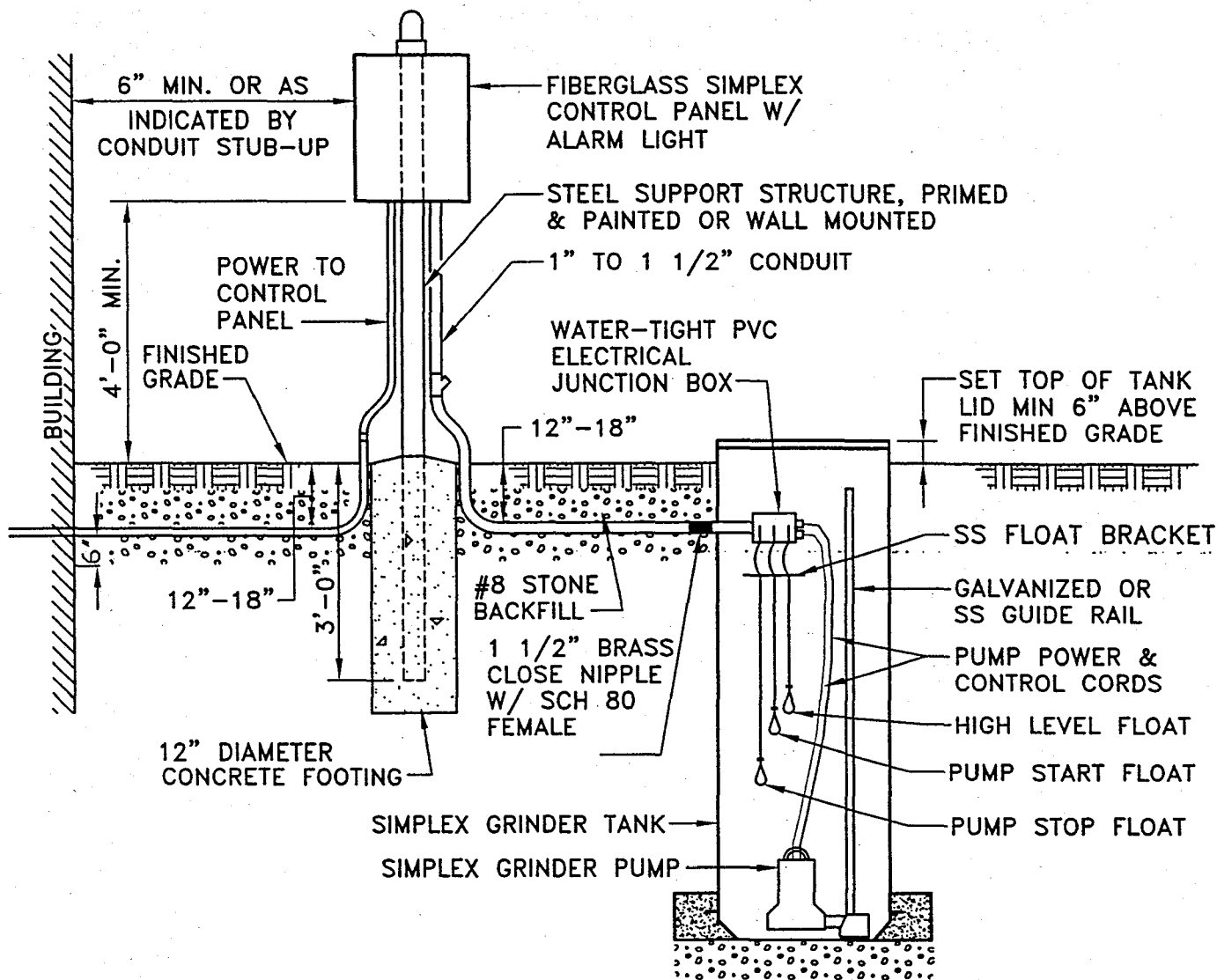
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**GRAVITY SERVICE LINE INSTALLATION
 DETAIL FOR GRINDER TANKS**

DATE:
 MARCH 2001

DETAIL:
 34



NOTES:

1. CONDUCTOR SIZE & QUANTITY SHALL BE PER PUMP SYSTEM MANUFACTURER RECOMMENDATIONS.
2. CONDUITS SHALL BE PVC SCHEDULE 40, SIZED PER CONDUCTOR REQUIREMENTS.
3. COLOR CODED & GAUGED TANK FEED WIRE FROM CONTROL PANEL TO PUMP STATION MUST BE PURCHASED FROM LEOLA SEWER AUTHORITY.
4. ALL PUMP STATIONS LARGER THAN 3.5 FT IN DIAMETER, SHALL BE PRECAST CONCRETE AND ADDITIONAL DETAILS APPLY.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

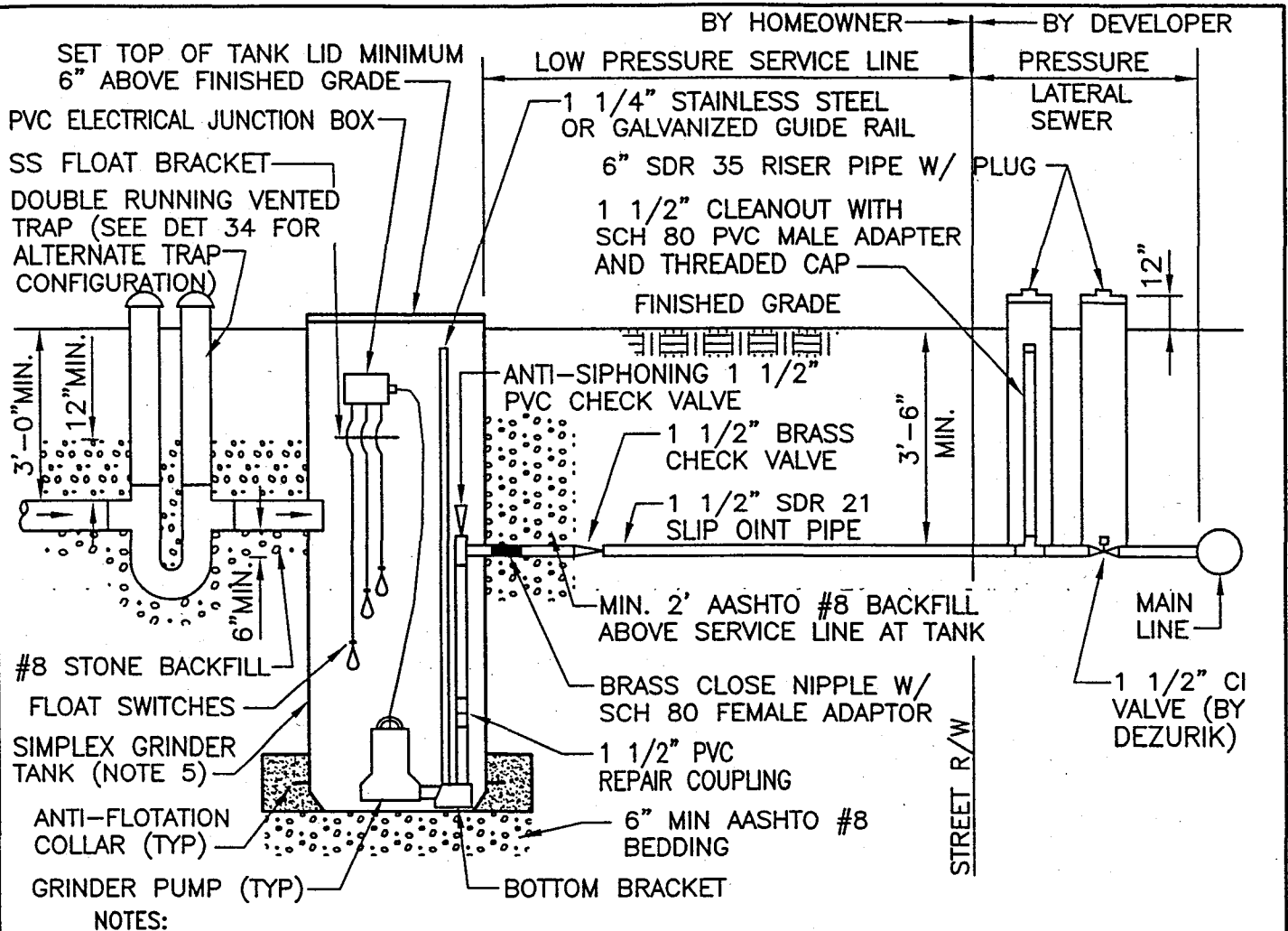
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**SIMPLEX GRINDER PUMP DETAIL
ELECTRICAL**

DATE: MARCH 2001

DETAIL: 35



NOTES:

1. ALL PLUMBING INSIDE GRINDER TANK AND BETWEEN THE OUTER TANK WALL AND THE BRASS CHECK VALVE SHALL BE SCH 80 PVC PIPE.
2. UNLESS OTHERWISE NOTED ALL ADAPTERS SHALL BE SCH 80 PVC (GLUE JOINTS WHERE APPLICABLE).
3. METALLIC DETECTION TAPE SHALL BE PLACE ABOVE LOW PRESSURE SERVICE LINE, MAX. 2 FT BELOW FINISHED GRADE.
4. ALL STRUCTURAL SUPPORTS, ANGLES, NUTS, BOLTS, WASHERS AND LAGS USED INSIDE THE TANK SHALL BE 316 STAINLESS STEEL.
5. 3/4 YARD (MIN) OF CONCRETE SHALL BE PLACED AROUND THE ANTI-FLOTATION COLLAR OF FIBERGLASS GRINDER TANKS TO PREVENT FLOTATION. CONCRETE SHALL EXTEND 1' ABOVE THE COLLAR AND TO THE LIMITS OF EXCAVATION. NO CONCRETE SHALL BE PLACED BETWEEN THE TANK BEDDING AND THE HORIZONTAL BOTTOM OF THE TANK.
6. BRASS CHECK VALVE SHALL BE BEDDED ON UNDISTURBED SOIL.
7. ALL PUMP STATIONS LARGER THAN 3.5 FT IN DIAMETER, SHALL BE PRECAST CONCRETE AND ADDITIONAL DETAILS APPLY.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

**SIMPLEX GRINDER PUMP DETAIL
PLUMBING**

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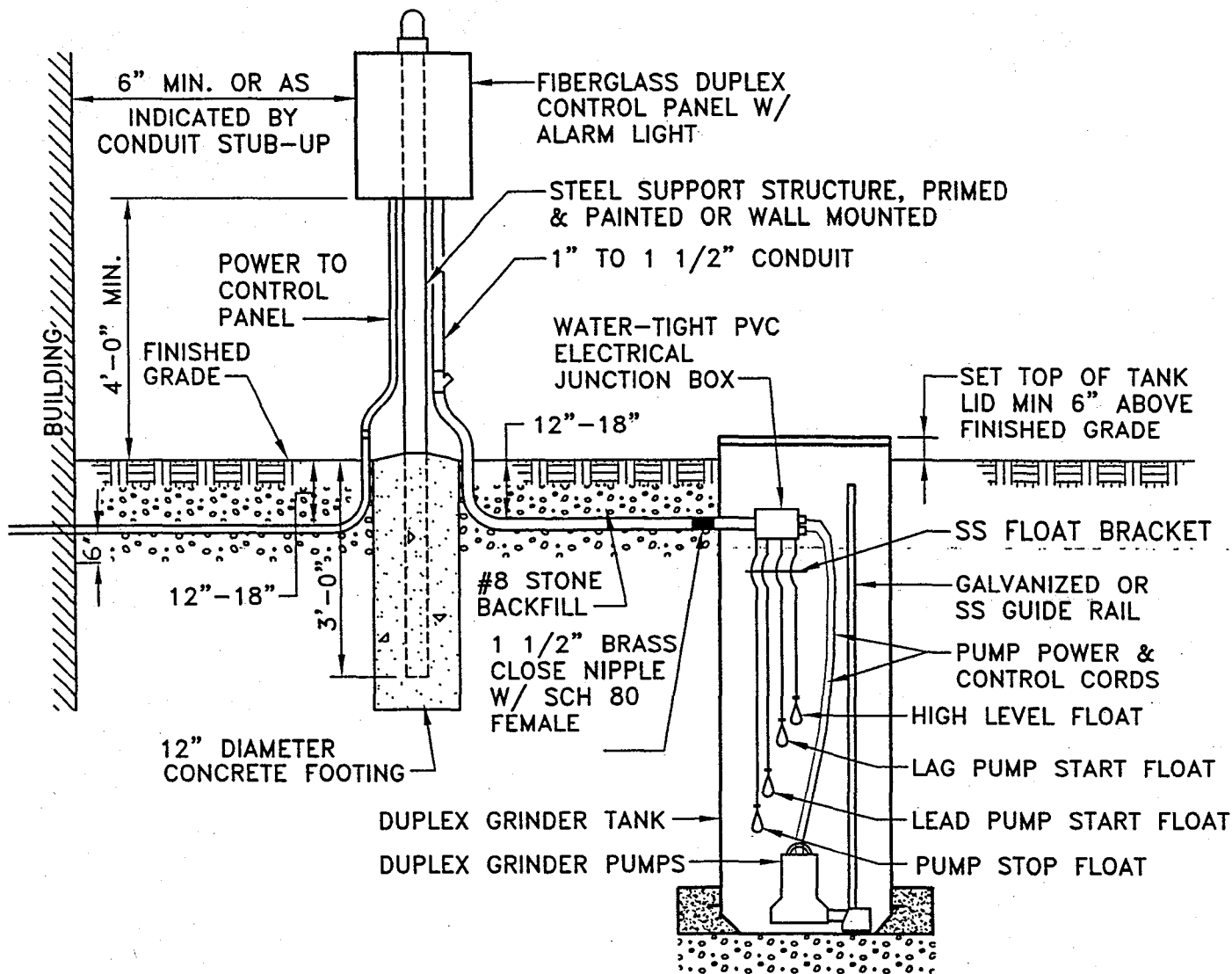
270 Granite Run Drive
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DATE:

MARCH 2001

DETAIL:

36



NOTES:

1. CONDUCTOR SIZE & QUANTITY SHALL BE PER PUMP SYSTEM MANUFACTURER RECOMMENDATIONS.
2. CONDUITS SHALL BE PVC SCHEDULE 40, SIZED PER CONDUCTOR REQUIREMENTS.
3. COLOR CODED & GAUGED TANK FEED WIRE FROM CONTROL PANEL TO PUMP STATION MUST BE PURCHASED FROM LEOLA SEWER AUTHORITY.
4. ALL PUMP STATIONS LARGER THAN 3.5 FT IN DIAMETER, SHALL BE PRECAST CONCRETE AND ADDITIONAL DETAILS APPLY.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

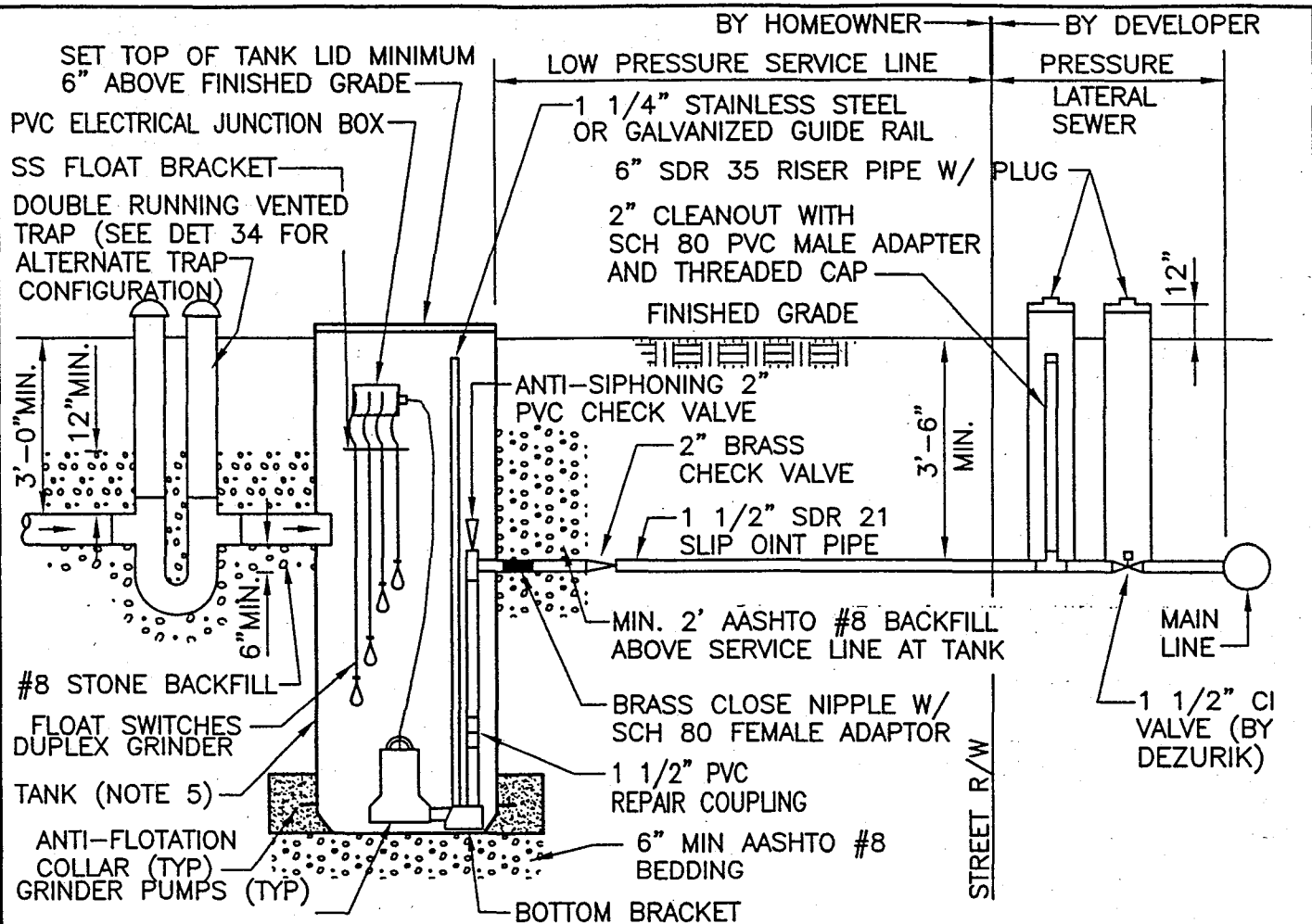
**DUPLEX GRINDER PUMP DETAIL
ELECTRICAL**

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Tel 717.569.7021

DATE:
MARCH 2001

DETAIL:
37



NOTES:

1. ALL PLUMBING INSIDE GRINDER TANK AND BETWEEN THE OUTER TANK WALL AND THE BRASS CHECK VALVE SHALL BE SCH 80 PVC PIPE.
2. UNLESS OTHERWISE NOTED ALL ADAPTERS SHALL BE SCH 80 PVC (GLUE JOINTS WHERE APPLICABLE).
3. METALLIC DETECTION TAPE SHALL BE PLACE ABOVE LOW PRESSURE SERVICE LINE, MAX. 2 FT BELOW FINISHED GRADE.
4. ALL STRUCTURAL SUPPORTS, ANGLES, NUTS, BOLTS, WASHERS AND LAGS USED INSIDE THE TANK SHALL BE 316 STAINLESS STEEL.
5. 3/4 YARD (MIN) OF CONCRETE SHALL BE PLACED AROUND THE ANTI-FLOTATION COLLAR OF FIBERGLASS GRINDER TANKS TO PREVENT FLOTATION. CONCRETE SHALL EXTEND 1' ABOVE THE COLLAR AND TO THE LIMITS OF EXCAVATION. NO CONCRETE SHALL BE PLACED BETWEEN THE TANK BEDDING AND THE HORIZONTAL BOTTOM OF THE TANK.
6. BRASS CHECK VALVE SHALL BE BEDDED ON UNDISTURBED SOIL.
7. ALL PUMP STATIONS LARGER THAN 3.5 FT IN DIAMETER, SHALL BE PRECAST CONCRETE AND ADDITIONAL DETAILS APPLY.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

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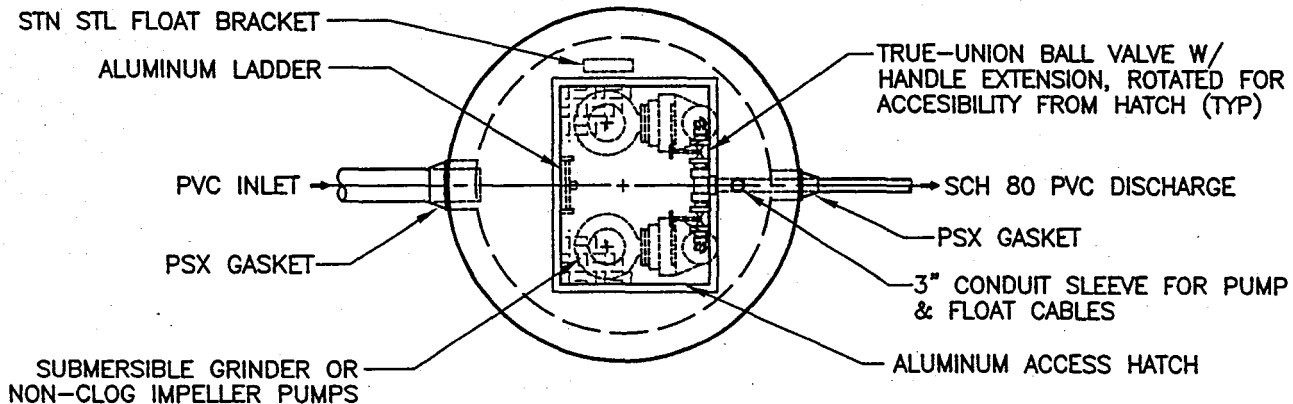
**DUPLEX GRINDER PUMP DETAIL
PLUMBING**

DATE:

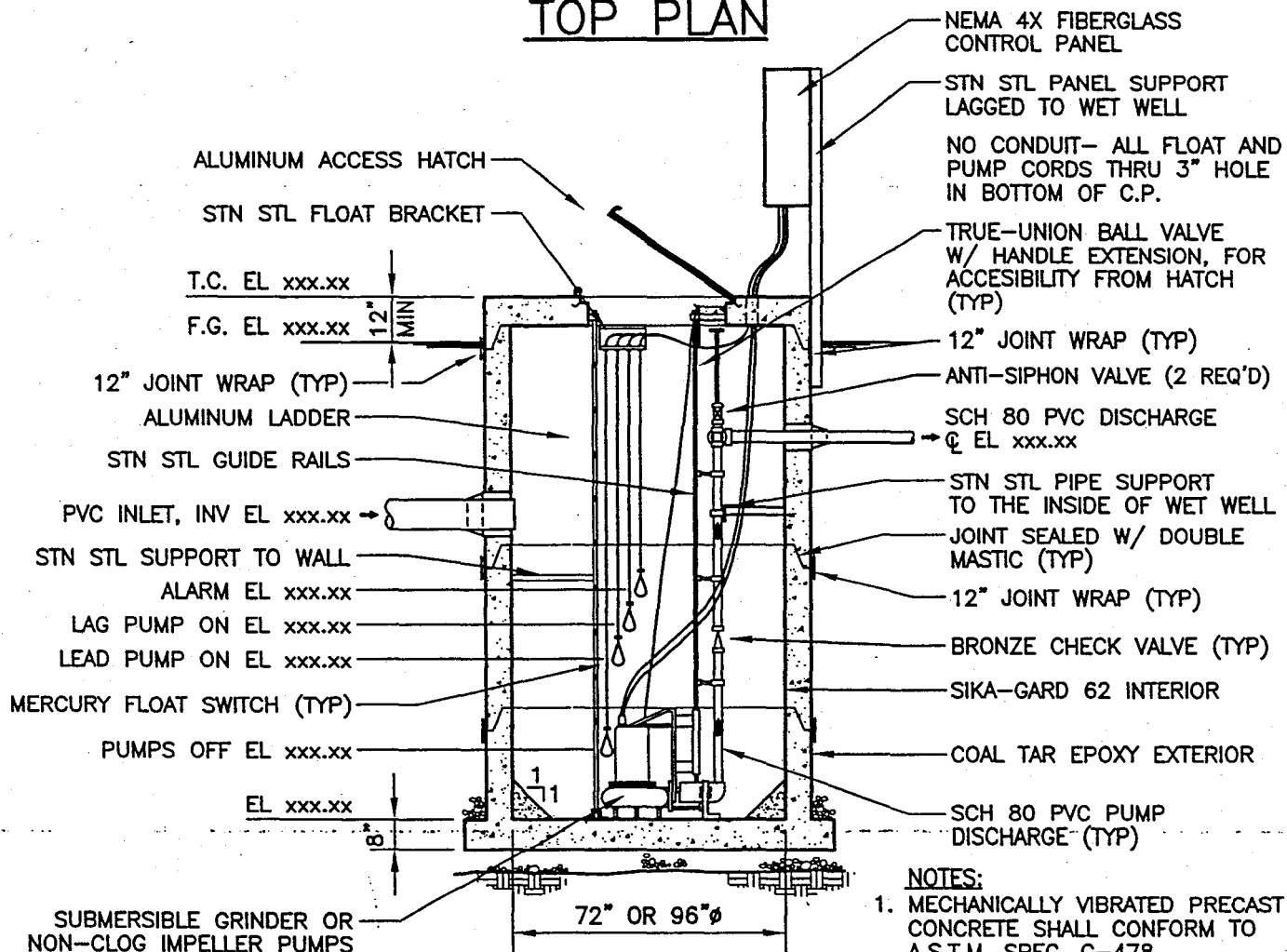
MARCH 2001

DETAIL:

38



TOP PLAN



SECTION

NOTES:

1. MECHANICALLY VIBRATED PRECAST CONCRETE SHALL CONFORM TO A.S.T.M. SPEC. C-478.
2. FILL ALL LIFTING HOLES WITH NON-SHRINK GROUT.

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STANDARD DETAIL - SEWER SYSTEM

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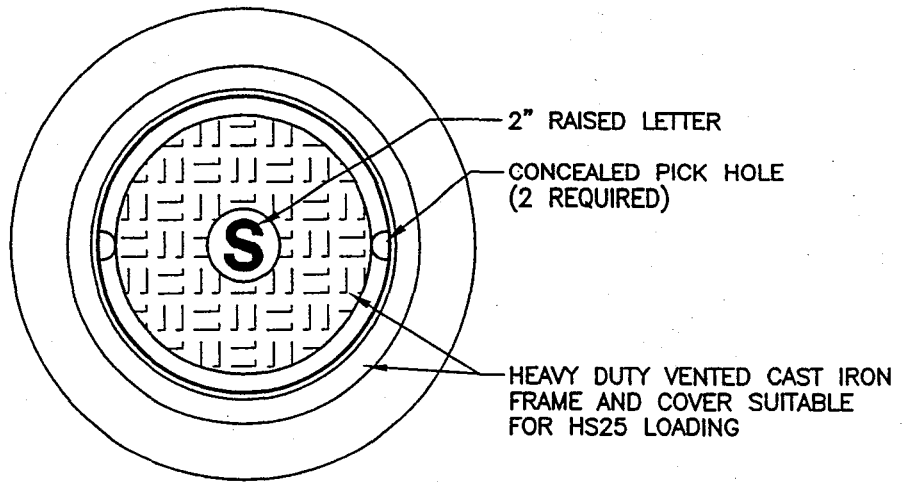
**CONCRETE DUPLEX GRINDER PUMP STATION
WITH PUMPS ON RAIL SYSTEM**

DATE: MARCH 2001

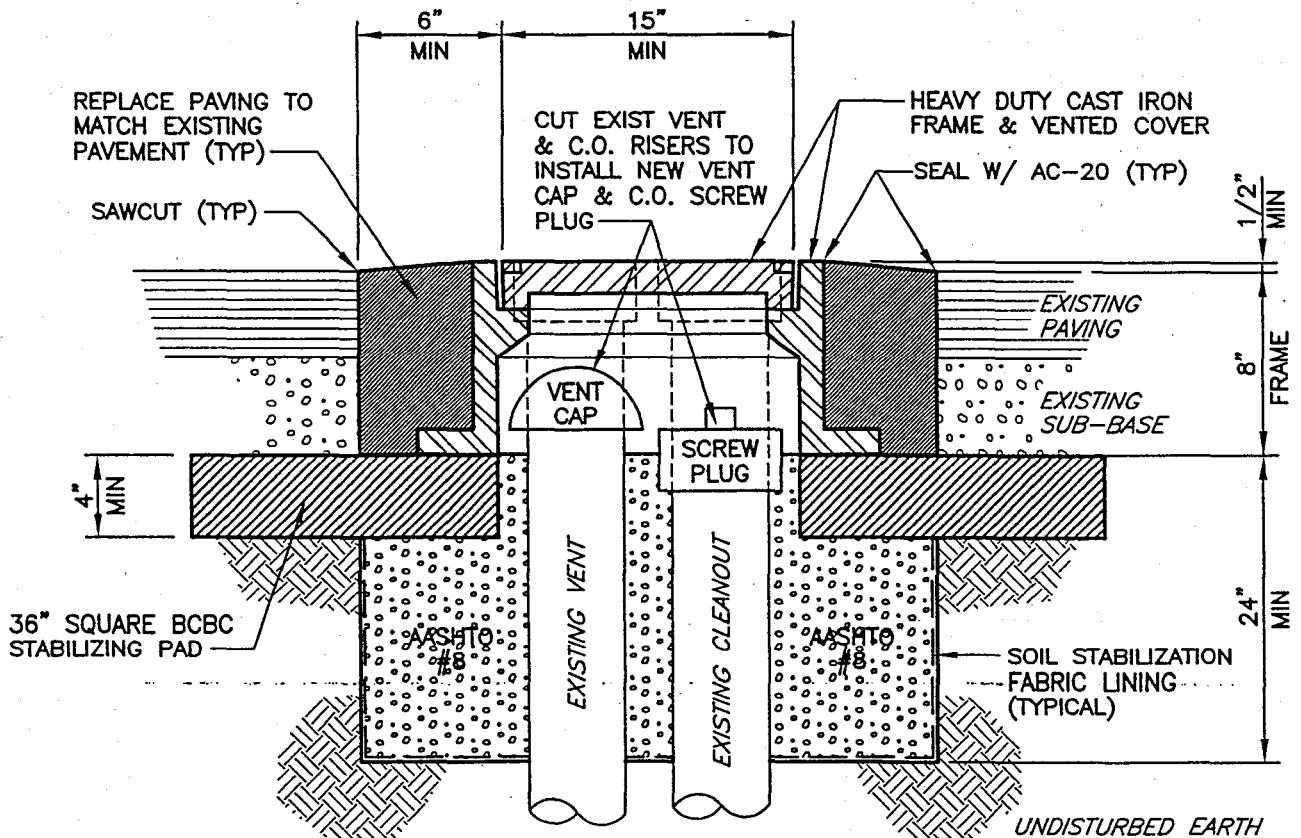
DETAIL: 38A

NOTES:

1. THIS DETAIL PERTAINS ONLY TO EXISTING VENTS & CLEANOUTS.
2. VENT CAP SHOULD MATCH EXISTING VENT MATERIAL.
3. EACH DRAIN WILL BE TESTED FOR DRAINAGE.



COVER PATTERN



SECTION

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

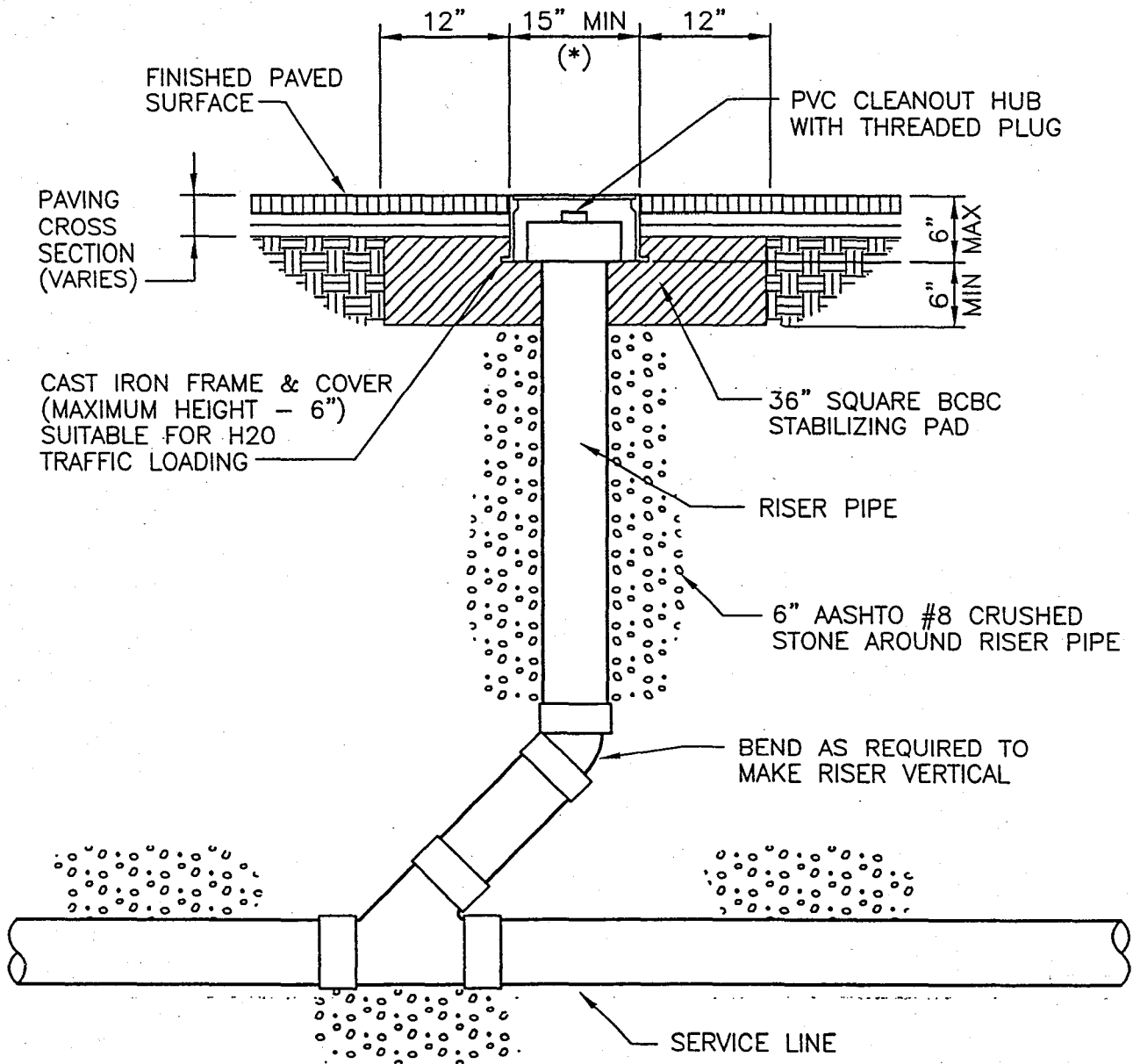
**EXISTING VENT & CLEANOUT
IN PAVED AREAS DETAIL**

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DATE:
MARCH 2001

DETAIL:
39



(*) NOTE: SEE DETAIL SHEET 39 FOR FRAME AND COVER

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

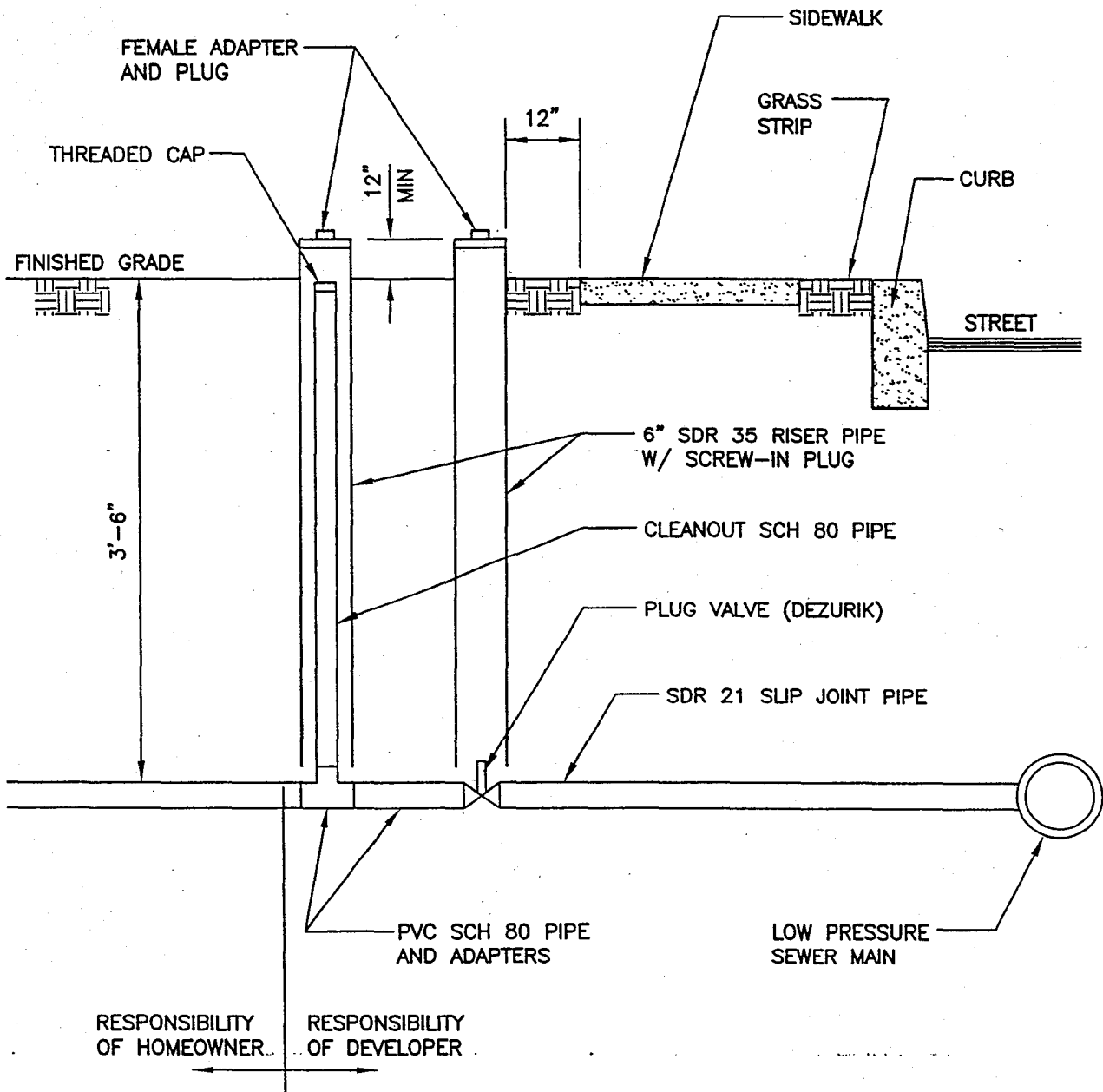
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**NEW CLEANOUT IN PAVED AREAS DETAIL
(BY SPECIAL EXCEPTION ONLY)**

DATE:
MARCH 2001

DETAIL:
40



NOTE: HOMEOWNER SHALL CONTACT LEOLA SEWER AUTHORITY FOR DETAILS OF GRINDER PUMP INSTALLATION AND CONNECTION TO THE SYSTEM.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

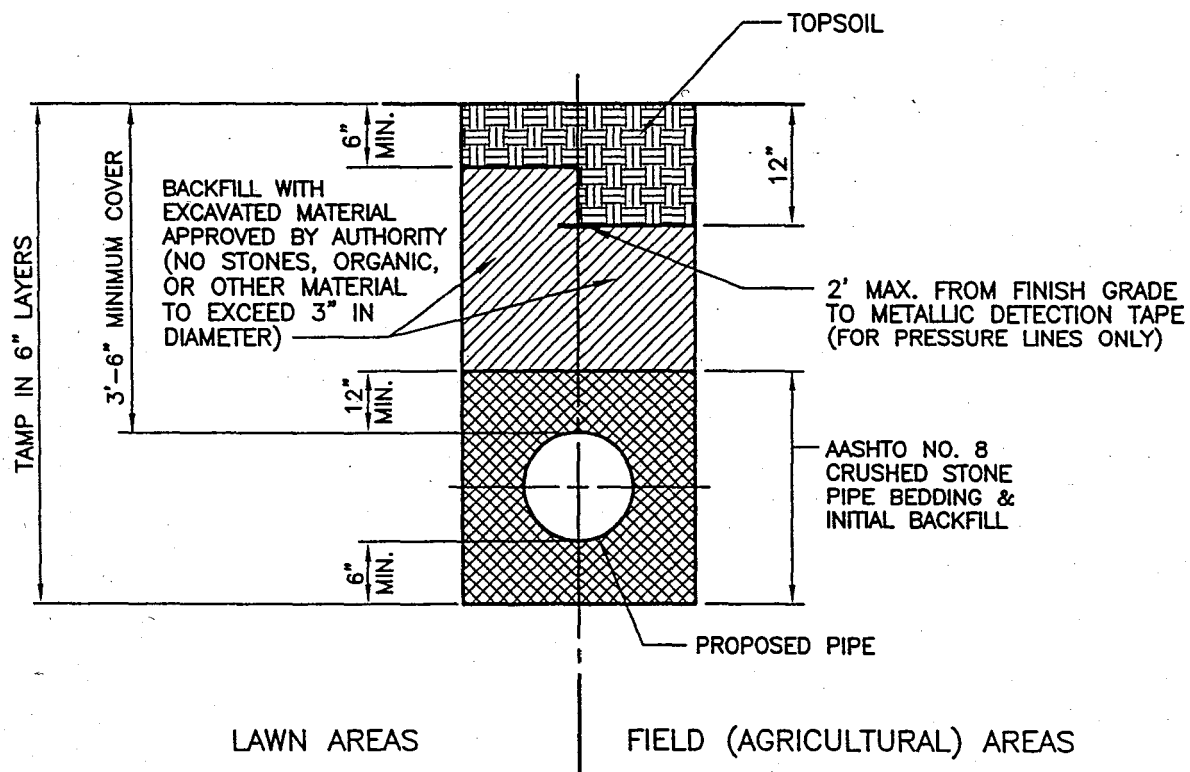
**LOW PRESSURE SEWER
LATERAL DETAIL**

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DATE:
MARCH 2001

DETAIL:
41



Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

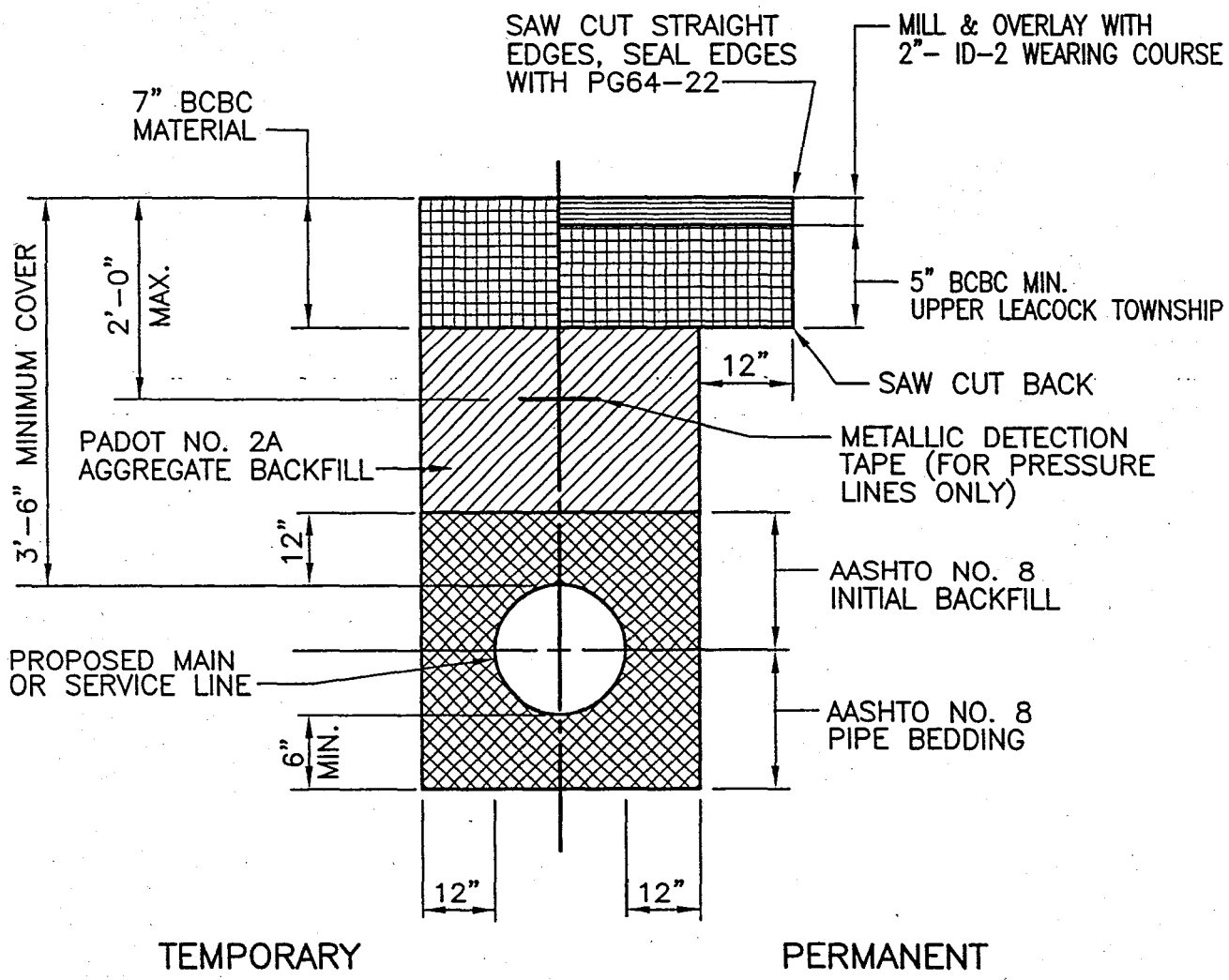
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**TRENCH RESTORATION
LAWN/FIELD AREAS**

DATE:
MARCH 2001

DETAIL:
42



NOTE: SEE DETAIL 43B FOR PAVEMENT RESTORATION AT ROAD CROSSINGS

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

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**PAVEMENT RESTORATION DETAIL
FOR EXISTING TOWNSHIP ROADS**

DATE:
MARCH 2001

DETAIL:
43

Dwg. Name: 00323066.DWG Last Revised: 04/05/01 13:10

TEMPORARY PAVING
IN ACCORDANCE WITH
PA DOT RULES AND
REGULATIONS

4'-0" MIN. COVER

PADOT NO. 2A
AGGREGATE
BACKFILL

12"

6"
MIN.

12"

12"

SEAL EDGE WITH
PG64-22

WEARING COURSE
AS REQUIRED
BY PADOT

BASE COURSE
AS REQUIRED
BY PADOT

SAW CUT BACK

AASHTO NO. 8
INITIAL BACKFILL

AASHTO NO. 8
PIPE BEDDING

PROPOSED PIPE.
SIZE VARIES

TEMPORARY

IN ACCORDANCE WITH
PA DOT RULES AND
REGULATIONS

PERMANENT

IN ACCORDANCE WITH
PA DOT RULES AND
REGULATIONS

NOTES:

1. ALL WORK TO BE IN ACCORDANCE WITH PADOT PUBLICATION 408.
2. SEE DETAIL 43B FOR PAVEMENT RESTORATION AT ROAD CROSSINGS

Leola Sewer Authority

STANDARD DETAIL - WATER SYSTEM

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**PAVEMENT RESTORATION DETAIL
FOR STATE ROADS**

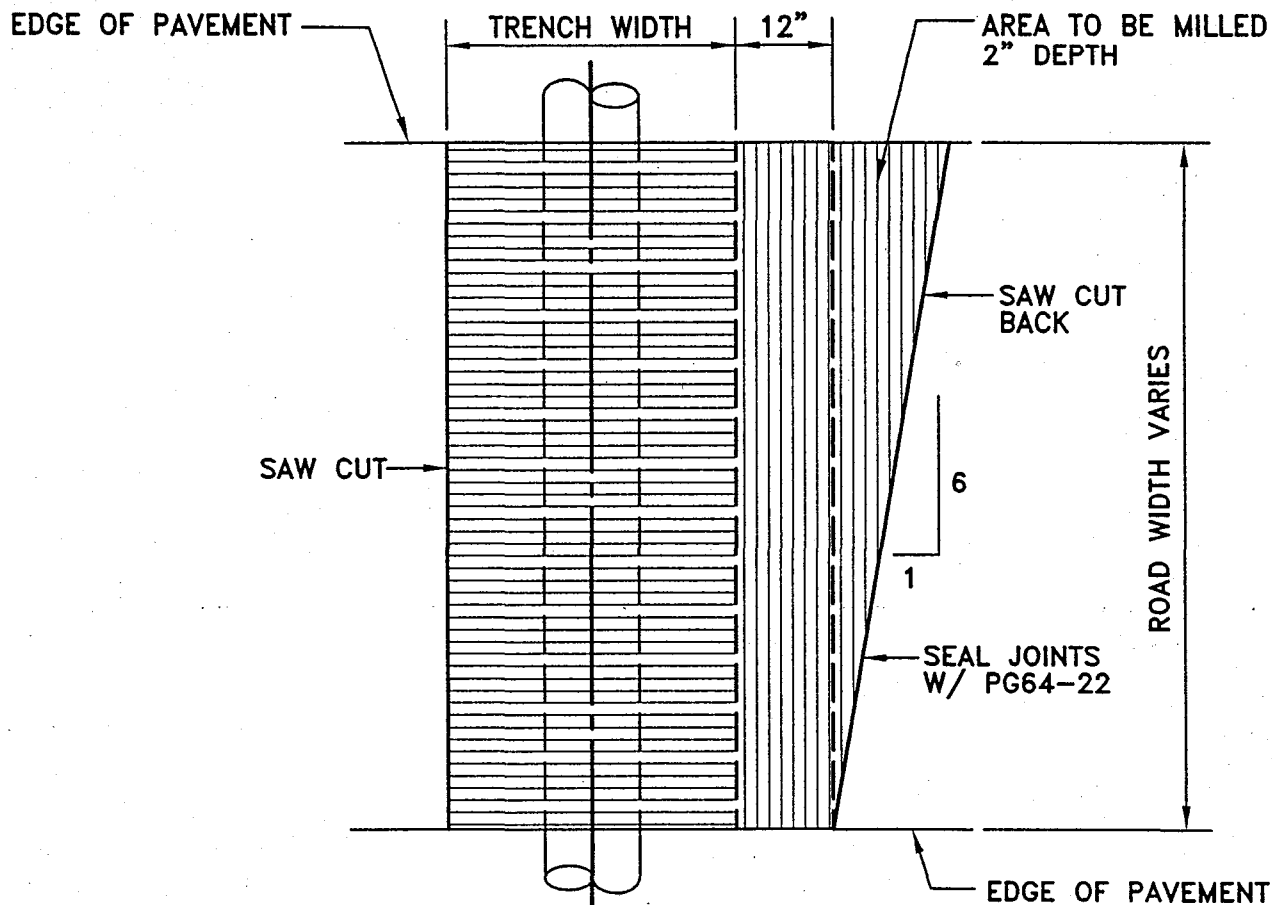
DATE:

MARCH 2001

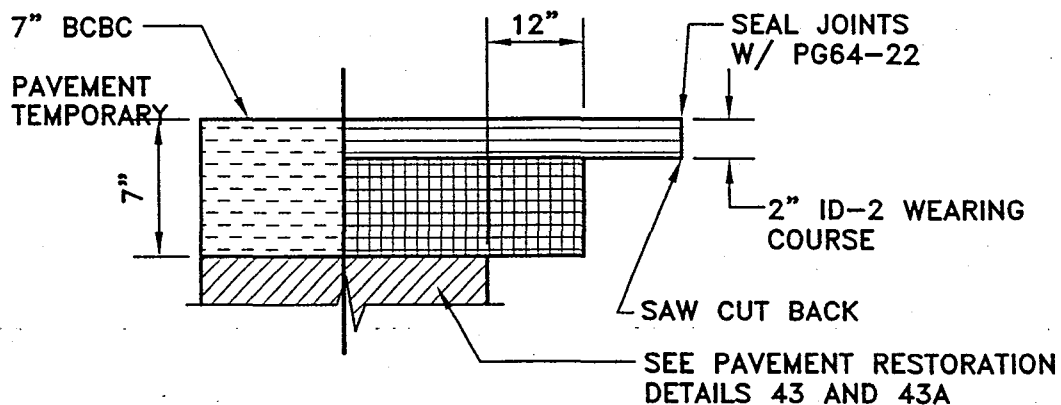
DETAIL:

43A

Dwg. Name: 00323939.DWG Last Revised: 03/16/01 09:29



PLAN



TEMPORARY

PERMANENT

SECTION

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

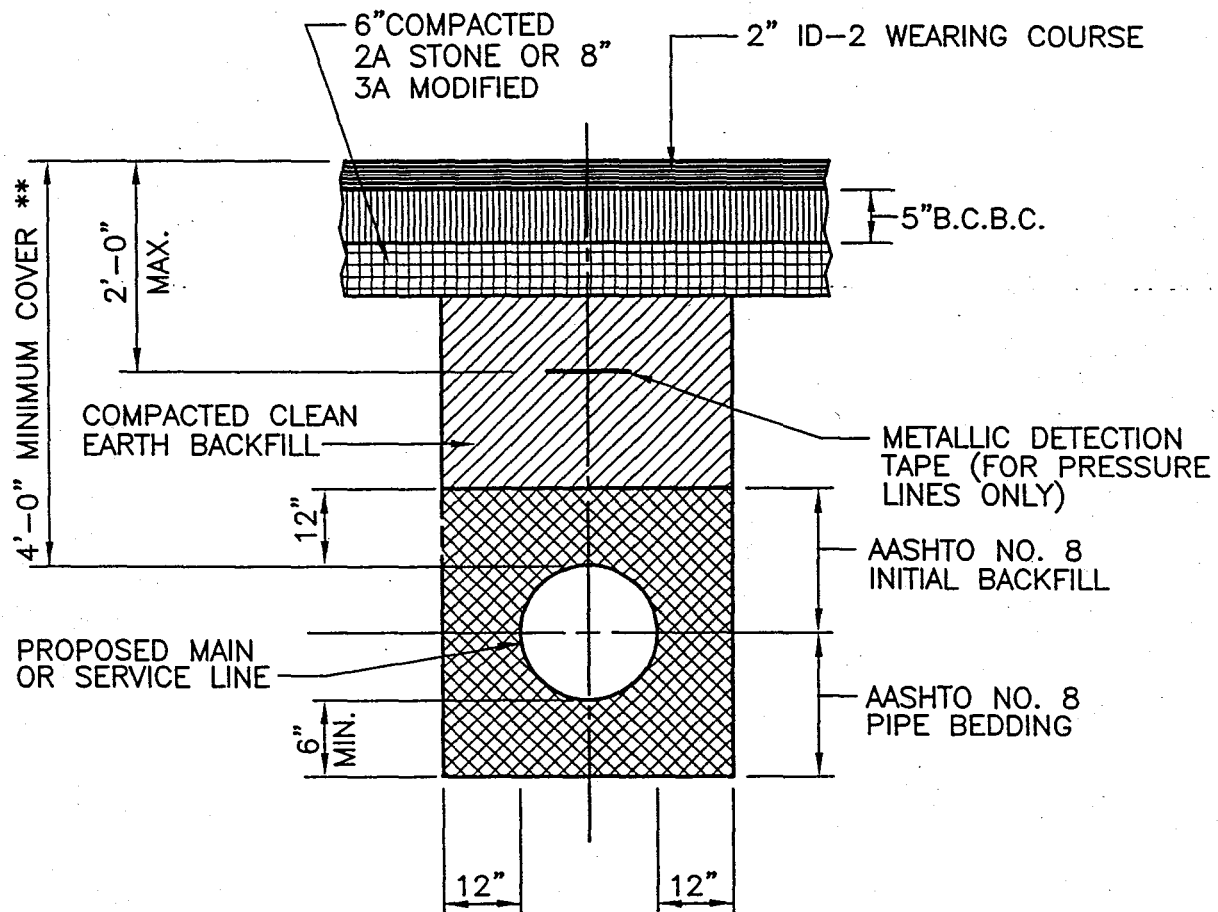
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**PAVEMENT RESTORATION DETAIL
AT ROAD CROSSINGS**

DATE:
MARCH 2001

DETAIL:
43B



* NOTE: NO STONE, ORGANIC OR OTHER MATERIAL TO EXCEED 3" IN DIAMETER.
 ** UNLESS OTHERWISE NOTED

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

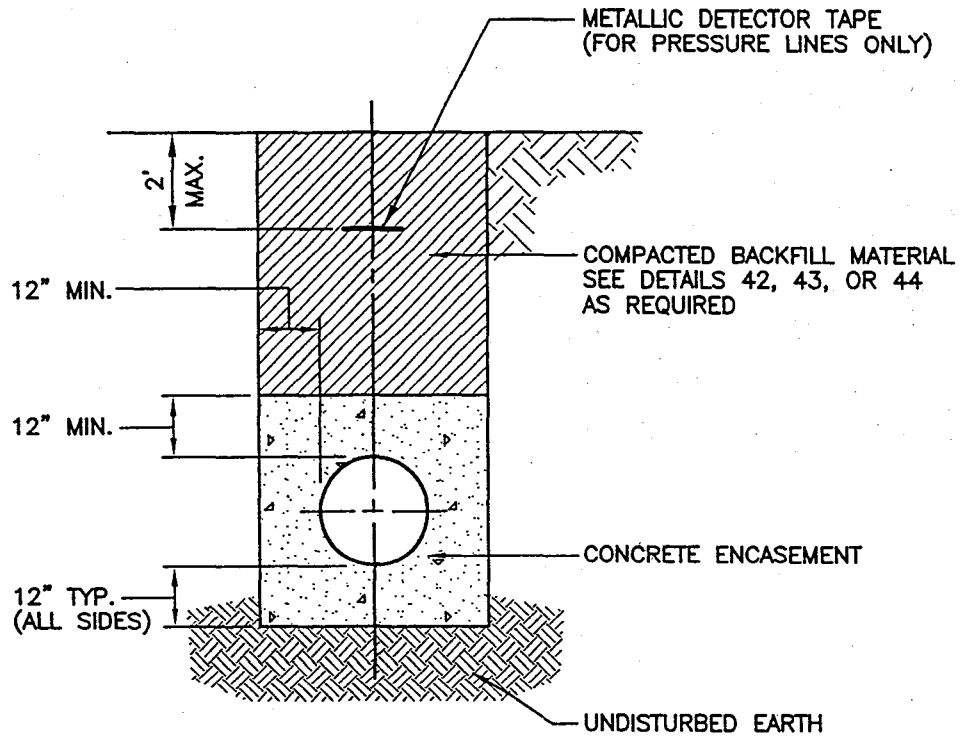
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**PAVEMENT RESTORATION
 FOR NEW TOWNSHIP ROADS**

DATE:
 MARCH 2001

DETAIL:
 44



Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

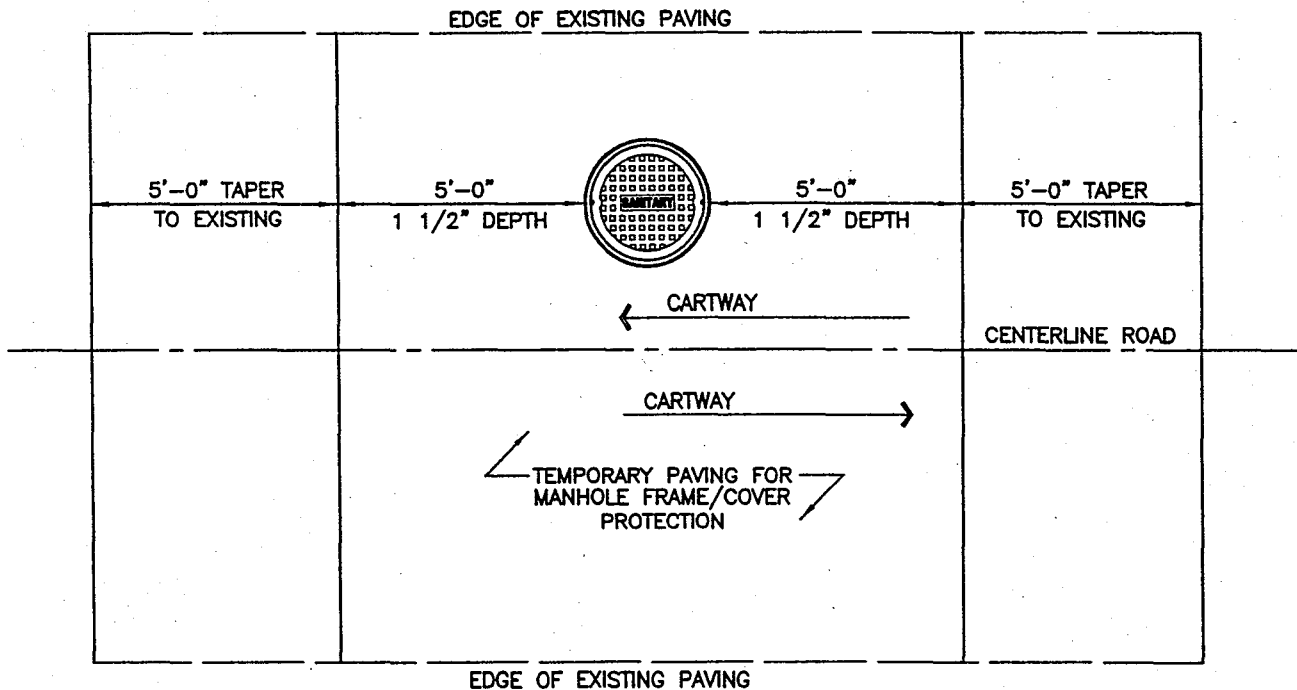
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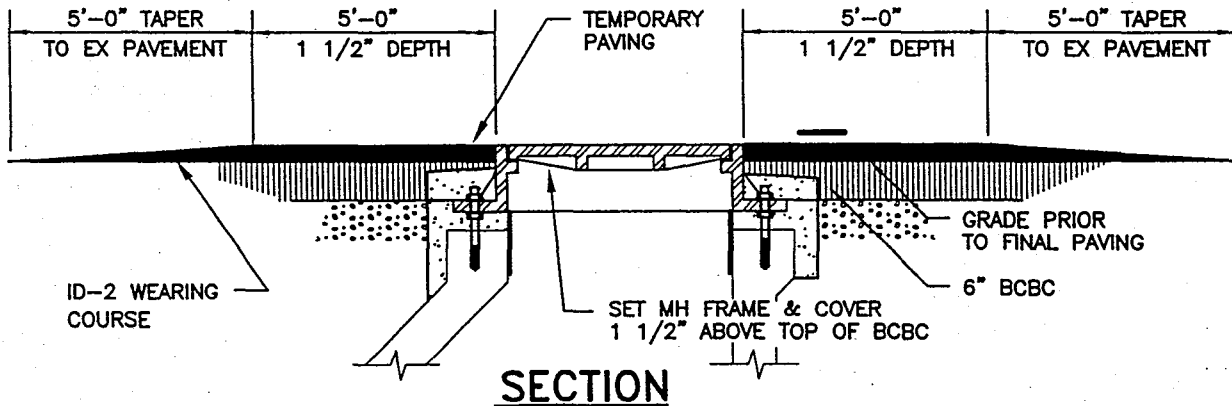
CONCRETE ENCASEMENT DETAIL

DATE:
MARCH 2001

DETAIL:
45



PLAN



SECTION

NOTE: TEMPORARY PAVING TO BE PLACED AT ALL MANHOLES WITHIN CARTWAYS, TO PROTECT MH FRAMES & COVERS FROM SNOW PLOWS.

USE THIS DETAIL FOR UPPER LEACOCK AND WEST EARL TOWNSHIP ALONG WITH STATE ROADS.

Leola Sewer Authority

STANDARD DETAIL - SEWER SYSTEM

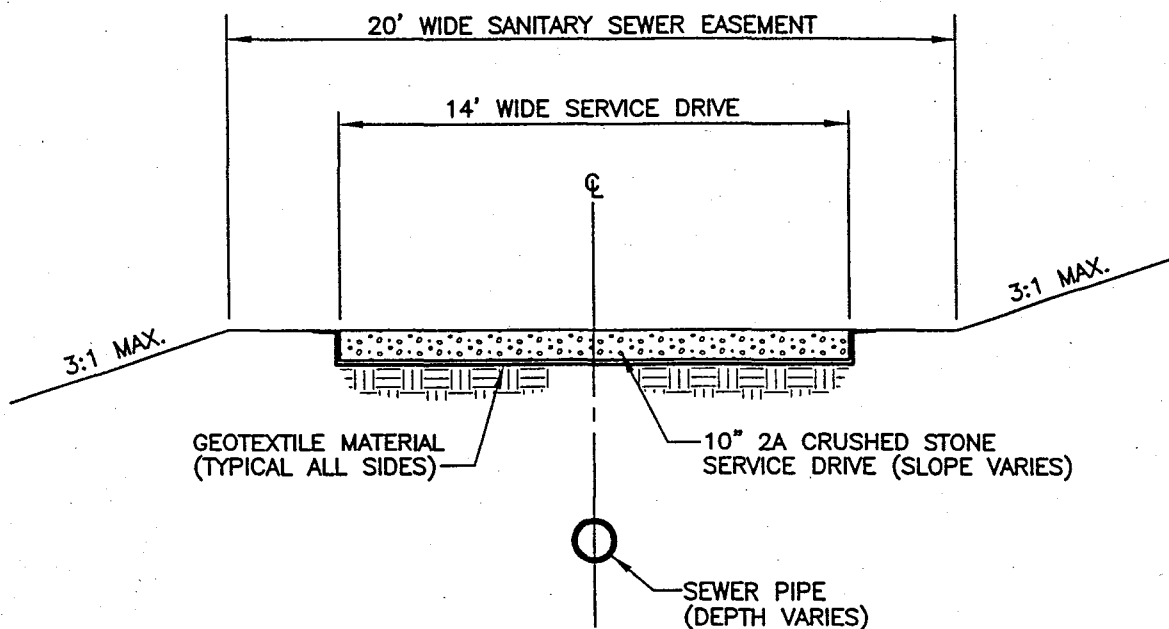
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**MANHOLE FRAME/COVER PROTECTION
DETAIL PRIOR TO FINAL PAVING**

DATE: MARCH 2001

DETAIL: 46



NOTE: PROVIDE SERVICE DRIVES IN AREAS WHERE SPECIFICALLY
REQUIRED BY LEOLA SEWER AUTHORITY (LSA).

Leola Sewer Authority
STANDARD DETAIL - SEWER SYSTEM

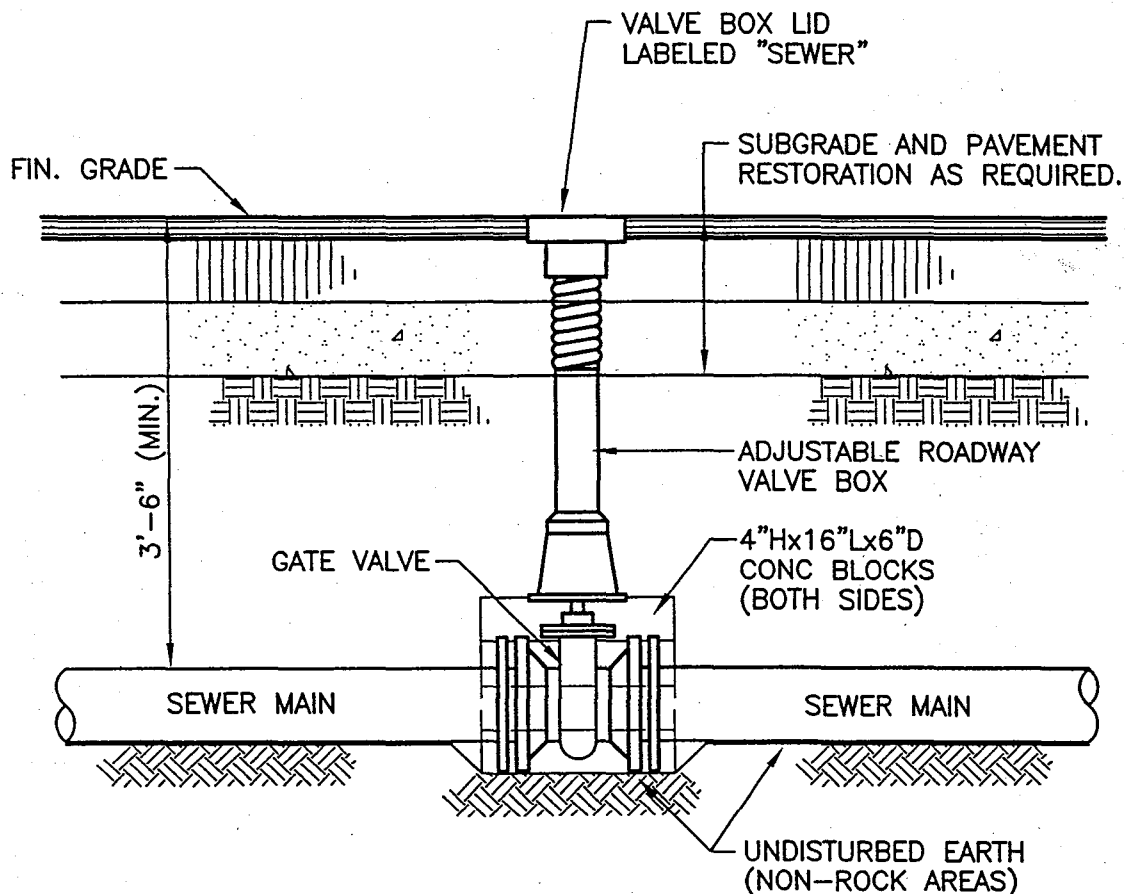
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SERVICE DRIVE DETAIL

DATE:
MARCH 2001

DETAIL:
47



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STANDARD DETAIL - SEWER SYSTEM

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STANDARD VALVE INSTALLATION

DATE:

MARCH 2001

DETAIL:

48