

CITY OF NORTH VERNON WASTEWATER CONSTRUCTION SPECIFICATIONS

Introduction

Unless modified, deleted, replaced or otherwise changed, the latest published edition of the following documents shall be the accepted standard for materials and/or procedures for the construction, modification, alteration, or expansion of North Vernon's sewer system:

1. IDEM Laws and Regulations.
2. Recommended Standards for Sewage Works (Ten State Standards).

If a conflict shall exist between reference sources, the most restrictive requirement shall prevail. The Wastewater Superintendent shall provide interpretation, as requested.

Property owners, at their cost, are responsible for the maintenance and repair of the sewer lateral from their building sewer to the right-of-way or utility easement line. The City is responsible for the maintenance and repair of the sewer lateral from the right-of-way or easement line to the public sewer main including the sewer lateral fitting which connects the sewer lateral to the public sewer main.

All work performed within a public right-of-way or an utility easement shall be performed by a plumber licensed in the State of Indiana, a contractor under the direct supervision of the Wastewater Department or an employee of the Wastewater Department. All work performed on a sewer lateral from a building to the right-of-way or utility easement line shall be performed by a plumber licensed in the State of Indiana except as herein stated. The owner of an owner occupied residence may perform work on the owner's sewer lateral outside of the public right-of-way or easement.

Anytime work is performed on a sewer lateral, a Sewer Permit is required for the purpose of documenting the work performed on the sewer lateral.

Plan approval by the City of North Vernon does not imply nor assure approval by IDEM. Plans are approved subject to the conditions of compliance with all applicable laws, rules, regulations and standards. The proposed project may be constructed only in accordance with the approved plans. There may be no deviation from the approved plans without the written approval of the City. Approval of the plans does not constitute an assurance that the proposed project will operate in compliance with all IDEM regulations.

Plans shall be submitted to IDEM for approval. The cost of submitting plans to IDEM and review by IDEM shall be paid by the Contractor. Construction shall not begin until such plans are approved by IDEM.

Due to Federal, State and City ordinances, all sewers connecting to the City of North Vernon's public sewer system shall comply with City of North Vernon standards.

Determination of the Amount of Sewage

Average Flows

The average flow of sanitary sewer shall be computed on the basis of 100 gallons per capita. The estimated flows listed are to be used only for the design of sewers and lift stations, and should not be used in the design of treatment plants.

<u>WASTEWATER SOURCE</u>	<u>ESTIMATED SEWAGE FLOW</u> (gallons per day)
Apartments	
One bedroom	200
Two bedrooms	300
Three bedrooms	350
Assembly Halls	
Per seat	2
Bowling Alleys (no food service)	
Per lane	75
Churches	
Small-per sanctuary seat	3-5
Large with kitchen-per sanctuary seat	5-7
Dance Halls	
Per person at maximum capacity	2
Factories	
No showers-per employee	20
With showers-per employee	35
Family Dwelling	
Per person	100

WASTEWATER SOURCEESTIMATED SEWAGE FLOW
(gallons per day)

Single Family	400
Food Service Operations	
Ordinary restaurant (not 24 hours) per seat	35
24 hour restaurant-per seat	50
Banquet rooms-per seat	5
Restaurant along freeway-per seat	70
Tavern (very little food service)-per seat	35
Curb service (drive-in)-per car space	50
Hospitals	
No resident personnel-per bed	200
Laundries	
Coin operated-per machine (standard size)	400
Motels	
Per Unit	100
Nursing and Rest Homes	
Per patient	100
Office Buildings (exclusive of cafeteria or Office) per employee per shift	20
Add for cafeteria (.5 per sq. ft.)	5
Playgrounds and Daytime Parks	
With toilet facility-per person	5
Schools	
Elementary (not including showers or Cafeteria-per pupil)	15
High and Junior High (not including Showers or cafeteria) per pupil	20
Add for showers-per pupil	5
Service Stations	
Per rest room	400

WASTEWATER SOURCEESTIMATED SEWAGE FLOW

(gallons per day)

Shopping Centers (without food service or
Laundries)-per area of floor space

0.2/sq.ft.

Swimming Pool (average with hot shower)
Per swimmer

10

Theaters

Movie-per seat

5

Trailer Parks (mobile home parks)
Per trailer space

300

Peak Flows

Sanitary sewers shall be designed on a peak flow basis using a peak factor of four (4) times the total calculated average daily wastewater flow for lateral sewers, and a peak factor of 2.5 for sub-mains and trunk sewers. Pumps and force mains should be designed to carry the peak flow of all the sewers that discharge into the lift station. The peak flow for area which do not have a 24-hour run-off period shall be calculated as follows:

$$\begin{array}{rcl} \text{Peak} & \times & (\text{Calculated Wastewater Flow} \times 24 \text{ hours}) \\ \text{Factor} & & \text{Run-off period (In Hours)} \\ & = & \text{_____ gpd} \end{array}$$

Peak Factor = 4.0 for Sewer mains

Peak Factor = 2.5 for Trunk Sewers

ENTITYRUN-OFF PERIOD

Municipality	24 hours
Factories	Length of Shift
Subdivisions (over 250 homes)	24 hours
Subdivisions (under 250 homes)	16 hours
Hospitals	12 – 24 hours
Schools	8 hours
Restaurants	16 hours
Mobile Home Parks	12 hours
Motels	4 hours

(Use of other run-off periods must be documented.)

Infiltration

An allowance of 15% of the daily peak sanitary flows shall be added to the above peak sanitary flows to establish daily infiltration levels to the treatment plant's drainage basin.

DETAILS OF DESIGN AND CONSTRUCTION

Minimum Size

All public sanitary sewers conveying raw sewage shall be at least eight (8) inches in diameter.

Depth

Sewers shall be deep enough to prevent freezing and to receive sewage from basements and cellars.

Location

Public sewer mains shall be installed in public right-of-way or upon approval, in public utility easement. A sewer maintenance area shall be provided by the formula:

$$(2.5 \times \text{depth of sewer line}) + \text{ten (10) feet}$$

This sewer maintenance area shall be no less than twenty (20) feet and shall be totally within the public right-of-way or public utility easement. It shall be evenly divided on both sides of the sewer line.

Flow Velocity

All sanitary sewers shall be designed to give a mean velocity of at least 2.0 feet per second, when flowing full; this is based on Manning's formula using an "n" factor of 0.013 in design. Use of other "n" values will be considered if shown justifiable on the basis of extensive field data. When velocities greater than fifteen (15) feet per second are expected, provisions should be made to protect against displacement and erosion of the pipe.

Minimum Allowable Slope

The minimum allowable slope shall be that which results in a velocity of at least two (2) feet per second when the sewer pipe flows at $\frac{3}{4}$ of full depth. Sewers 24 inches or less shall be laid with uniform slope and straight alignment between manholes. The line and grade alignment shall be checked with laser instrument whenever possible: use of batter boards is also acceptable.

<u>Sewer Size</u>	<u>Min. Slope to Obtain 2.0 FPS Velocity (ft./100 ft.) (n-0.013)</u>	<u>Approx. Capacity Minimum Slope (GPD)</u>	<u>Approx. Capacity Minimum Slope (CFS)</u>
8"	0.40	520,000	0.80
10"	0.28	750,000	1.16
12"	0.22	1,100,000	1.70
15"	0.15	1,680,000	2.60
18"	0.12	2,330,000	3.60

Steep Slopes

If plans are submitted for approval with a slope less than the minimum, the consulting engineer must show justification for the recommendation.

Sewers on 15% slope or greater shall be anchored with concrete anchors spaced as follows:

- a. Not over 36 feet center to center on grades 20% to 35%.
- b. Not over 24 feet center to center on grades 35% to 50%.
- c. Not over 16 feet center to center on grades 50% and over.

Changes in Pipe Size

When a smaller sewer discharges into a larger one, the invert of the larger sewer must be lowered sufficiently to maintain the same energy gradient. An approximate method to accomplish this is to place the 0.8 depth point of both sewers at the same elevation.

When a larger sewer discharges into a smaller one, the invert of the smaller sewer should not be raised to maintain the same energy gradient.

CONNECTIONS

Roof drains, foundation drains and all other clean water connections to the sanitary sewer system are prohibited. The following shall appear on sanitary sewer plans and construction plans submitted to the City and IDEM for review:

"No buildings shall be connected to a sewer lateral until the building is under roof. Roof drains, foundation drains, foundation sump pumps and all other clean water Connections are prohibited to the sanitary sewer system."

Protection of Water Supplies

There shall be no physical connection between a public or private potable water system and a sewer, or its appurtenance, which would permit passage of any sewage into the potable supply.

Parallel Installation

Sanitary sewers and manholes shall be laid at least ten (10) feet horizontally from any existing or proposed water main. When local conditions prevent a separation of ten (10) feet, a sewer line may be laid closer than ten (10) feet to a water main if it is laid in a separate trench; if it is laid in the same trench, the water main must be located at one side on a bench of undisturbed earth. In either case, the elevation of the crown of the sewer must be at least eighteen (18) inches below the invert of the water main.

When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the water main should be constructed of mechanical-joint D.I. iron pipe. The sewer shall be constructed on mechanical-joint D.I. iron pipe and both services should be pressure tested to assure water tightness.

Crossings

Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least eighteen (18) inches below the bottom of the water main. When the elevation of the sewer cannot be buried to meet the above requirement, the water main shall be relocated to provide this separation or reconstructed with slip-on or mechanical-joint D.I. iron pipe which will withstand a 50 psi pressure test for a distance often (10) feet on each side of the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

LATERALS

Size

The size and slope of sewer laterals within the right-of-way or utility easement shall be subject to the approval of the City, but in no event shall the diameter be less than six (6) inches. Sewer lateral connections between the building sewer and the right-of-way or utility easement line may be four inch (4") for single family residential buildings. All other sewer laterals shall be at least six inches (6") in diameter.

Slope

The slope of the six (6) in. pipe shall be not less than one eighth inch (1/8" or 1%) per foot, and the general requirement shall be a slope of one quarter in. (1/4" or 2%) per lineal foot.

Location

No sewer lateral shall be laid parallel to within five (5) feet of any bearing wall which might thereby be weakened.

Depth

The minimum sewer lateral depth shall be as low as possible to afford protection from frost. Sewer lateral depth shall comply with the Uniform Plumbing Code.

Alignment

The sewer lateral shall be laid at uniform grade and in straight alignment. Changes in direction shall be made only with properly curved pipe and fittings.

Clean Outs

A 6" clean out shall be installed on the right-of-way or easement line. Clean outs of the sewer laterals shall be built at all horizontal or vertical changes of direction of sewer laterals and along straight segments of pipe, clean outs are required every 100 feet outside the right-of-way as measured from the right-of-way to the building. A pipe lateral shall be connected to the building clean out by a commercial fitting. Multiple building may be connected to a common service lateral, if the individual branches to units are connected outside the buildings (manifold-like). If a common service lateral is used to serve multiple building, it must connect to the public service main in a manhole and terminate in a manhole if over 150 feet in length.

All cleanouts shall have metallic caps/plugs for locating with detectors. The cap/plug shall not have a protruding operating nut but rather a recessed operating nut. Installation of cleanouts in traffic areas should be avoided, however, if such installation is required, materials shall be capable of bearing traffic vehicle weight. Cleanouts constructed of plastic material in paved areas are unacceptable.

Bedding

All sewer laterals shall be install on a six inch (6") bedding. The sewer lateral shall be bedded #8 or #11 stone. Initial backfill shall be to twelve inches (12") above the top of the sewer lateral using sand, pea gravel, grits or stone.

Backfill

Backfill material within street right-of-way shall be granular material compacted in place. Outside the right-of-way, the backfill may consist of excavated material.

Connections

Connections to the sanitary sewer main shall only be located at existing "Y" or "T" connections on the main. When none exists on the main, a commercially manufactured wye shall be installed and the main cut in a neat, even manner and the connection rendered watertight by means of a fernco or rubber connector. Also a rubber manufactured "y" saddle may be used. Opening in main must be big enough to allow lip on saddle to fit inside. Clear silicone shall be used between saddle and pipe for extra seal. Saddle of "Y" must be installed on main at 10:00 and 2:00 direction on pipe. The connection between the building sewer and sewer lateral shall be by a commercially available coupling or "donut".

Materials

Pipe and joint materials shall conform in all respects to the material requirements outlined in this Section.

The lateral connections shall be of premium joint construction and be of the same material as the street sewer in order to minimize infiltration at the connection between street main and house lateral. Extra strength ABS solid wall, plastic pipe may be used only upon approval of the Wastewater Superintendent. When joint material and/or dimensions are not compatible, a commercial adaptor shall be provided.

SEWER MAIN PIPE MATERIALS

ABS

ABS and PVC plastic truss pipe conforming to ASTM Material Specification ASTM D-2680 may be installed only upon approval of the Wastewater Superintendent. Said pipe should be subject to installation requirements and limitations as specified in ASTM D-2680-85a. All fittings shall be compatible with vitrified clay fittings.

PVC

PVC gravity sewer pipe conforming to ASTM Material Specification ASTM D-3034-SDR35 may be used. Said pipe shall be installed as specified by the manufacturer. Pipe seals shall meet ASTM D-3212 specification.

ABS or PVC pipe shall not be used in industrial areas unless approved in writing by the Wastewater Superintendent.

Class IV and V (as specified by ASTM) bedding shall not be used with the installation of PVC sewer pipe.

Other Type

Use of other type of pipe is prohibited unless approved by the Wastewater Superintendent. Should a developer desire to use other types of pipe, he/she must submit a written request to the City stating the type of pipe, proposed use, location, and manufacturer's technical information. The developer must receive written permission from the Wastewater Superintendent before proceeding with the pipe installation.

Joints

Sewer joints shall be premium joints and shall be designed to prevent infiltration and to prevent entrance of roots. In all jointing operations, the trench shall be dry before making pipe joints. All surfaces of the pipe to be jointed and all parts of the joint shall be clean and dry.

Vitrified Clay

Vitrified clay pipe shall not be used for any repairs or mains.

ABS

ABS composite pipe shall be chemically welded using a standard ABS coupling on the exterior of the joints. All joint mating surfaces shall be prepared for chemical welding by wiping cloth or rag to remove foreign material. MEK joint primer shall be applied to the interior of the coupling and exterior of the pipe spigot end; this shall be immediately followed by coating the same surface with ABS cement containing a minimum of 20% dissolved ABS. Primer and ABS cement shall be flowed on joint surfaces by brush or swab to provide liberal coating. Primer and ABS cement shall be applied on pipe spigot end sufficiently to extend slightly beyond end of coupling in its final position. Pipes shall be stabbed home without undue delay. All pipe spigots shall have a "home" mark to facilitate closure. Joints may be backfilled upon completion, inspection and approval by Department inspector.

Manholes

Manholes barrels and top sections shall conform to "Specifications for Precast Reinforced Concrete Manhole Sections" (ASTM C-748). Manholes shall be installed in accordance with City of North Vernon Standard Construction Drawings. In addition, all pre-cast reinforced concrete manholes shall include the sidewall rings and the base. The cone shall be the eccentric type. The joint between manhole sections shall be O-ring or equal approved by the Wastewater Superintendent. All manhole joints must be wrapped on outside with rubberized flexible seal with a width of at least 6" minimum. At points of pipe inlet, the precast base manhole shall contain a Wedge Lock or O-ring joint or approved equal, which is sufficiently flexible to prevent shear of the pipe due to differential settling. Grouted joints between sections and cast in place bases are not acceptable.

Manhole castings shall be made of cast iron, capable of supporting H-20 traffic loads. All lids shall be solid with no vent holes. Water tight manhole covers are to be used wherever the manhole covers may be flooded by street run-off or high water or as required by the Wastewater Superintendent. Watertight castings shall be R-1772-B or approved equal. Steps inside the manhole shall be polypropylene encapsulated steel spaced a maximum of twelve (12) inches apart and comply with OSHA standards for manhole steps. The standard base shall be precast by the manufacturer.

Manholes shall be installed at the end of each sewer line and/or service lateral having a length greater than 150 feet at all changes in grade, size, alignment, and at all pipe intersections. Manholes shall also be installed at distances not greater than 400 feet for sewers. Locating manholes in sidewalks shall be avoided wherever possible.

Drop inlets shall be avoided wherever possible. Where they are required, a drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Drop manholes shall be constructed with an outside drop connection. Inside drops shall only be used when tying into any existing sewer main and upon approval of the Wastewater Superintendent. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert should be filleted to prevent solids deposition. Wherever possible, the height of manhole sections shall be selected in order to allow the manhole casting to be set directly in the top cone at the required elevation rather than using brick to raise the casting. In areas where manholes are located in streets, the casting and cover shall be installed at the same grade as the street by use of an adjustable casting extension or other approved method.

The minimum diameter of manholes shall be 48 inches; larger diameters are preferable. A minimum access opening of twenty-two (22) inches shall be provided.

The flow channel through manholes should be made to conform in shape, slope, and smoothness to that of the sewers.

The base of the manhole shall have openings for the sewer pipe cast to the alignment and elevations as part of the base openings, so as to form a watertight connection. The channel and bench shall be integrally cast or formed as part of the manhole base. The manhole base shall be set on a six inch (6") granular base with a four foot (4') minimum depth. The granular material shall be the same as required for pipe bedding as specified elsewhere in these regulations. Cast in place bases shall be used at locations where a manhole is constructed around an existing main. At all other locations, pre-cast bases shall be used. Other types of manholes, cones, castings, steps, and bases may be used only after permission has been granted in writing by the City.

Final grade adjustment of manhole casting shall be made by brick or other approved method. No material which will decay, such as wood, shall be used as manhole casting adjustment. The height of adjustment by brick or other acceptable means shall not exceed the minimum height of a precast riser collar section available for increasing the height of the manhole.

PIPE INSTALLATION

Sanitary sewer pipe shall be installed in accordance with ASTM C-12-72.

Trench Excavation

Open no more trench in advance of pipe laying than is necessary to expedite the work. Excavate trenches to a width that will provide adequate working space, but not more than the maximum design width. Do not undercut trench wall. Excavate trenches below the pipe invert a sufficient distance to provide space for the pipe bedding. Carry trenches in ledge rock, compact rocky, or gravelly soil, or other unyielding materials below the bottom of the pipe at least one-fourth (1/4) of the outside diameter of the pipe or four (4) inches, whichever is greater. Refill the space beneath the pipe with bedding material as specified for first class bedding.

Excavate pipe bell holes at each joint to provide full-length barrel support of the pipe and to prevent point loading at the bells or couplings.

All trench construction work shall comply with OSHA and applicable safety laws and regulations. In all cases over five feet (5') in depth, trenches must be braced, or an acceptable cage inserted, or the ditch must be laid back to the angle of repose to protect the people working in the excavation. In existing street rights of way, permission must be obtained from the Wastewater Superintendent to lay back the slopes in a public right-of-way.

Handling Pipe

Protect pipe during handling against impact shocks and free fall. Do not permit hooks to come in contact with premolded joint surfaces. Handle pipe having premolded joint rings or attached couplings so that no weight, including the weight of the pipe itself, will bear on or be supported by the jointing material. Take care to avoid dragging the spigot ring on tile ground or allowing it to be damaged by contact with gravel, crushed stone, or other hard objects. After delivery alongside the trench, carefully examine each piece of pipe for roundness and specification compliance. Acceptable pipe may be marked with paint or other permanent marking material, so that the marks are plainly visible after installation in the trench and before the pipe is covered.

Laying Pipe and Pipe Bedding

Standard pipe bedding shall be first class bedding. The pipe shall be bedded in crushed stone or rounded gravel-bedding material placed on the trench bottom. The bedding material shall have 95% passing a 3/4 inch sieve and 95% retained in a No. 4 sieve. The bedding shall have a minimum thickness beneath the pipe of six inches (6") or one fourth (1/4) of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. Initial backfill from pipe horizontal centerline to a level not less than twelve inches (12") above the top of the pipe shall be of the bedding material. Hand placed backfill shall be finely divided materials free from debris, organic material and stones.

Carefully prepare bedding so that the pipe, after installation, will be true to line and grade. Surface grade will material or trench subgrade beneath the pipe to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. Density fill material beneath the pipe. After each pipe has been brought to grade, aligned, and placed in final position, deposit and density sufficient bedding material under the haunches and on each side of the pipe to hold the pipe in proper position during subsequent pipe jointing, bedding and backfilling operations. Deposit bedding material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

Place pipe that is to be bedded in a concrete cradle or encased in concrete in proper position on temporary supports consisting of preshaped wood blocks or bricks with wood edges. When necessary, rigidly anchor or weight the pipe to prevent floatation when the concrete is placed.

Place concrete for cradles, arches, or encasement uniformly on each side of the pipe and deposit at approximately its final position. Do not move concrete more than five feet (5 ft) from its point of deposit. Concrete placed beneath the pipe shall be sufficiently workable so that the entire space beneath the pipe can be filled without excessive vibration.

Grade stakes shall be required prior to laying any pipe. Line and grade shall be controlled by either laser alignment or batter boards.

Clean joint contact surfaces immediately prior to jointing. Use lubricants, primers, or adhesives as recommended by the pipe or joint manufacturer. Unless otherwise required, lay all pipes straight between changes in alignment and at uniform grade between changes in grade. Excavate bell holes for each pipe joint. When jointed in the trench, the pipe shall form a true and smooth line. Keep trenches dry during pipe laying. Divert surface water from the trench area to the greatest extent practicable without causing damage to the adjacent property. Before pipe laying is started, remove all water that may have entered the trench. Whenever practicable, start pipe laying at the lowest point and install the pipe so that the spigot ends point in the direction of flow.

Backfilling Trenches

Unless other protection work is directed, back fill trenches immediately after the pipe is laid. In the case of concrete cradle bedding, delay backfilling until the concrete has set sufficiently to support the back fill load. Except for unusual circumstances (such as subaqueous installation), permit no water to rise in unbackfilled trenches after the pipe is in place. Backfill material to be placed above pipe bedding shall be free of brush, debris, and junk. Unless specifically authorized, place no rock or rock excavation or detritus in the upper eighteen (18) inches of the trench. Place no rock or stones having a dimension larger than six (6) inches within three (3) feet of the top of the pipe. Large stones may be placed in the remainder of the trench backfill only if well separated and arranged so that no interference with backfill settlement will result.

Backfill shall be installed in six inch (6") compacted lifts. Use puddling, jetting, or water flooding for consolidating backfill material only when approved by the Wastewater Superintendent. Particularly prone to water damage are sewers laid in heavy clay soils or during cold winter months. Water flooding or jetting in porous sand or gravel during warm periods may be recommended. In general, limit the addition of water during backfill to provide optimum moisture content for tamping procedures.

All backfill for sanitary sewers or force mains in roadway areas or that will be under curbs, or within five (5) feet of pavement or curb, shall be made with approved granular material. In all other areas, the backfill material may consist of on-site material but the pipe must be covered with tamped bedding material to a depth of one (1) foot over the highest point of the pipe.

Concrete Encasement

In areas requiring concrete encasement, ductile iron Class 50 shall be used unless waived by the Wastewater Superintendent. Concrete encasement is required where sanitary sewers cross under streams, drainage swales, points of heavy loading, or at other locations directed by the City.

Concrete encasement shall completely surround the pipe and shall have a minimum thickness at any point of one fourth ($1/4$) of the outside diameter of the pipe or four (4) inches, whichever is greater. In addition, four (4) reinforcing bars of a size selected by the Wastewater Superintendent shall be evenly spaced around the pipe and have a length equal to the length of the encasement.

Concrete encasement provides additional field supporting strength. Wherever the strength of the pipe is not sufficient to support the external loads, the encasement should be designed to provide the necessary additional strength.

Testing Requirements

All testing shall be witness by a representative of the Wastewater Department. All tests shall be documented in writing as to the test method, date of test and results of the test. Written documentation on the tests shall be submitted to the Wastewater Superintendent.

The intent of these specifications is to secure a sanitary sewer system to prevent infiltration. Towards this end, all sewer pipes and manholes shall be inspected for leakage.

Sewer pipe joints shall be tight and all visible leakage shall be repaired in a manner approved by the City.

The leakage outward or inward (exfiltration or infiltration) shall not exceed 200 gallons per inch of pipe diameter per mile per day for any section of the system. An exfiltration or infiltration test may be performed with a minimum positive head of 2 feet. All sanitary sewer mains shall be air tested. The air test shall, as a minimum, conform to the test procedure described in ASTM C-828-76T.

All air tests must be done in the presence of the City's Construction Inspector who will determine if the tested pipe span is acceptable. Air testing is done after backfilling. The air test is conducted between two consecutive manholes. All pipe outlets must be plugged in the section being tested using suitable test plugs. One of these plugs must be tapped and used for filling the test section with compressed air. Air shall be slowly supplied until the internal pressure of the test section reaches five (5) psi. In no case shall air pressure exceed nine (9) psi.

At the time of the test, each manhole shall be inspected by the City Inspector to determine possible leaks. All manhole shall be vacuum tested in the presence of the Wastewater Superintendent (or his representative) at the Contractor's cost. Manhole testing shall be performed by the following method:

1. All incoming and out going sewer lines shall be plugged.
2. Vacuum manhole tester will be inserted into manhole.
3. After vacuum and pressure has been started, set vacuum at 10" hg.
4. Check vacuum by chart, if vacuum drops less than 1", manhole is acceptable and passes.

All manholes which fail the test shall be repaired or replaced and retested at the Contractor's cost.

All sewer lines shall be tested with a "go-no go" mandrel for deflection 30 or more days after the sewer line trench has been backfilled to finish grade. The diameter of the "go-no go" mandrel shall be 95% of the undeflected inside diameter of the pipe and have 9 sides. Deflection of the PVC sewer pipe diameter shall not exceed 5%. The PVC pipe shall be tested with a "go-no go" mandrel pulled by hand. No mechanical pulling device shall be used. Pipe failing the deflection test shall be replaced.

OTHER REQUIREMENTS

Sewers must be straight between manholes and may be tested for straightness by flashing a light between manholes.

Building Permits for structures in a new development shall not be issued until the sewers serving the structure have been tested and passed. This prevents the unauthorized connection of a structure to a sewer thus preventing a test. Model homes, for sales display only and not for immediate occupancy, may be built prior to construction of the sanitary sewers. These houses shall not be connected to the sanitary sewer system and will not have occupancy permits issued until the sanitary sewers are tested and accepted by the City.

SANITARY SEWER PUMP STATION & FORCE MAIN

Sanitary sewer pump stations shall be designed in accordance with the latest edition of the Recommended Standards for Sewage Works. Unless waived by the Department, pump stations are to be submersible type, design for meeting the peak hourly flow with the largest pump out of service, and shall meet the guidelines presented herein.

Sanitary sewer force mains shall be designed so that the minimum velocity of 2.0 feet per second (fps) is developed when the sewage pumps are operating at the pump's total dynamic head design. There shall be at least a minimum of 30 inches cover over the top of the sanitary sewer force main pipe.

Ductile iron pipe, fittings and joints used for the construction of sanitary sewer force mains shall be 250 psi Class pipe. All fittings shall be mechanical joint.

Polyvinyl Chloride pipe, fittings and joints used for the construction of sanitary sewer force mains shall be designed for operating at 200% of the expected design pressure. PVC force mains are required to be SDR21, ASTM D-2241. All fittings shall be mechanical joints. Glued fittings are not acceptable.

Upon completion of the construction of sanitary sewer force mains but prior to FINAL INSPECTION, all sanitary sewer force mains and appurtenances shall be tested for leaks as specified herein. The Department shall be notified at least 24 hours in advance of the scheduled test time and, at its own discretion, have an inspector present during the performance of the test.

Pipelines shall be tested before backfilling at joints except where otherwise required by safety, necessity, local ordinance, or public convenience.

Where practicable, pipelines shall be tested between line valves or plugs in lengths of not more than 1,500 feet.

Sanitary sewer force mains shall be hydrostaticly tested at 100 pounds per square inch (PSI) or 50 PSI over the total static head pressure, which ever is greater. The CONTRACTOR shall furnish a recording pressure gauge which shall be used for the continuous measurement and recording of test pressures and test time.

Loss of water pressure during the test shall not exceed 10 PSI in a 24 hour time period or 2 PSI in a four (4) hour time period. Duration of test shall be not less than four (4) hours.

Where leaks are visible at exposed joints and/or evident on the surface where joints are covered, the joints shall be recaulked, repoured, bolts retightened or relaid, and leakage minimized, regardless of total pressure drop shown by the test.

All pipe, fittings and other materials found to be defective during the test shall be removed and replaced at the CONTRACTOR's expense.

Lines which fail to meet tests shall be repaired and retested as necessary until test performance requirements are met.

All sanitary sewer force mains must connect to manholes at the flow channel elevation. The ENGINEER shall show the method of connecting force mains to manholes in the plan's details.

Concrete thrust blocks shall be provided at all bends on the sanitary sewer force main. Concrete cradle, anchors or encasement of force mains and fittings shall be placed where shown on the plans. Concrete shall be 3,000 PSI and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints.

Force mains constructed under creeks or drainage waterways shall be constructed of ductile iron pipe to a point at least ten feet (10') beyond the edge of the creek or drainage ways and shall be encased in concrete.

In places where concrete will be poured at a mechanical joint fitting, polyethylene (plastic) sheet having a minimum thickness of 3 mil, shall be wrapped around the fitting to prevent the concrete from coming in contact with the fitting's bolts and nuts.

Individual Homeowner Lift Stations

If an individual homeowner or commercial building cannot connect to the sewer by gravity then it is their responsibility to install a pump station from their building to the Cities sewer main.

It will be the homeowner's responsibility to cover all costs associated with the pump station including installation, operation, and maintenance.

Pump station must be a complete one piece unit consisting of grinder pump, valves, float and alarm system and all other appurtenances needed for operation and installed in ground. All connections must be watertight. If discharge is to be connected to an existing force main, pump must be sized to overcome force main pressure. When connecting to the force main a 2-inch tap must be made at a side angle with a corporation stop. A combination valve and check valve unit must be installed at right of way. Unit must be of EONE or equal. All piping must be hdpe or equal and rated at 150 psi minimum. Discharge from pump must be at least 1 and 1/2 inch discharge.

Seeding

All lawn and grass areas damaged by construction shall be final with six inches (6") of good topsoil. The area shall be fertilized and seeded with grass of the same type or mixture as the existing lawn. After seeding, the area shall be covered with straw and mulch to prevent erosion. Seeding shall be applied at the rate of 10 lbs per 1,000 sq.ft. Fertilizer shall be 12-12-12 and applied at the rate of 5 lbs per 1,000 sq.ft.

RECORD DRAWINGS

At the completion of construction, the contractor shall supply the City with one (1) set of reproducible red line record drawings to document any and all deviations from the APPROVED plans. These plans must be clearly marked "RECORD DRAWINGS" on every sheet with all sewer service lateral locations, manhole rims, manhole inverts and line distances verified by a post- construction survey made at the contractor's expense. Both plan and profile of the sewer lines shall be verified and documented on the RECORD DRAWINGS.

RECORD DRAWINGS shall be prepared, signed and sealed by a licensed surveyor or registered professional engineer.

Table A
Wastewater System Capacity Fee Schedule

REU is equal to 400 gallons per day or 4 persons	Amount \$600.00
<i>Type of Establishment</i>	Flow, gpd
Agricultural Labor Camp per occupant	50
Airport	
Per passenger	3
Per Employee	20
Apartment/Duplex	
One-bedroom	200
Two-bedroom	300
Three-bedroom	350
Assembly Hall per seat	2
Bar	
With food service per seat	70
Without food service per seat	35
Barber Shops & Beauty Salon per chain	150
Bowling Alley	
With bar and/or food service per lane	125
Without food service per lane	75
Bus Station per passenger	3
Campground	
Organizational	
With flush toilets per camper	40
Without flush toilets per camper	20
Recreational	
With individual sewer connection per campsite	100
Without individual sewer connection per campsite	50
Church	
With kitchen per sanctuary seat	5
Without kitchen per sanctuary seat	3
Condominiums	
One-bedroom	200
Two-bedrooms	300
Three-bedrooms	350
Correctional Facilities per inmate	120
Day Care Centers per person	20
Dentist	
Per chair	750
Per employee	75
Factory (Industry) No Process Water	
With showers per employee	35
Without showers per employee	20
Food Service Operations	
Cocktail Lounge per seat	35
Restaurant (not 24 hour) per seat	35
Restaurant (24 hour) per seat	50
Restaurant (24 hour) per seat along Interstate	70
Curb Service (drive-in) per car space	50

Type of Establishment**Flow, gpd**

Hospital per bed	200
Hotels and Motels per room	100
Kennels per animal enclosure	20
Laundries per washing machine	400
Mental Health Facilities per patient	100
Mobile Home Park per space	200
Nursing Home per bed	100
Office Building per sq. ft.	0.5
Outpatient Surgical Center per patient	50
Picnic Area per visitor	5
Schools per student	
Elementary	15
Middle	20
Secondary	25
Service Stations per restroom	400
Shopping Center	
Per sq. ft.	0.2
Per employee	
Swimming Pool per swimmer	10
Theater	
Drive In per car space	5
Inside per seat	5
Manufacturing/Industrial Facilities	**
Unique Facilities	**

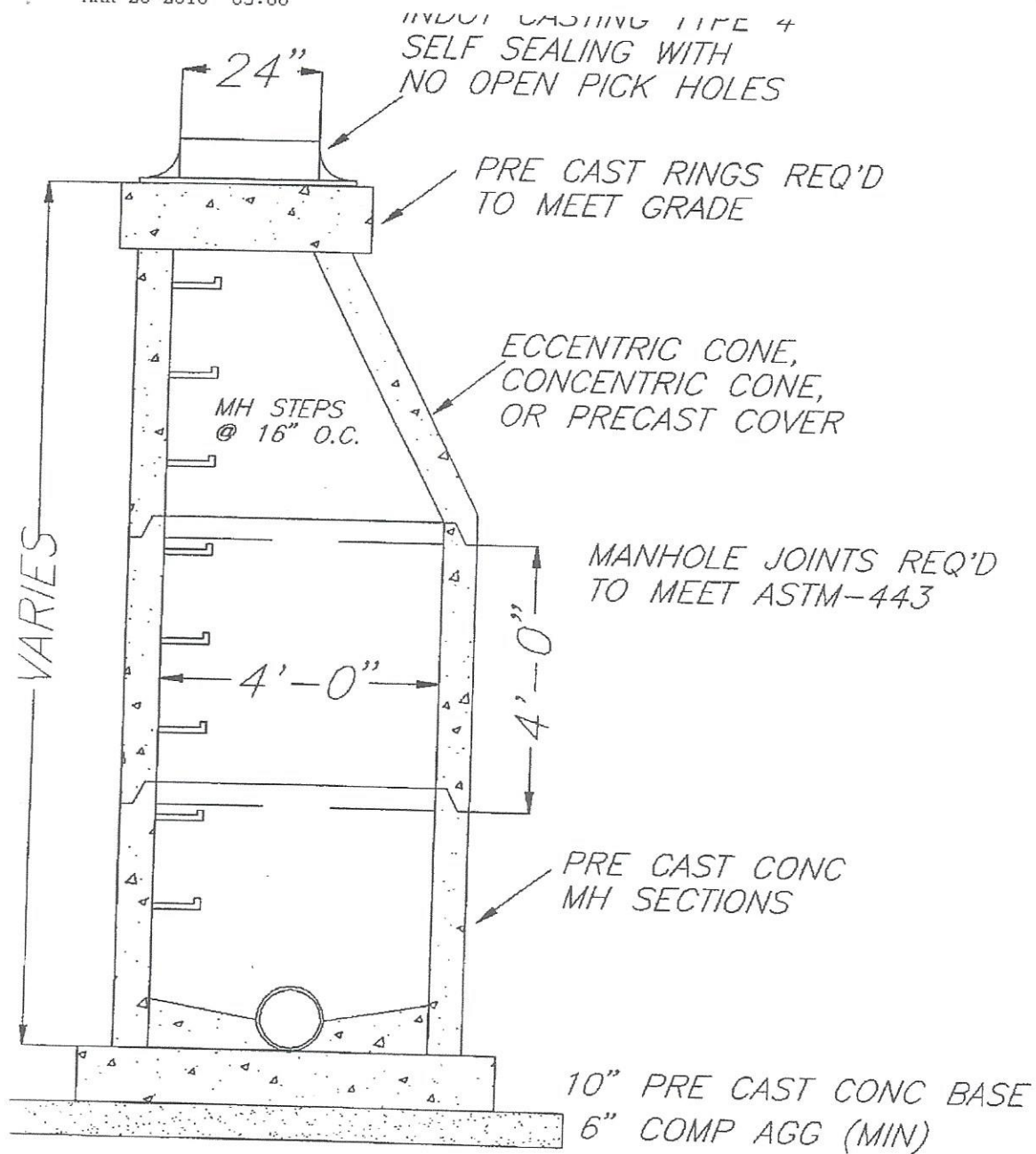
** Based on with the Hydraulic or Mass Loading, whichever is greater, as follows:

BOD Loading – 0.17 lb. BOD per person per day
Solids Loading – 0.20 lb. TSS per person per day
Ammonia-N Loading - .01 lb. NH₃ – H per person per day
COD Loading – 0.41 lb. COD per person per day

Calculation of Capacity

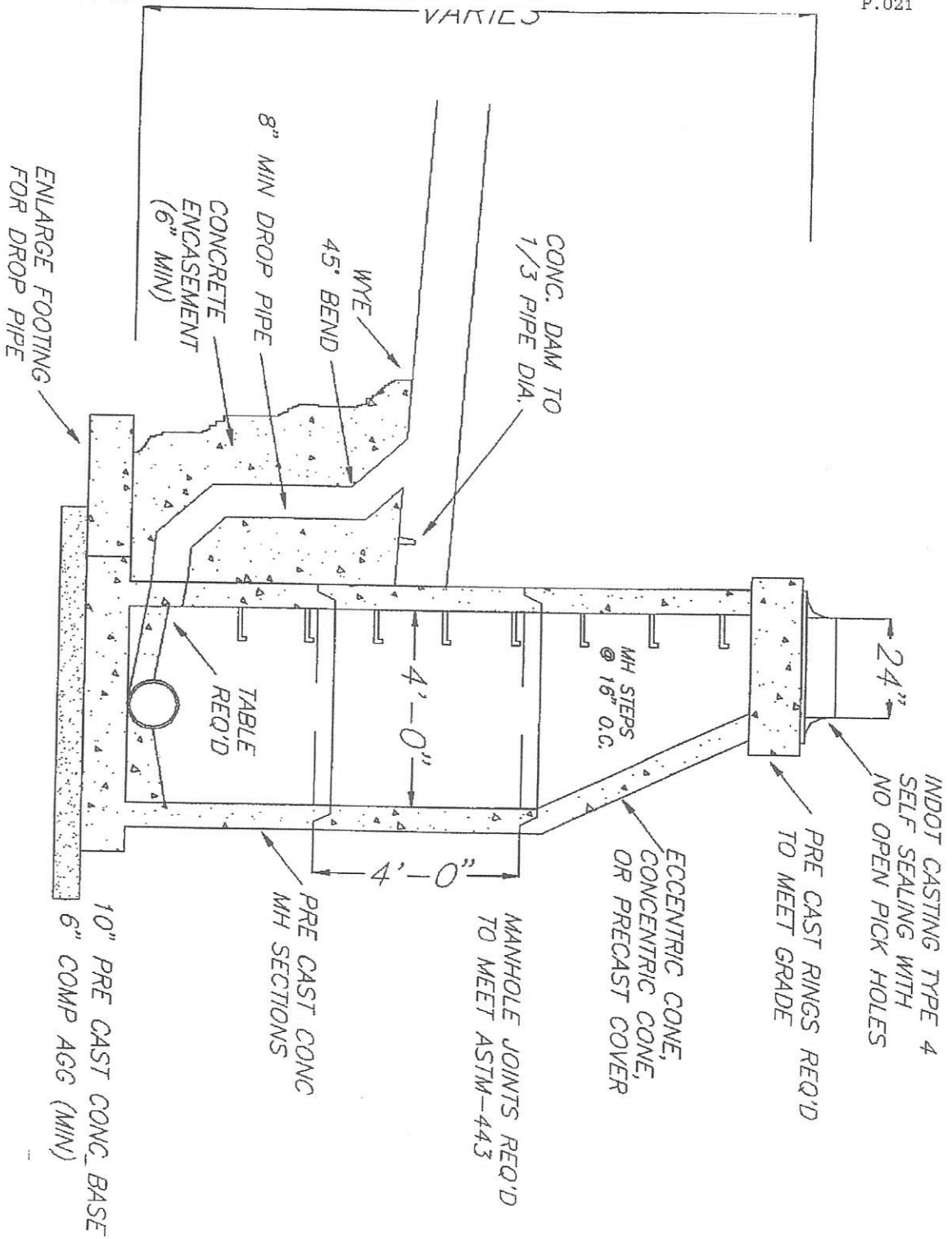
Total flow from the facility based on the above expected volume from
Each type of establishment divided by 400 gpd (REU) = number of REU's
Number of REU's times \$600.00 = Capacity Fee

Example: 100 space Mobile Home Park
From above 1 space = 200 gpd
200 gpd times 100 spaces = 20,000 gpd
20,000 gpd divided by 400gpd/REU = 50 REU's
50 REU's times \$600/REU = \$30,000 Capacity Fee

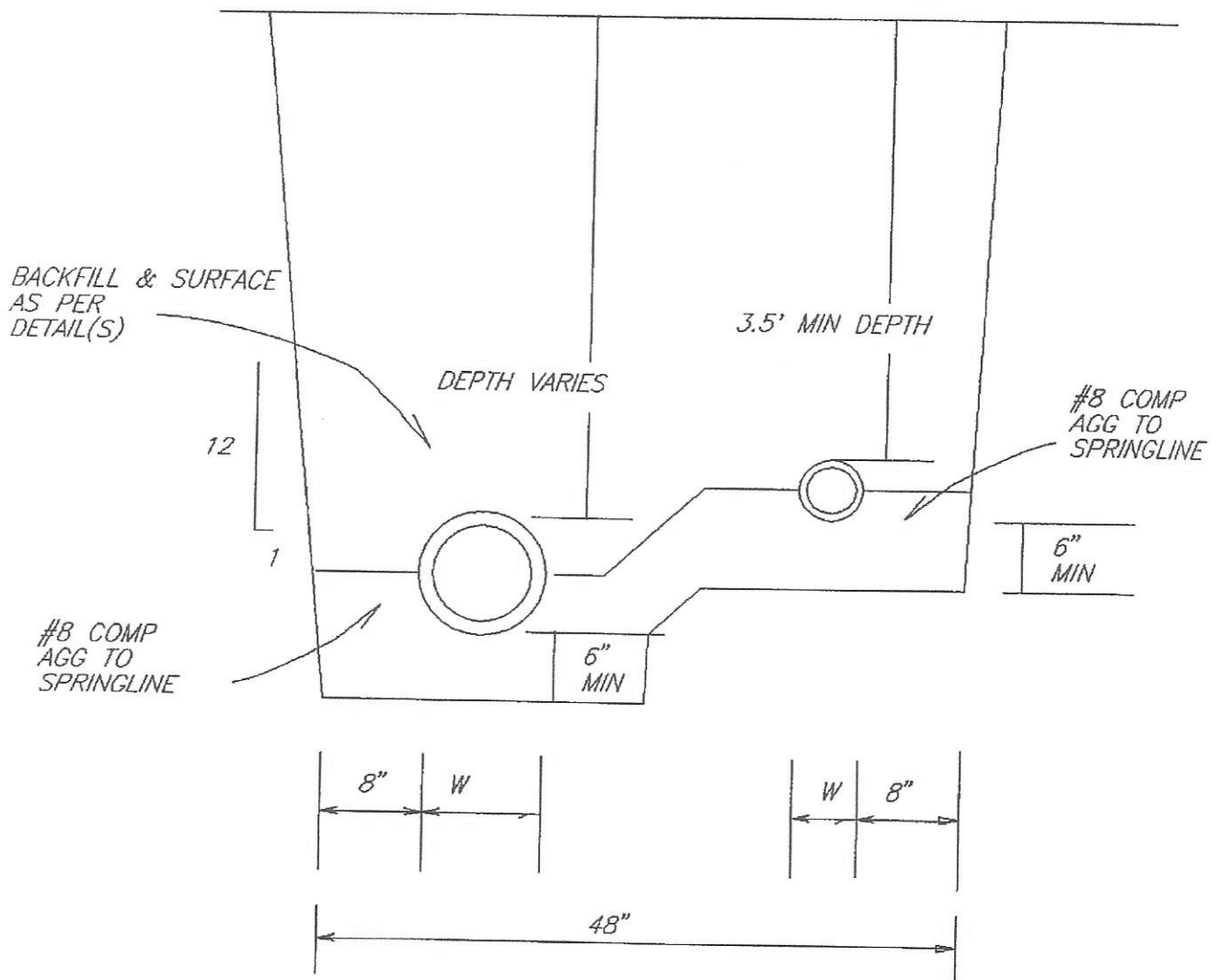


SANITARY MANHOLE C-4

N.T.S.

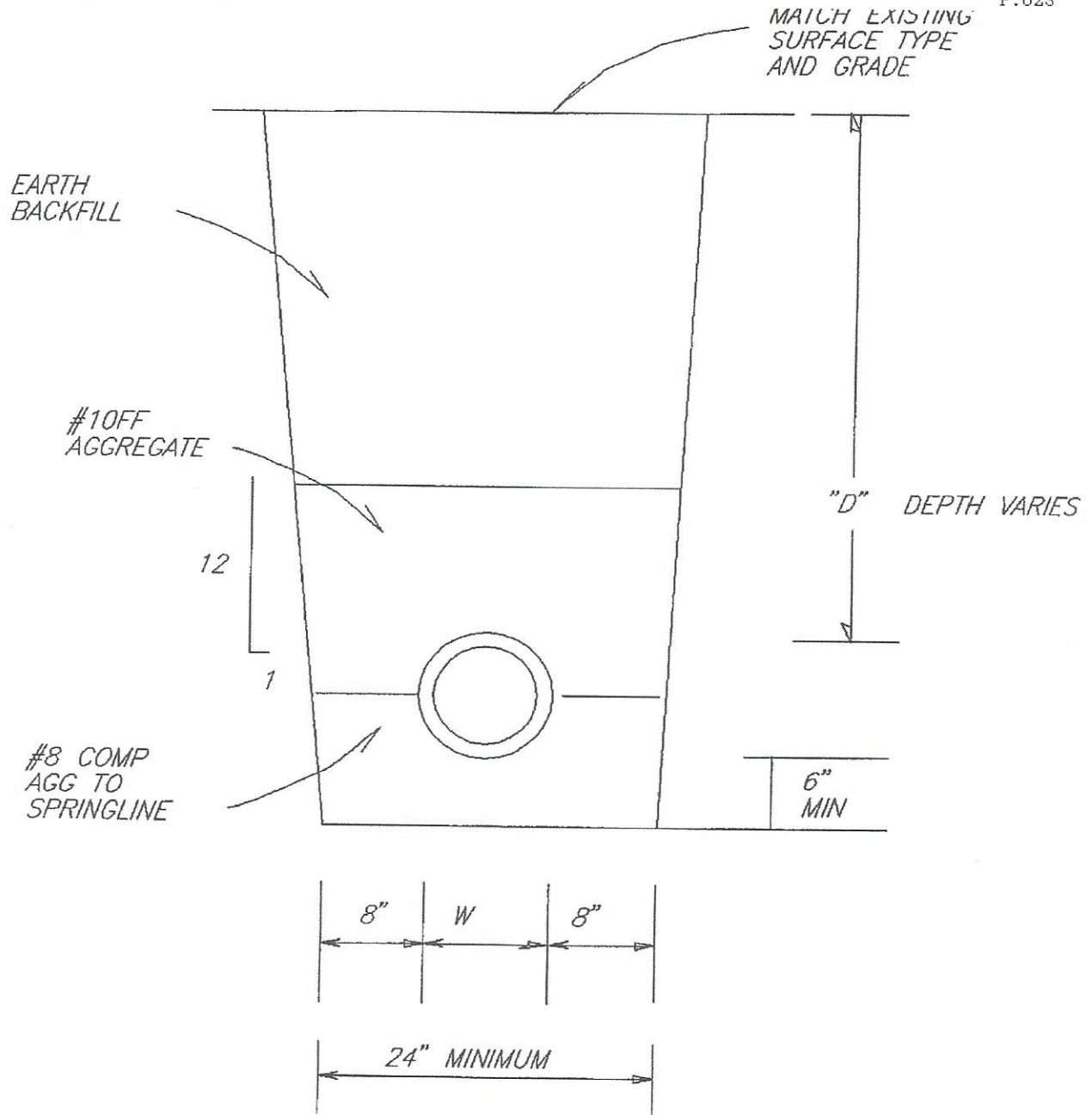


DROP MANHOLE DETAIL



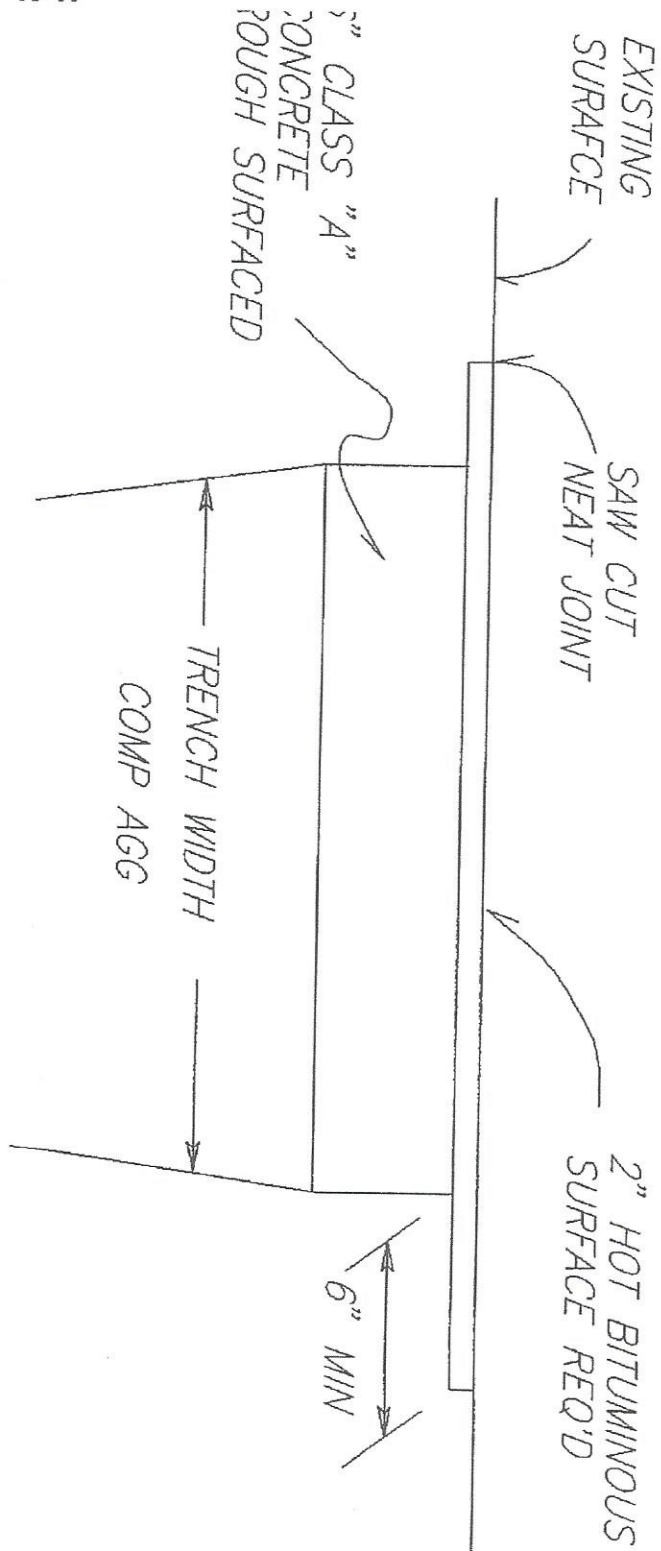
COMBINED GRAVITY & FORCE MAIN TRENCH DETAIL

N.T.S.



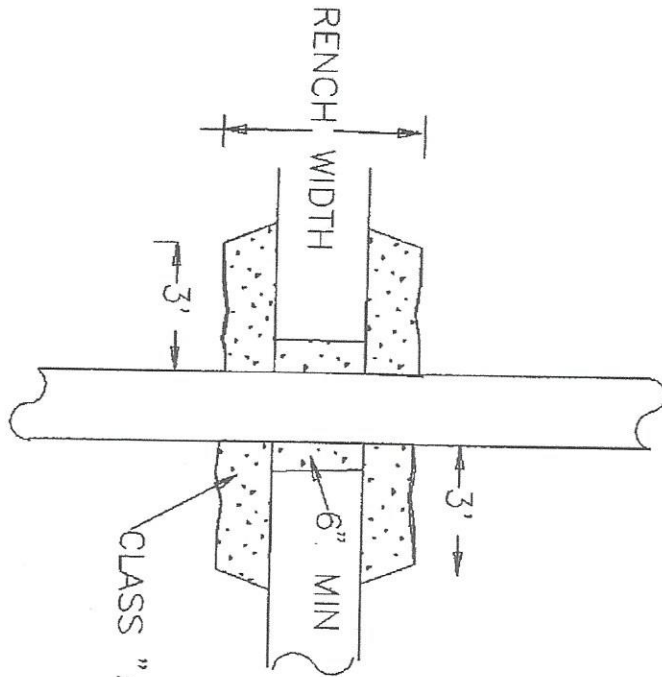
STANDARD TRENCH DETAIL (SEWER)

N.T.S.

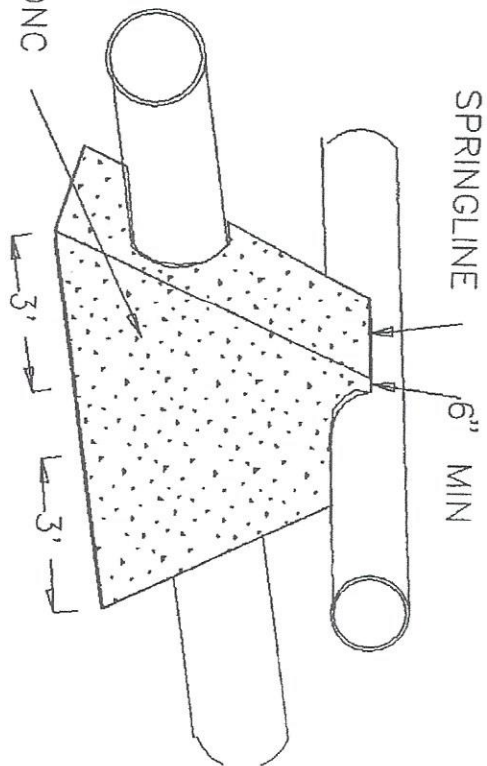


PAVEMENT PATCH DETAIL

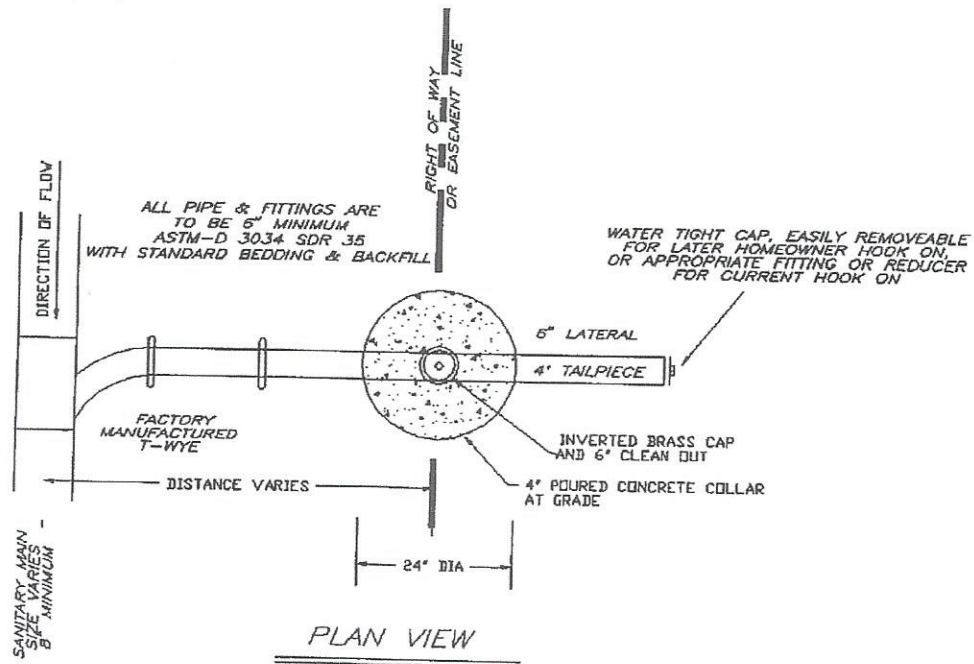
N.T.S.



WHERE 12" VERTICAL SEPARATION CANNOT BE MAINTAINED
THE FOLLOWING CONCRETE ENCASEMENT SHALL BE PLACED

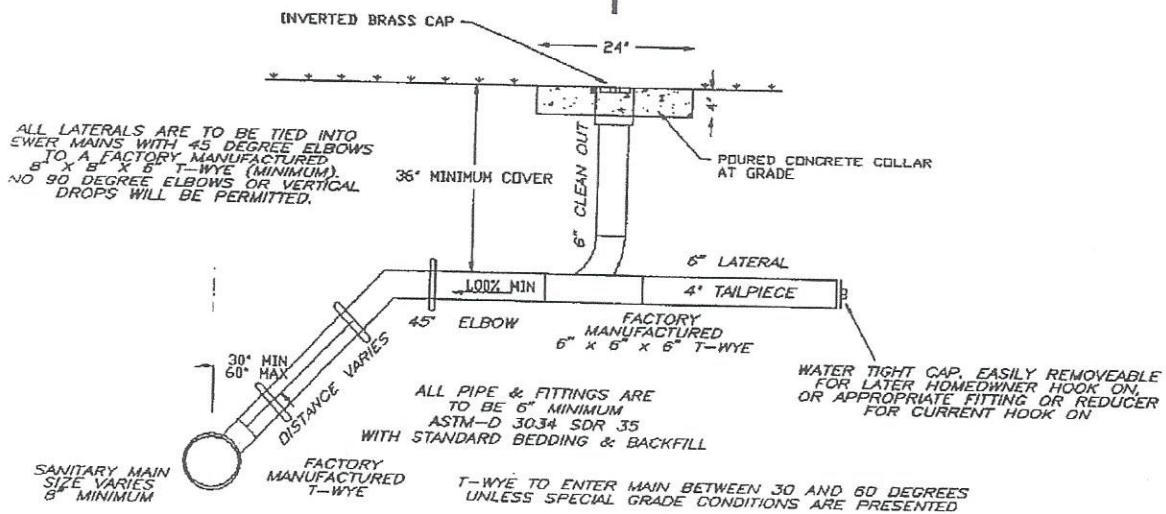


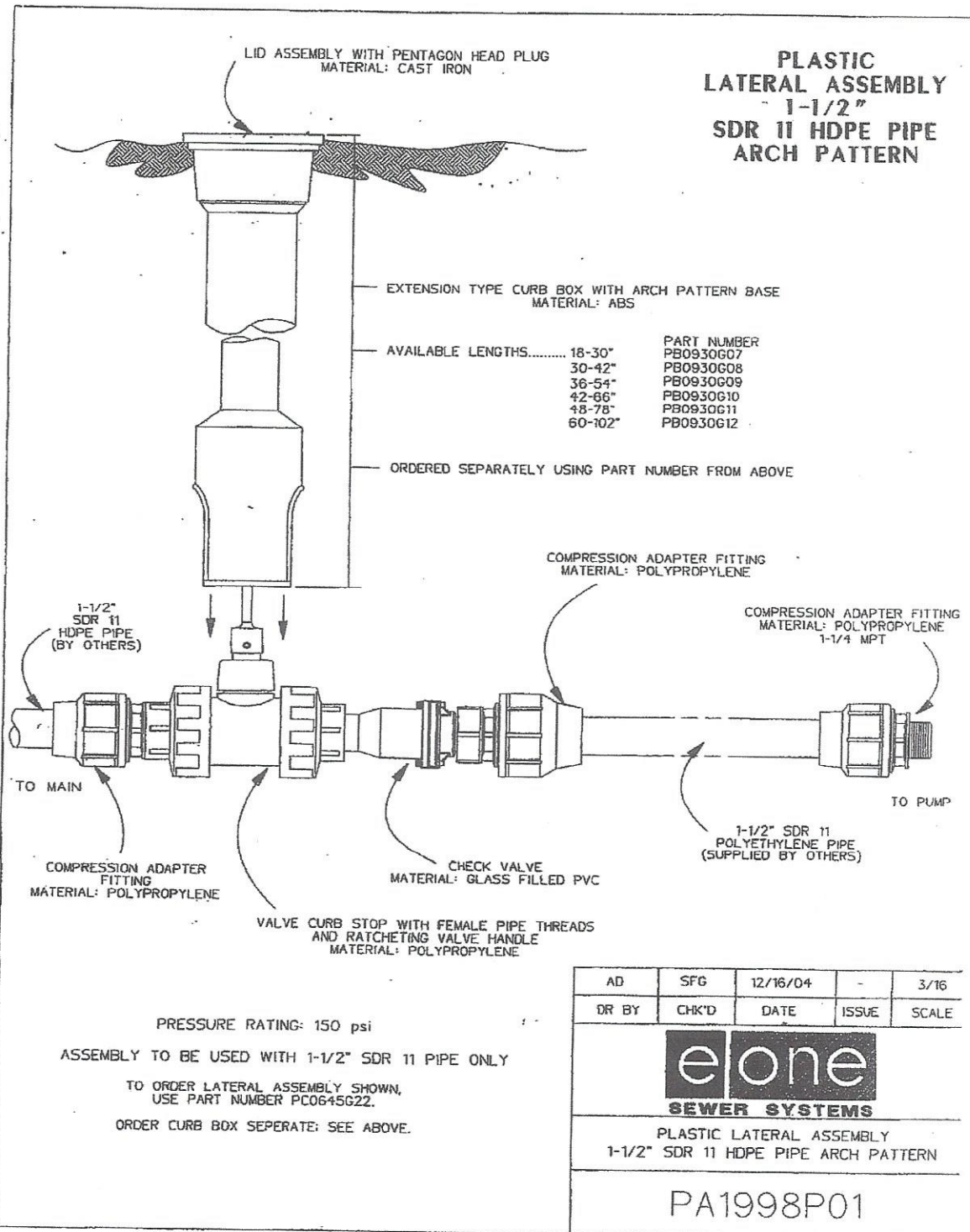
CROSSING DETAIL



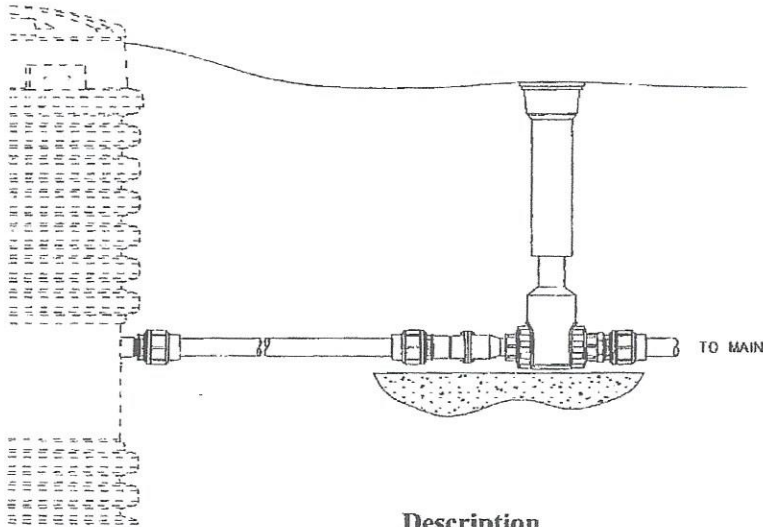
TYPICAL SEWER LATERAL CONNECTIONS

N.T.S.





Forced Sewer Main Service Lateral Kits SDR 11 HDPE Pipe featuring Engineered Thermoplastic Valves and Fittings



Description

These kits feature all components commonly needed to connect an Environment One Series 2000 grinder pump station to the corporation stop/saddle tap on a sewer main. The kit is designed to be used with SDR 11 HDPE pipe, high density polyethylene pipe (provided by others) and includes compression fittings for fast, easy field installation. The curb stop assembly integrates a robust polypropylene ball valve curb stop and Environment One's field-proven redundant check valve. Curb boxes are supplied in Arch pattern with support plate included.

Thank you for considering E/One's Forced Sewer Main Lateral Kits. As you review the following information, please note that we have included order instructions on the last page of this section for your convenience.

Standard Features

- Compression couplings for 1 1/4" SDR 11 HDPE pipe
- All fittings designed and tested to 150 psi service pressure
- Factory-assembled, integrated ball valve curb stop and check valve assembly
- Check valve made from glass-filled PVC with fabric-reinforced elastomeric flapper
- Arch pattern curb boxes in heights from 1 1/2 feet to 7 feet
- Curb boxes made from ABS with cast iron lids
- Rated for 150 psi

Optional Features

- Compression couplings for 1 1/2" SDR 11 HDPE pipe
- Curb boxes for 1 1/2" SDR 11 HDPE pipe
- Curb boxes available in several sizes

