TECHNICAL SPECIFICATIONS FOR

FOR CONSTRUCTION OF SEWER MAINS

AND APPURTENANCES TO BE CONNECTED

TO THE PUBLIC SEWER SYSTEM

MOUNT JOY BOROUGH AUTHORITY

21 East Main Street, P.O. Box 25
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ARRO Project No. 07037.99

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TECHNICAL SPECIFICATIONS FOR CONSTRUCTION OF SEWER MAINS AND APPURTENANCES TO BE CONNECTED TO THE SEWER SYSTEM OF THE MOUNT JOY BOROUGH AUTHORITY

SECTION 1. GENERAL CONDITIONS

1.1 Scope

A. These Technical Specifications cover the requirements for extensions of and connections to the Authority Public Sewer System. All extensions and connections shall be completed in accordance with the Rules and Regulations of the Authority and these Technical 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 Rules and Regulations and Technical Specifications, including such detail drawings as may be required to prosecute the work. All furnished drawings shall contain design plans and profiles at a scale of 1"=20' horizontal and 1"=5' vertical unless otherwise approved by the Authority. Qualified, careful and experienced workmen shall execute the work in the best and most workmanlike manner.

B. The Authority reserves the right to establish special supplemental requirements for any given extension or connection based upon unique features of the specific project, recent changes in standard operating and construction practices which may not be reflected within the Rules and Regulations and the Technical Specifications, or for any other legal or administrative reasons which the Authority may identify.

C. The following items are required as part of the design, construction, and dedication process for all extensions of and/or connections to the Authority Public Sewer System:

1. All design/construction plans and specifications shall be sealed by a Professional Engineer who is registered in the state of Pennsylvania prior to approval of the documents by the Authority.

2. All design/construction plans shall include a note indicating that all construction shall conform to the latest revision of Authority specifications at the time of Final Plan approval by the Authority, and that all deviations from Authority specifications shall require approval by the Authority prior to construction.

3. All design/construction plans shall be based on a U.S.G.S. datum. The U.S.G.S. tie-in benchmark location must be either shown or referenced on the plans.

4. As required by the Authority, shop drawings of all materials and equipment to be installed as part of the construction project shall be submitted to the Authority for review and approval prior to construction.

5. As required by the Authority, a complete construction schedule and construction contact list shall be submitted to the Authority prior to construction.

6. Construction shall not begin until the Authority has approved a Final Plan.

7. The Authority shall be notified one week prior to the beginning of construction.

8. A pre-construction conference shall be conducted prior to construction. Attendees shall include the Authority, Authority Engineer, Developer, Developer's Engineer, and Developer's Contractor, unless otherwise approved by the Authority.

9. As required by the Authority, complete record documents and operation and maintenance manuals shall be submitted to the Authority for review and approval. Dedication of facilities to the Authority shall not occur until approval has been obtained.

10. Relative to projects involving several types of utility installations, the Authority will only offer final approval of the design plans when design of all other utility installations is complete and only after final approval of the plans has been obtained by those agencies that regulate the other utility installations (e.g., storm sewer, gas mains, electric utilities, etc.). At that point, the Authority will require written confirmation that all other reviewing agencies have approved the plans. The Authority shall then have the opportunity to re-review the plans for conformance with Authority specifications. Should the plans no longer be in conformance with Authority specifications, the Authority will forward its concerns in the form of a review letter to the entity responsible for the design. Only after all potential utility conflicts have been addressed to the Authority's approval will the design plans be finally approved by the Authority. At no point during this process will the Authority permit the construction of any utilities until all comments have been addressed to the satisfaction of the Authority and until a final set of revised plans incorporating all comments have been received and acknowledged by the Authority. During construction, the Authority reserves the right to inspect any utility installation that it deems in conflict or detrimental to those utilities owned or slated to be owned by the Authority. Any costs borne by the Authority for such inspection shall be the responsibility of the Developer installing said utilities.

1.2 Definitions

A. Terms used in the Technical Specifications that are the same as terms used in the Authority's Rules and Regulations shall have the same meaning as established in the Rules and Regulations. The following additional terms shall apply to the Technical Specifications and shall have the meaning established below unless indicated otherwise in the text.

1. *Building*: A building is a structure built, erected and framed of component structural parts designed for the housing, shelter, enclosure or support of persons, animals or property of any kind.

2. *Cellar Drain*: A protected and trapped drain for the purpose of carrying off spent waters from the basement of a dwelling, factory, laboratory, workshop, or other Building, but excluding any drainage resulting from rain water, springs, wells, or other ground or surface water.

3. *Natural Outlet*: Any outlet into a watercourse, ditch, pond, lake or other body of surface or groundwater.

4. *Professional Engineer*: An individual licensed and registered under the laws of the Commonwealth of Pennsylvania to engage in the practice of engineering.

5. *Professional Land Surveyor*: An individual licensed and registered under the laws of the Commonwealth of Pennsylvania to engage in the practice of surveying.

6. *Vent Pipe*: Shall mean any pipe extended vertically from a sewer to provide ventilation for the Service Line.

7. *Service Connection*: That portion of, or place in, a Sanitary Sewer where the Lateral Sewer connects to the Service Line

8. Lateral Sewer: Refers to the sewer line from the sewer main connection to a point 5 foot behind the curb line or if there is no curb line 5 foot beyond the edge of roadway, if there is no curb line or roadway it shall be delineated by the edge of the right-of-way.

9. *Service Line*: That part of the main house drain or sewer line extending from the outer building wall or foundation wall to its Connection with the Lateral Sewer.

1.3 Use of Explosives

A. Blasting and Explosives: Any extensions or modifications to the Authority's water system, which contemplates blasting or use of explosives, shall be submitted to the Authority for review at least three (3) days prior to the commencement of such work. The authority, in its discretion, may prohibit the use of explosives on any such work or may limit the range or scope of blasting work if, in the opinion of the Authority's Administrator or Superintendent or its Consulting Engineer, the use of explosives could cause damage or harm to the Authority's existing water system.

B. When blasting is permitted by the Authority for any specific project, the use of explosives shall be governed by the "Regulations for the Storage, Handling and Use of Explosives" of the Pennsylvania Department of Labor & Industry as well as any other applicable federal, state or local regulations governing the use of explosives. In addition, the party seeking to use explosives shall obtain from the local municipality any blasting permits required in order to use explosives for any part of the construction of any work. Receipt of the Authority's permission to use explosives on any particular work does not constitute a release of liability of any Extender, contractor or other party undertaking such project. Any harm caused to the Authority's facilities as a result of such blasting shall be repaired or replaced by the party causing such harm. Where the Authority's approval to use explosives in any particular project is given, the Owner, Extender or contractor to whom such permission is given shall: (a) comply with any additional requirements or safeguards imposed by the Authority in addition to all other federal, state and local bodies regulating the use of explosives and blasting; and (b) defend, indemnify and hold harmless the Authority from and against all damages, injuries, and death caused by use of such explosives.

1.4 Right-of-ways

Any time a Sewer Main extension or improvement is proposed and is to be dedicated to the Authority that is not within a dedicated Municipal Right-of-way, the Extendor shall provide the Authority with a thirty-foot (30') wide perpetual right-of-way for the privileges and rights of constructing, reconstructing, enlarging, repairing, inspecting, maintaining, use, remove or relocate the Sewer Main. The Extendor shall be responsible for legally recording the right-of-way and noted on adjacent property deeds.

SECTION 2. TRENCH PREPARATION AND EXCAVATION

2.1 General Requirements

A. Perform sheeting and shoring as required by Federal, State, and local laws and regulations and as otherwise required to protect workers, the public, and adjacent structure, utilities, and other aboveground and belowground facilities.

B. Excavation of every description and of whatever substances encountered shall be performed in accordance with all applicable Federal, State, and Local requirements.

C. Stripping, Storing and Restoring Surface Items: The Extender shall remove all paving, sub-paving, curbing, gutters, brick, paving block, granite curbing, flagging or other similar materials, and grub and clear the surface over the area to be excavated. He shall properly store and preserve such materials that may be required for future use in restoring the surface. The Extender shall be responsible for any loss of damage to said materials because of careless removal or neglectful or wasteful storage, disposal, or use of the materials.

D. Restoration: The Extender shall restore all shrubbery, fences, poles, 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.

E. 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, in no case shall the trench, from 6 inches below the bottom of pipe to 12 inches above the crown of the pipe, be wider than the pipe nominal diameter plus 12 inches on each side of the pipe.

F. Length of Trench:

1. No trench shall be opened more than 100 feet in advance of the pipelines laid.

2. The Extender 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 Extender 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.

4. The length of open trench shall not exceed what the Extender can complete within that working day.

G. Pumping and Draining: The Extender 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.

H. Accommodations of Drainage: The Extender 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 Extender to plank or bridge over the gutters so that the flow of water is not impeded.

I. 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 Extender, at all times, to maintain crossing, walks, sidewalks, and Streets open to traffic and in a satisfactory condition, and to keep all fire hydrants, valves, fire alarm boxes, and letter 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. Maintenance and protection of traffic on Borough or Township Streets and State Highways shall be in strict accordance with PennDOT 408 Specifications, Section 900; and Pennsylvania Title 67, Chapter 203. The Extender shall modify the sign locations daily in order to protect that section of Street to be disturbed during that same day.

J. Caution in Excavation: The Extender 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 shall be held responsible for the repair of such structures when broken or otherwise damaged due to carelessness on his part.

K. Protection of Utilities, Property and Structures: The existence and location of underground utilities as indicated on any plans of the Authority are presented merely to serve as a notification that such utilities do exist in the general proximity of the work. Any utilities not shown, or not located as shown, shall not be cause of the Extender to deny responsibility for their protection and/or repair during construction.

1. The Extender shall notify all utility companies in advance of construction to include requesting the utilities to be located in accordance with Pennsylvania One Call Act 287, current amended (811 or 1-800-242-1776) and cooperate

with agents of these companies during the progress of the work. Procedures for emergency action and repairs to utilities shall be established with the utility company prior to commencement of the work. During the course of his work, if the Extender damages any of the aforementioned utilities, he shall immediately follow the procedure of emergency action and repair as established at his own expense.

2. Whenever the Extender, during the progress of the excavation, uncovers 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 by the Extender.

3. The Extender 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.

L. Excavation in Fill: When the pipe is laid in fill, the compacted embankment shall be brought to a height of at least 24 inches above the proposed top of the pipe before the trench is excavated.

2.2 Stream Crossings

A. Construct stream crossing in accordance with an approved Stream Crossing Plan and an approved Sedimentation and Erosion Control Plan. Obtain all Federal, State, and Local permits.

B. Make all necessary provisions for cofferdamming, dewatering, and removal of excess excavated material.

C. Maintain the flow in the stream at all times.

D. Construct stream crossings as shown on either the Casing Cradle Detail – Gravity Sewer Installation via Boring/Jacking or the Casing Cradle Detail (Open Cut Or Force Main), as applicable. Encase pipe to limits shown on the Standard Detail with PennDOT 408 Class A concrete. The vertical distance between top of concrete and the lowest point in the streambed shall be no less than 36 inches.

E. Where rock is encountered in the stream crossings, do not use forms to construct the concrete encasement. Place concrete on firm rock below the pipe to provide a firm bond between the encasement and the rock. Where concrete encasement to the dimensions shown on either the Casing Cradle Detail – Gravity Sewer Installation Via Boring/Jacking or the Casing Cradle Detail (Open Cut Or Force Main), as

applicable is entirely in rock, the vertical distance between top of encasement and the lowest point in the stream bed may be 12 inches, but no less.

2.3 Boring, Jacking, and Tunneling

A. General: Installation of pipe lines shall be by open-cut methods unless boring, jacking, and/or tunneling is approved or required by the Authority, PennDOT, railroad company, or other entity having jurisdiction over a particular location where a pipe line is being installed. Prior to the start of such construction, complete plans and specifications shall be submitted to and approved by the appropriate entity.

B. Casing Pipe Materials:

1. *Steel Casing Pipe*: ASTM A53 or other suitable steel meeting the approval of the appropriate entity.

   a) 35,000 psi minimum yield strength.
   b) Full circumference welded joints.
   c) Asphalt coated.
   d) Minimum wall thickness: 0.375 inch.
   e) Steel casing pipe shall be at least 6 inches in diameter larger than the outside diameter of the carrier pipe bell, or as required by the owner of the right-of-way, the entity issuing the permit, or the Authority.
   f) Smooth wall steel pipes with a nominal diameter of over 54 inches will not be permitted for use as casing pipe.

2. *Casing Spacer*:

   a) Constructed of two-piece solid fusion shell of stainless 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 or a spacer made entirely from UHMW polymer with T-304 stainless steel fasteners. A minimum of three (3) casing cradles per pipe stick is required. Provide casing spacers similar to Model CCS as manufactured by Advance Products & Systems, Inc.

3. *Casing End Seals*: Synthetic rubber with Type 304 stainless steel bands; APS Model AC or AW or Equal.

4. The type of casing spacer shown in either the Casing Cradle Detail – Gravity Sewer Installation via Boring/Jacking or the Casing Cradle Detail (Open Cut or Force Main), as applicable will also be approved for use on gravity sewers.

2.4 Sinkholes

A. Sinkholes: Where a sinkhole is found or formed during construction or warranty period, the Authority shall be notified immediately. The Authority Engineer shall conduct an evaluation of the sinkhole. The Authority Engineer shall choose a method of sinkhole remediation. Remediation of the sinkhole shall be completed under the direction of the Authority Engineer and as specified hereinafter.

B. Sinkhole Prevention and Remediation: Soil located above a zone of solution activity is usually soft and wet. Contractor shall maintain the depth of excavation to the absolute minimum required to accommodate the Work, and shall take measures to prevent the development of localized low spots. If weak, yielding or saturated conditions are encountered, Contractor shall perform excavation as described below:

1. Perform excavation and backfill of unstable subgrade as follows:

   a. If, during preparation of subgrade, soft or unstable subgrade areas are detected, excavate the unsuitable subgrade to the limits directed by the Engineer.

   b. Backfill the excavated areas with on-site soil backfill material.

      (1) Compact in layers not exceeding 6 inches loose depth. Compact to 95% of the soil's maximum standard dry density, to pipe trench bottom or structure aggregate base bottom.

   c. If during subgrade excavation operations a sinkhole develops, the Contractor shall remove all soft or unstable soils located in the base of the sinkhole and shall continue excavation until stable soils are encountered, the "throat" of the sinkhole is exposed and/or the presence of rock outcrops or the depth of excavation preclude further excavation.

      (1) Due to the instability of the sides of an existing sinkhole, extreme caution must be exercised during sinkhole remediation to prevent collapse of the soils due to pressure from equipment.

   d. Following removal of all unstable soils from the base of the sinkhole, an evaluation of the stability of the base and sidewalls shall be conducted by Owner's Geotechnical Engineer. This evaluation will be used to make specific recommendations regarding remediation of the cavity. As a guide, the sinkhole should be backfilled as described below.

      (1) If the base of the excavation exposes a "throat" or opening into bedrock, grouting and/or concrete may be required to fill or block

the throat in order to prevent additional soil from collapsing or being washed into the opening.

(2) At no time shall concrete be placed above the Authority's utilities. Concrete should remain a minimum of 6-inches below the Authority's utilities.

(2) Having established or modified the integrity of the base of the sinkhole, Contractor may proceed with backfilling of the excavation. Sinkhole shall be backfilled approximately 1-1/2 feet with crushed aggregate having a maximum particle size of approximately 3/4 inches.

(3) Backfill the final 1/2 to 2/3 of the excavation using site soils compacted to at least 95% of soil's maximum dry density.

e. Payment for additional work will be made using the unit prices for Miscellaneous Unclassified Excavation and Miscellaneous Aggregate Backfill.

SECTION 3. PIPE BEDDING, TRENCH BACKFILL, AND GENERAL PIPE INSTALLATION REQUIREMENTS

3.1 Bedding

A. The trench shall be excavated to a depth of six (6) inches below the outside diameter of the pipe barrel, or deeper if so specified. The resultant subgrade shall be undisturbed, or compacted as approved. The bedding shall then be prepared by placing thoroughly compacted PennDOT No. 1B coarse aggregate in 6-inch (uncompacted thickness) layers to the spring line of the pipe. Bedding material shall be chocked by hand method. Bedding material shall be deposited in the trench for the full width below and on each side of the pipe and shall be brought up along each side of the pipe uniformly to avoid displacing the pipe. Bedding shall provide uniform and continuous bearing and support for the pipe at every point between pipe section ends.

B. Special Bedding:

1. *Concrete Encasement*: If concrete encasement is required, the trench shall be excavated to a depth of six (6) inches below the outside of the barrel of pipes 24-inches in diameter or less and nine (9) inches below the outside of the barrel of pipes larger than 24-inches in diameter.

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 Extender shall excavate and remove such unsuitable material to an approved width and depth. The unstable subgrade excavation shall be backfilled with PennDOT No. 2B aggregate compacted in maximum 6-inch thick layers.

3.2 Backfilling

A. 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.

B. 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 with PennDOT No. 1B aggregate. The Extender shall use special care in placing this portion of the backfill so as to avoid damaging or moving the pipe. The backfill shall be placed in 6-inch layers (uncompacted thickness, unless State Highway) and spread evenly by hand or other approved mechanical methods.

C. Final Backfill:

1. *Aggregate Backfill to Restoration Depth (State, City, Borough, 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 PennDOT 2A aggregate material subject to limitations specified and consolidated in six (6) inch layers by tamping or other approved mechanical methods. 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.

2. *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 approved by the Authority and containing no stones larger than eight (8) inches in maximum dimension. A maximum of 20% of the backfill volume may be stones if the stones are evenly distributed within the material. Excavated material shall be free of organic material, refuse, and frozen materials subject to limitations specified and shall be consolidated in eight (8) inch layers by tamping or other approved mechanical methods. 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.

3. *Compaction*:

   a) *Within State Highway Right-of-Way*: All trench backfill operations 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. The Extender shall have no claim to the Authority even though such requirements may entail more labor or services than the methods herein described. Use mechanical tampers or trench rollers to compact final backfill materials in trench refill operations to produce a density of backfill at the bottom of each layer of not less than 100 percent of maximum lab density as determined by ASTM D698 or as determined by PennDOT requirements. The Extender shall perform field determinations of density, when requested, in accordance with ASTM D1556 or in accordance with PennDOT requirements.

   b) *Areas Other Than State Highway Right-of-Way*: Use mechanical tampers or trench rollers to compact backfill materials in trench refill operations to produce a density of backfill at the bottom of each layer of

not less than 95 percent of maximum lab density as determined by ASTM D698. The Extender shall perform field determinations of density, when requested, in accordance with ASTM D1556.

3.3 General Pipe Installation Requirements

A. 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 to vary the location of fittings and valves when such changes may be necessary or advantageous. No claims for cost compensation will be allowed for changes in location or grade except as such changes are made after trenching has been done.

B. Sewers on Steep Slopes: Sewers on 15 percent slope or greater shall be anchored securely with concrete anchors or equal, spaced as follows:

1. Not over 36 feet center to center on grades 15 percent and up to 35 percent.

2. Not over 25 feet center to center on grades 35 percent and up to 50 percent.

3. Not over 16 feet center to center on grades 50 percent and over.

C. Handling of Materials into Trench: Proper implements, tools and facilities satisfactory to the Authority shall be provided and used by the Extender for the safe and convenient prosecution of the work. All pipe, fittings, joining 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.

D. Pipe Clearance in Rocks: 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, bells, and fittings for pipes 24 inches in diameter or less, and 9 inches for pipes larger than 24 inches in diameter. The specified minimum clearances are the minimum clear distances, which will be permitted between any part of the pipe and/or fitting being laid and any part, protection or point of such rock, boulder or stone.

E. Concrete 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 joining 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 width of trench required for the size of pipe being used.

3. 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 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 7 days of the time of placing and the Authority shall have strict control of the rate of backfilling.

F. Hammer Test: Ductile iron pipe and iron fittings shall be inspected for defects and while suspended above grade, be rung with a light hammer to detect cracks.

G. Cleaning Pipe and Fittings: All lumps, blisters and excess coating shall be removed from the bell and spigot end of each pipe, and the outside of the spigot and the inside of the bell shall be wire brushed and wiped clean and dry and free from oil and grease before the pipe is laid.

H. 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 heavy, tightly woven canvas bag of suitable size shall 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 and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved aggregate 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.

1. Precautions shall be taken to prevent dirt from entering the joint space.

2. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Authority. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

I. 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.

J. Permissible Deflection of Joints: If deflection is required, make after joint is assembled. The amount of deflection shall not exceed the maximum limits as specified in the AWWA C600 and C900.

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

L. Pipe Joining:

1. *Mechanical Joints*: The spigot end of the pipe shall be centrally located in the bell so that the rubber gasket is evenly seated.

   a) All loose rust or foreign matter shall be removed from the inside surfaces of the bell and outside surface of the spigot prior to assembly. Bolts shall be tightened uniformly with a ratchet wrench so as to affect the joint seal. The normal range of bolt torques to be applied are:

Bolt Size (Inches)	Torque-Ft. Lbs.
5/8	45 - 60
¾	75 - 90
1	100 - 120

   b) If effective sealing is not attained at the maximum torque indicated above, the joint shall be disassembled and reassembled after thorough cleaning.

2. *Push-On Type Joints*: Make joints as recommended by the manufacturer so as to affect the joint seal.

3. *Push On Field Lok Gaskets*: Install as recommended by the manufacturer.

SECTION 4. SEPARATION OF SEWERS AND WATER MAINS

4.1. Horizontal Separation

A. Do not install any sewer line closer than 10 feet horizontally to any potable water line.

B. Where site conditions prohibit the 10-foot separation, with the approval of the Authority, install the sewer line so that the top of the sewer line is at least 18 inches vertically below the bottom of the potable water line.

4.2 Vertical Separation

A. Where a sewer line must cross under a potable water line, install the sewer line so that the top of the sewer line is at least 18 inches below the bottom of the potable water line. Maintain the 18-inch vertical separation for at least 10 feet on either side of the potable water line as measured perpendicularly from the potable water line. Provide structural support for the potable water line so that the pipe does not settle or deflect during or after completion of construction.

B. Where the sewer line cannot be located to meet the requirements specified in Section 4.2.A above, proceed as follows:

1. Relocate the potable water line to provide the 18-inch separation from top of sewer line to bottom of water line, for a minimum distance of 10 feet on either side of the sewer line as measured perpendicularly from the sewer line.

2. Center one full length (minimum 18 feet) of potable water pipe over the sewer line so that the water line joints will be as far from the sewer line as possible.

3. Construct the relocated water line of AWWA C151 Special Class 52 ductile iron pipe with push-on joints or mechanical joints.

4. Provide adequate structural support for the potable water line so that the pipe does not settle or deflect during or after completion of construction.

5. Construct the sewer line for a minimum distance of 10 feet on either side of the potable water line, as measured perpendicularly from the water line, of AWWA C151 Special Class 52 ductile iron pipe with mechanical joints.

6. Prior to backfilling of the pipes, pressure test both the potable water line and the sewer line to assure that any joint within 12 feet of the crossing point, as measured perpendicularly from one pipe to the other pipe, will not leak.

4.3 Exceptions to Separation Requirements

A. Where a sewer line must cross over a potable water line or the separation requirements as specified above in Sections 4.1 and 4.2 cannot be met, contact the Authority to determine materials, details, and extent of concrete encasement for pipes.

4.4 Depth of Cover

A. Provide minimum cover of 4 feet from top of pipe to finished grade, unless otherwise shown of the Drawings.

SECTION 5. GRAVITY SEWERS

5.1 Materials

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

B. Pipe Joints: For pipe joints, use rubber gaskets suitable for conveying domestic sewage.

C. Ductile Iron Pipe: Ductile iron cement lined pipe shall be in full accord with AWWA C151, Latest Edition, for the material class or pressure designated and AWWA C150, Latest Edition, for wall thickness.

1. Minimum diameter shall be 8 inches.

2. Minimum thickness shall be Special Class 52.

3. Factory coat outside of pipe and fittings with bituminous material. Coating shall be in full accord with AWWA C104, Latest Edition, except the coating shall not be less than 20 mil dry thickness.

4. Iron fittings shall be cement lined ductile or gray iron and shall be in full accord with the standard specification set forth in AWWA C110 or AWWA C153, Latest Editions. All fittings shall have a minimum pressure rating of 250 psi and shall have joints as required for pipe restraint.

5. Joints shall be of the push-on type or mechanical joint type in full accord with AWWA C111 for all pipe except at changes in alignment, valves, casing, or other conditions requiring restraints.

6. Inside of pipe shall be corrosion-resistant, in accordance with AWWA C104.

D. Polyvinyl Chloride Sewer Pipe: PVC pipe and fittings shall conform to ASTM D3034, SDR 35 or SDR 26 for sewers at a depth of twelve (12) feet and deeper.

1. Minimum diameter shall be 8 inches.

2. Fittings shall conform to same ASTM standard as for pipe.

3. Joints shall be push-on with elastomeric gasket, ASTM D 3212 and ASTM F 477.

E. PVC Waterstop for Use at Manhole Openings: Gasket-type waterstop composed of virgin polyvinyl chloride (PVC) such as manufactured by Fernco Joint Sealer Co., The General Engineering Company, or equal.

F. Shielded Flexible Pipe Coupling: Clamped design with virgin PVC coupling and two Type 304 stainless steel bands, such as manufactured by Fernco Joint Sealer Company, or equal.

G. Manhole Materials:

1. *General*: All pre-cast manhole components shall meet the requirements of ASTM C478 unless otherwise specified below.

a) *Acceptable Manufacturers*:
1) Terre Hill Concrete Products.
2) Monarch.
3) Or Equal.

2. Precast manhole bases shall have flexible watertight joints at the point of entry of any sewer pipe into the manhole. The rubber materials shall conform to ASTM C 443. The gaskets shall be cast into the manhole base to become an integral part of the concrete. The gaskets shall be A-Lok Rubberman, Dura-Seal III as manufactured by Dura Tech Inc., Dual Seal II as supplied by Terre Hill Concrete Products, PSX gasket by Press Seal Gasket (PSX gasket requires two stainless steel bands with gasket), or equal.

3. Concrete for cast-in-place manhole components shall have a compressive strength of not less than 4,000 psi at 28 days (tests shall be in accordance with ASTM C 39). Aggregates shall be of quality, gradation and proportions as approved by the Authority after submission of test results on the design mix. Each cubic yard of concrete shall contain no less than six (6) bags of Portland cement. Slump of concrete shall not exceed 4 inches. Ready-mixed concrete shall conform to ASTM C 94. Portland Cement shall conform to ASTM C 150, Type II.

4. *Manhole Steps*: No. 4 Grade 60 steel reinforcing rod encapsulated in polypropylene; MA Industries, Inc., or equal. The distance between rungs shall be 12 inches. The rungs shall have end lugs to prevent side slippage, and shall have a minimum clear rung width of 12 inches. The step surface shall be non-slip. The steps shall be protected from dissimilar materials in accordance with ASTM C 478, Latest Revision.

a) 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, valves, or benches.

b) Manhole steps shall be grouted in place using a non-shrink, non-metallic grout.

c) The use of polypropylene inserts to secure the manhole steps shall not be permitted, nor shall the use of epoxy to secure the steps.

5. *Non-Shrink, Non-Metallic Grout (minimum of 2,500psi strength):* Ready-mix product such as Sonogrout by Sonneborn, Masterflow 713 Grout by Master Builders, Darex Non-Metallic Grout by W. R. Grace and Company, F-100 by Sauereisen Cement Company, Five Star by U. S. Grout Corporation, or equal.

6. *Preformed Plastic Sealing Compound*: ASTM C990, Rope Form, of butyl rubber (not bitumen) composition, 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 complete.

   a) *Acceptable Manufacturers*:
      1) Press-Seal Gasket Pro-Stik or EZ Stik.
      2) Henry Sealant Rub-R-Nek
      3) Or equal.

7. *Coatings*:

   a) Prepare surfaces to be coated in accordance with the written instructions of the coating manufacturer, including cleaning, sandblasting, or acid etching as necessary.

   b) Coat precast components at the factory.

      1) *Exterior Surface Coating*: Use one of the following:

      2) Koppers Company, Inc. Bitumastic No. 300-M, 20-mil minimum thickness.

      3) MAB Ply-Tile Epoxy Tar Coating, 20-mil minimum thickness.

      4) Or equal.

8. *Manhole Frame and Cover*: Gray/Cast Iron castings with built-in o-ring seal conforming to ASTM A48, minimum Class 35B, designed for AASHTO M105 and AASHTO Highway Loading HS-25. Provide castings of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion or other defects. Where water-tight frame and covers are required, also provide gray/cast iron inner sealing lid with steel locking bar, bronze locking screw, and sealing gasket of commercial grade rubber.

   a) *Finish*: Bearing surfaces shall be machined to prevent rocking and rattling under traffic.

9. *Exterior Manhole Encapsulation System*: If directed by the Authority, wrap-around heat-shrinkable sheeting consisting of a cross-linked polyolefin backing, coated with a protective heat-activated adhesive. Manhole frame hold-down bolts are not required with this system. The Authority requires manhole frame hold-down bolts. These bolts shall be standard, J or L shape with standard coarse thread ends, ASTM A307, four per frame.

10. *Grade Rings*: Shall be manufactured as compressed molded reinforced concrete meeting ASTM C – 478 specifications.

11. *Underground Warning Tape:* Printed polyethylene tape, 3 inches minimum wide, magnetic for PVC pipe, green for sanitary sewers, 1-inch minimum lettering, printed with name of utility buried below, and suitable for installation in all soil types. Tape shall be placed 24" above all sewers and force mains.

5.2 Installation

A. General: Design and installation must generally meet all requirements in the most recent PADEP Domestic Wastewater Facilities Manual unless otherwise noted in these Specifications. 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 shall be centered in, shoved tight and secured against the bell of the previously laid pipe. The interior of each pipe section shall be cleaned of all excess joint and foreign material before the next pipe is laid. The pipe shall be laid in the aggregate materials as specified. 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 in accordance with ASTM D 2321 for PVC pipe and AWWA C600 for ductile iron pipe. Sewers shall be designed with a minimum 0.50% grade on non-terminal runs and minimum 1.00% grade on terminal runs unless otherwise approved by the Authority. When SDR 26 pipe is required (at depths equal to or greater than 12') in a manhole run, the entire run shall consist of SDR 26 pipe. This also applies to DICL pipe

B. Manholes: Manholes shall be placed at each change of grade, size and alignment of the pipe, and at all intersections. Terminal cleanouts will not be acceptable.

5.3 Testing

A. Alignment: After the sewers have been laid and backfilled (a minimum of 30 calendar days), a mandrell shall be pulled between manholes or manhole locations

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 have the mandrell test preformed throughout its length and any and all defects shall be corrected by the Extender, to the satisfaction of the Authority, before the work shall proceed and before acceptance shall be made.

B. General Requirements for Leakage Testing:

1. Perform leakage tests after backfilling of the sanitary sewer and adjacent utilities are installed and backfilled, no sooner than five days after backfilling.

2. At the Extender's option, preliminary leakage tests (for Extender's information only) may be performed before backfilling provided that:

   a) There is no conflict with other Specification Sections which require that no more than a specified length of trench be open at any time.

   b) All pipe (sewer mains and service laterals) is sufficiently restrained to prevent movement during the testing process.

   c) Tests for pipeline acceptance are also made after backfilling.

3. At the Extender's option, leakage testing for acceptance of the pipeline may be performed with the pipe backfilled, but with the joints exposed, provided that pipe joints are properly backfilled in accordance with the installation Specifications and that the various types of materials used in bedding and backfilling are not contaminated with foreign or incompatible materials.

C. Air Test for Leakage:

1. Perform air tests in accordance with the UniBell PVC Pipe Association test procedure UNI-B-6-98 or latest revision.

2. Add air until the pressure in the pipe section is raised to 4 psi, plus the groundwater correction pressure as specified in UNI-B-6-98 of latest revision, but in no case more than 9.0 psi.

3. Wait five minutes for stabilization before beginning leakage test.

4. At the end of five minutes, adjust the air pressure to 3.5 psi plus the groundwater correction pressure as specified in UNI-B-6-90 and then start the timing for the leakage acceptance test.

5. The pipe section will be considered to have passed the leakage test if the test pressure drops 1.0 psi or less in the time period specified in Table I below.

TABLE I

MINIMUM TIME ALLOWED FOR A 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED

Pipe Diameter (in.)	Time in Minutes:Seconds for the Pipe Test Section Length in Ft.(')								
	100'	150'	200'	250'	300'	350'	400'	450'	500'
4	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24	7:07
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24	12:40
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	19:45
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38	28:28
15	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04	44:31
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41	64:03
21	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31	87:11
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33	114.03
27	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48	144:20
30	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15	177:53
33	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53	215:34
36	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46	256:33

Note: When length of the test section falls between the lengths shown in the table heading, use the specified time for the longer of the two lengths.

D. Infiltration: After the air testing described in the preceding Section 5.3.C has been completed by the Extender, 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 section by the Authority and/or during the warranty period, to establish the leakage of groundwater into the sewer and laterals. The cost of these investigations shall be borne by the Extender.

E. Deflection Testing of PVC Pipe:

1. Perform deflection test a minimum of 30 calendar days after completion of backfilling and after any adjacent utilities have been installed and backfilled on the pipe section to be tested.

2. Use a mandrill with a diameter equal to 95 percent of the actual inside diameter of the pipe. Do not use mechanical pulling devices to move the mandrill through the pipe.

3. Pipe section will be accepted if deflection does not exceed 5 percent of the actual inside pipe diameter at any point in the section under test.

F. Vacuum Testing of Manhole:

1. The Authority reserves the right to require vacuum testing of manholes as deemed necessary. Prior to testing manholes, thoroughly clean such and seal openings, both to complete satisfaction of the Authority. Seal openings using

properly sized plugs. Perform testing with frames and covers installed. The joint between the manhole and the manhole frame shall be included in the test.

a) Perform vacuum testing in accordance with the testing equipment manufacturer's written instructions.

b) Draw a vacuum of 10 inches of mercury and close the valves.

c) Consider manhole acceptable when vacuum does not drop below 9 inches of mercury for the following manhole sizes and times:

1) 4 foot diameter - 60 seconds.
2) 5 foot diameter - 75 seconds.
3) 6 foot diameter - 90 seconds

2. If any manhole fails to pass the vacuum test, the Extender shall determine at his own expense the source or sources of leakage. The Extender shall repair or replace all defective materials and/or workmanship and shall conduct such additional retests as required to demonstrate that the manhole meets the requirements, at his own expense and at no cost to the Authority. All materials and methods used to repair the manholes shall meet with the approval of the Authority.

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 acceptable. Upon such acceptance, the warranty period will commence. If, during this final inspection, any irregularities are observed, the condition must be corrected at the Extender's expense prior to acceptance.

SECTION 6. GRAVITY SERVICE LINES, SERVICE CONNECTIONS AND LATERAL CONNECTIONS

6.1 Materials

A. Polyvinyl Chloride Pipe (PVC): As specified for Sewer Pipe and Fittings; 4-inch minimum diameter. SDR-35 pipe is required between the main and extending 5 foot past curb or if there is no curbing 5 foot past edge of existing or proposed roadway or if neither exists then to the right-of-way. Schedule 40 solvent joint, SDR-35 or SDR 26 (when sewers are 12' deep or greater) can be used between the right-of-way and the building, including trap assembly. Colored primer must be used for all solvent joint applications.

B. Pipe Plugs: Designed for permanent installation and removable. Obtain plugs for various types of pipe used from the respective pipe manufacturer.

C. Service Saddles:

1. Saddle assembly consists of:

a) Saddle and bell.

b) Adapter as required to provide for push-on installation of Lateral Sewer to Service Connection.

c) Service sealing gasket which fits in groove in either bell or adapter.

d) Tap gasket for sealing saddle/bell to collector pipe.

e) Strap and fasteners for securing saddle/bell to collector pipe.

2. Pressure rating of assembled push on connection: Minimum 7 psi.

3. *Materials and Components*:

a) *Saddle/bell*: Cast iron; ASTM A48, minimum Class 30 coated with bituminous paint as required for AWWA C151 ductile iron pipe.

b) *Service push-on joint sealing gasket*: ASTM F477.

c) *Adapter*: PVC; ASTM D3034, SDR 35; epoxy bonded in cast iron bell.

d) *Tap gasket*: Synthetic rubber meeting requirements of ASTM C361 for oil-resistant gaskets.

e) *Strap*: Type 304 stainless steel; minimum thickness 24 gage; minimum width 2.5 inches.

f) *Strap bolts*: Type 304 stainless steel; minimum diameter 3/8 inch.

g) *Nuts and bolts*: Type 304 stainless steel.

4. Use service saddles instead of in-line fittings only when approved by the Engineer at locations where use of in-line fittings is unfeasible or inappropriate. Service saddles may not be used for any lateral over 6 inches in diameter.

5. Use "Y" pattern connections except:

a) For vertical riser laterals, where "T" pattern service connections may be used.

b) Where "T" pattern service connections are approved by the Authority.

6. *Manufacturer*: Romak Saddle, Inserta Tee or equal.

6.2 Installation

A. Fittings (saddles, risers, bends, and plugs) and service pipe shall be furnished and installed in strict accordance with these Technical Specifications and any and all practices and precautions required above for the gravity Sanitary Sewers are equally applicable to the Service Connection, Lateral Connection and Service Line. The Extender shall place a 2"x 2" wooden marker at the end of each Lateral Sewer unless connecting directly to an existing Service Line. The marker shall be one piece and may not be constructed from two or more smaller pieces. The marker shall extend from the Lateral Sewer invert to 24 inches above grade and must be maintained by the Developer / Contractor / Extender. A PVC-compatible mechanical joint (MJ) cap or plug shall be installed at the end of the lateral. Laterals shall be attached to the sanitary sewer system via connection to the gravity sanitary sewer piping only. In no case shall Service Connections, Lateral Connections or Service Lines connect directly to manholes unless otherwise approved by the Authority. If the main at the service connection is SDR 26 pipe (depth equal to or greater that 12'), the Lateral Sewer to the cleanout shall also utilize SDR 26 pipe, cleanout must be on owners property and meet distance requirements stated in "definitions section for Service Connection, Lateral Connection and Service Line".

B. If rock is encountered during the installation of a Service Connection or Lateral Sewer, the Extender shall construct the previously listed items to provide a minimum "rock-free" distance of one foot beyond the end of the Service

Connection or Lateral Sewer. No Service Connection or Lateral Sewer shall be "butted" against rock.

C. All Service Connection, Lateral Sewer and Service Line shall be installed with a minimum grade of one percent (1.00%). A straight alignment shall be maintained where possible. A minimum cover of four feet (4') shall be provided for the trap assembly to prevent crushing and freezing of the pipe, unless the Authority approves a lesser minimum cover.

D. No trench shall be backfilled until the Service Connection, Lateral Sewer or Service Line has been visually inspected and approved by the Authority or Authority Engineer's Representative.

E. Trap:

1. A main or intercepting trap shall be placed between the end of the Lateral Sewer and the Building, on the Service Line. The trap shall be a PVC trap with Vent Pipe. The Vent Pipe shall be on the Building side of the trap. Unless otherwise authorized by the Authority, the top of the Vent Pipe shall be a minimum of 6 inches (6") above the ground and shall have a cowl type vent to prevent surface water from entering the Sewer.

2. A cleanout shall be installed as part of the trap assembly.

F. 90-degree bends shall not be permitted on Service Connections, Lateral Sewer, Service Lines and Trap Assemblies. When directional changes are necessary, two (2) 45-degree bends configured with a minimum one foot long stick of pipe between each shall be used. Cleanouts shall be installed immediately adjacent to all directional changes of 45-degrees or greater, including locations where lesser bends are used to accomplish a greater than 45-degree bend. Any exceptions must be approved by the Authority.

G. All Service Connection, Lateral Sewer and Service Line shall be installed in an orderly fashion, working from the sewer main toward the connecting Building.

H. The Authority reserves the right to test each Service Line prior to approval by the Authority. The test shall be witnessed by an agent of the Authority and the Service Line shall not be deemed acceptable until said Service Line has satisfactorily passed the test hereinafter described. All costs of testing and any subsequent test(s), including equipment, material, water or labor required shall be the responsibility of the Owner.

1. The Service Line shall be tested by plugging the line at the Service Connection / Lateral Sewer by the use of a "test tee" and by plugging the line at its point of connection with the Building Sewer. All risers, vents, plugs and cleanouts shall be adequately blocked, plugged or supported to withstand the

pressure associated with the test. The test shall be made by either air or water. In either case, the test shall be designed to provide a residual pressure of 5.0 psi throughout the length of the Service Line.

2. The test shall be made by attaching a water pump or air compressor testing apparatus to any suitable opening and after closing and supporting all other inlets and outlets to the Service Line, forcing air or water into the Service Line until there is a uniform gauge pressure of 5.0 psi. The Service Line shall be deemed acceptable if this pressure is maintained for 15 minutes without the introduction of additional water or air.

3. Care shall be taken that the pressures generated by the test do not exceed the pipe manufacturer's recommendations.

I. Service Connection / Lateral Sewer shall be tested in accordance with the procedures specified for gravity Sanitary Sewers.

J. The following requirements shall be applicable for that portion of a Service Line installed five-feet past the curb or five-feet beyond paved roadway, or at the edge of right-of-way if no paved road exists. It shall be the responsibility of the Owner of the Improved Property served to require his plumber or contractor to adhere to these requirements.

1. The trench shall be thoroughly compacted using mechanical tamping equipment.

2. The trench area shall be graded to conform to existing grade.

3. No surplus excavated materials or debris shall be piled or stored in this area.

4. All Street surfaces which are disturbed or damaged by the Owner or his plumber or contractor shall be properly repaired at the Owner's cost.

5. Subsequent settlement of the Street resulting from improper construction practices shall be promptly repaired at the Owner's cost.

6. In no case, shall the Service Line be installed at a higher elevation than any potable water service within 18-inches.

7. In no case, shall a Service Line be installed within an 18-inch radius of any other utility.

8. If the Owner or his plumber or contractor fails to comply with any of the requirements of this Subsection H, then after reasonable notice to the Owner, the Authority may proceed on its own to make any necessary corrections or repairs so that the aforesaid requirements are fulfilled. If the Authority does

so repair, then the Owner of the Improved Property shall be liable to the Authority for the entire cost of such repairs and said cost will be included in the Owner's next quarterly billing for sewer services.

6.3 Special Conditions and Requirements

A. Unless otherwise authorized by the Authority, cleanouts shall be provided in each Service Line at fifty (50) foot intervals.

B. Cleanouts shall be constructed using a wye fitting in the run of the pipe with a 45-degree bend (1/8 bend) and riser to the ground surface. The riser shall be provided with a standard four-inch (4") screw type ferrule.

C. Where the Service Line and the Lateral Sewer are both of the same size pipe, connections shall be made by properly joining the spigot end of the Service Line with the bell end of the Lateral Sewer. This connection shall be approved by the Authority.

D. If the Service Line and Lateral Sewer are of unlike materials or sizes, the connection shall be made with a fitting of PVC elastomeric sleeve or a flexible coupling or reducing coupling with stainless steel straps suitable for the type and size of pipe to be connected (Fernco Coupling, or equal). Sealing with grout or mastic will in no circumstances be permitted.

E. All Service Connections to Sewers shall be made at the terminus of the Lateral Sewer unless the Authority specifically authorizes otherwise.

F. When no Lateral Sewer was previously constructed, the connection to the Sewer main and the construction of the Lateral Sewer from the Sewer main to the edge of the right-of-way shall be made by the Authority or a contractor approved by the Authority at the cost of the Owner.

G. Basement floor drains or sump pumps shall not be connected in any manner to the Sewer System. The Authority will not be responsible for any damage that may result from basements being flooded via floor drains or sump pump failures due to the stoppage of sewers.

SECTION 7. FORCE MAINS

7.1 Materials

A. Cement Lined Ductile Iron Pipe: Use ductile iron cement lined pipe conforming to AWWA C151, Latest Edition, for the material class or pressure designated and AWWA C150, Latest Edition, for wall thickness. Minimum wall thickness shall be Special Class 52 except where flanged pipe is required. Use Special Class 53 pipe where flanged connections are required.

AWWA rated SDR 18 PVC with 10 gauge tracer wire may be substituted where approved by the Authority.

1. *Cement Mortar Linings*: Conform to AWWA C104, Latest Edition, except the thickness of linings should not be less than 1/8 inch.

2. *Corrosion-Resistant Linings*: Where directed by the Authority or Engineer.

3. *Fittings*: Ductile or gray iron in accordance with the requirements set forth in AWWA C110 or C153, Latest Editions. All fittings shall be minimum Class 250 with cement lining and joints as required for pipe restraint. Iron fittings to be enclosed in pits, vaults, or manholes shall be of the flanged type.

4. *Joints*: Push-on type or mechanical joint type in accordance with AWWA C111, for all pipes except at changes in alignment, valves, tees, caps, casings, and plugs.

    a) Joints requiring pipe restraint shall be Lok-Type or TR Flex as manufactured by U. S. Pipe; Super-Lock as manufactured by Clow; Lok-Fast as manufactured by American Pipe; Snap-Lok or locked mechanical joint as manufactured by Griffin; locked mechanical joint as manufactured by Atlantic State; or approved equal.

    b) In addition to restrained joints, adequate tie rods shall be provided to develop full joint restraint and must extend to the adjacent fitting or joint as approved by the Authority.

    c) Mechanical joint retainer glands shall not be used. Only ductile or SDR-8 Mega-lug style joint glands or approved equal shall be required.

    d) Prior to construction, joint restraint system details shall be submitted for Authority's review and approval.

B. Air Valves: The Authority reserves the right to require air valves, of any one of the following types, at any location in the force main.

1. *Sewage Air Release Valve*: Designed to automatically release air, gas or vapor under pressure during system operation. 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 shall be as follows:

   a) *Minimum Working Pressure Rating*: 150 psi.

   b) *Valve Body and Cover*: Stainless Steel or Cast iron, ASTM A48, Class 35 or ASTM A126, Class B.

   c) *Discharge Orifice Seat, Mechanism and Valve Stem*: Stainless Steel.

   d) *Orifice Button*: Stainless steel and Buna-N, Nitrile Rubber.

   e) *Mechanism Lever Pins and Float*: High strength stainless steel, ASTM A 240.

   f) *Backflushing and Cleaning Accessories*: Factory assembled to the valve and consisting of a shut-off valve at bottom inlet, a blow-off valve near the bottom of the valve body, quick disconnect couplings and shut-off valve at top of valve, and a 5-foot section of rubber hose with quick disconnect coupling.

   g) *Acceptable Manufacturers*:
      1) A.R.I USA Inc.
      2) APCO.
      2) Golden Anderson.
      3) Val-Matic Valve and Manufacturing Corp.
      4) Or Equal.

2. *Sewage Air and 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 shall be as follows:

   a) *Minimum Working Pressure Rating*: 150 psi.

   b) *Valve Body and Cover*: Stainless Steel or Cast iron, ASTM A 48, Class 35 or ASTM A126, Class B.

c) *Float Stem and Guide*: Bronze, ASTM B 584.

d) *Floats*: Stainless Steel, ASTM A 240.

e) *Orifice Seat*: Buna-N, Nitrile Rubber.

f) *Backflushing and Cleaning Accessories*: Factory assembled to the valve and consisting of an inlet shut-off valve, a blow-off valve near the bottom of the valve body, quick disconnect couplings and a shut-off valve at the top of valve, and a 5-foot section of rubber hose with quick disconnect coupling.

g) *Acceptable Manufacturers*:
   1) A.R.I. USA Inc.
   2) APCO.
   2) Golden Anderson.
   3) Val-Matic Valve and Manufacturing Corp.
   4) Or Equal.

3. *Sewage Combination Air Valves*: Consisting of an air release valve and an air and vacuum valve factory piped into a compact assembly. The combination assembly shall automatically release air, gas or vapor under system operating pressure and shall also allow air to re-enter the system during draining or when a vacuum occurs. Combination valve designs shall feature long bodies and float stem components so that the operating mechanisms are kept free from contact with sewage during operation. Valve construction shall be as follows:

   a) *Minimum Working Pressure Rating*: 150 psi.

   b) *Valve Bodies and Covers*: Cast iron, ASTM A 48, Class 35 or ASTM A126, Class B.

   c) *Air Release Valve Discharge Orifice Seat, Mechanism and Valve Stem*: Stainless Steel.

   d) *Air Release Valve Orifice Button*: Stainless Steel and Buna-N, Nitrile Rubber.

   e) *Air Release Valve Mechanism Lever Pins and Float*: High strength stainless steel, ASTM A 240.

   f) *Air and Vacuum Valve Float Stem and Guide*: Bronze, ASTM B 584.

   g) *Air and Vacuum Valve Floats*: Stainless Steel, ASTM A 240.

h) *Air and Vacuum Valve Orifice Seat*: Buna-N, Nitrile Rubber.

i) *Backflushing and Cleaning Accessories*: Factory assembled to the combination valves and consisting of two inlet shut-off valves, two blow-off valves, two clear water inlet valves, and a 5-foot section of rubber hose and quick disconnect couplings.

j) *Acceptable Manufacturers*:
   1) APCO.
   2) Golden Anderson.
   3) Val-Matic Valve and Manufacturing Corp.
   4) Or Equal.

C. Underground Warning Tape: Printed polyethylene tape, 3 inches minimum width, green for force mains, one-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. (Reference either the Backfill And Pavement Restoration Detail For State/Boro/Twp Roads or Trench Restoration Lawn/Agricultural Areas standard detail, as applicable.)

D. Cleanouts: Cleanouts shall be constructed as shown in either the Force Main Valve & C.O. Detail – Manhole Type 1 or the Force Main Valve & C.O. Detail – Manhole Type 2, as applicable. Valves shall be installed in each cleanout manhole.

E. Valves and Appurtenances:

1. *Valves*: Valves shall be installed on force main at locations shown in the Standard Details and as required by the Authority.

2. *Eccentric Plug Valves (3"-24" diameter)*: Valves installed in valve/cleanout pits shall be actuated with a worm gear operator and hand wheel. Buried valves shall be actuated with an underground actuator through a cast iron valve box and a 2" operating nut. Eccentric plug valves as manufactured by Clow / McWane, Inc. or approved equal.

   a) Valves shall open left (counter-clockwise).

   b) Buried valves shall have 2-inch square cast iron operating nuts. Each valve shall also be supplied with a roadway type valve box.

   c) Buried valves shall be supplied with mechanical joint end connections.

   d) Valves located in vaults, pits, or manholes shall have flanged ends.

3. *Gate Valves (3"-12" in diameter):*

a. Stem type when installed underground and rising stem type otherwise.

b. Valve stem seal of such design that allows replacement of O-rings with valve under pressure in the fully open position.

c. Iron body, outside screw and yoke, bronze mounted with resilient-seated wedge conforming to AWWA C 509.

d. Resilient seat of Styrene Butadiene SBR or Urethane Rubber bonded to cast iron wedge.

e. Stem seals of "O"-ring type.

f. Valves equipped with 2-inch square operating nut and open counter-clockwise. When the operating nut on the valve is more than 4' below finished grade, a valve operating nut extension shall be installed on the valve.

g. Exterior to be asphalt varnish or epoxy coated; interior ferrous metal parts to be epoxy coated, AWWA C 550.

h. Acceptable Manufacturers: American Flow Control, or approved equal.

4. *Valve Boxes*: Standard 5-1/4-inch cast iron extension roadway type valve boxes shall be installed over buried valves and shall contain enough adjustment threads for future adjustments of 6" up or down. Screw threads shall be cast integrally with box wall. Welded screw threads are not acceptable.

F. Access Hatches

Cleanout and Air/Vacuum chamber access frames and covers may be replaced with access hatches if so approved by the Authority. If an access hatch is approved, the hatch must either be watertight or contain a drainage coupling integral to the hatch channel frame. The drainage coupling design must have a pipe installed from the drainage coupling to the outside of the cleanout vault, turned down, and extended to an elevation of 18" below finished grade. The pipe end must be located inside ½ cubic yard of PA DOT 2B aggregate completely wrapped in PA DOT Class I geotextile material. Where hatches have the potential of being placed under traffic and/or equipment loading, these hatches must be rated for HS-25 loading. Where hatches will not be placed under traffic and/or equipment loading, the Authority will consider hatches which do not meet HS-25 loading criteria. However, in this case, hatches must be located at least 18" above final grade.

7.2 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. Pipe laying shall commence at the lowest point and proceed upgrade.

2. *Construction Control*: During the installation of a force main, the pipe shall be laid at a constantly increasing grade to each high point, air valve, or point of discharge. The Extender shall provide sufficient construction control to assure that there are no sags in the force main which could tend to accumulate air other than at the high points. Failure to comply with this requirement shall necessitate that the Extender take remedial steps to correct this situation. All associated costs shall be borne by the Extender.

B. Anchorage:

1. *Concrete Thrust Blocks*: ARE NOT PERMITTED

2. *Reaction Backing*: IS NOT PERMITTED

3. *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.

4. *Anchorage for Bends*: All bends deflecting 11.25 degrees or more on force mains 6 inches in diameter or greater shall be provided with a thrust restraint system to prevent movement.

   a) Either a restrained joint pipe or thrust block system (only by authorization of the Authority) will be permitted.

   b) Suitable metal rods shall be used only as directed by the Authority.

   c) Mechanical joint retainer glands shall not be used to obtain a restrained joint.
   d) "Duc-a-Lugs" ARE NOT PERMITTED.

C. Cleanout Installation: Cleanout manholes shall be provided at each dead end and at 400-foot intervals (maximum) on long stretches of force main. Terminal cleanout manholes shall be used on all dead ends and at other locations as required by the Authority.

D. Setting Fittings and Valves:

1. *General*: Valves and fittings shall be set and jointed to pipe in the manner specified previously for cleaning, laying, and jointing pipe.

2. Provide a concrete manhole for every air valve. Manholes shall meet the required specified above for gravity Sanitary Sewers. The manholes shall be constructed to permit valve repairs and afford protection to the valve and pipe from impact where they pass through the manhole walls. All valves and fittings shall be supported by saddles. The saddles shall be continuous under all valves and fittings within the valve manholes.

7.3 Tests

A. Hydrostatic Tests:

1. *Pressure Test*: After the pipe has been laid and backfilled as specified, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of 150 psi 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.

   a) *Duration of Test*: At least two hours.

   b) *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 Extender. The Extender will make all taps into the pipe, and furnish all necessary assistance for conducting the tests.

   c) *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 Extender shall make the necessary taps at such points before the test is made. After the test has been completed, the Extender shall insert plugs at the tapping points.

   d) *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 Extender 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 Extender will furnish laboratory calibrated test gauge and measuring device, and all necessary assistance to conduct the test.

   a) *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 pressure within 5 psi of the specified leakage test pressure after the pipe has been filled with water and the air expelled.

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

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

   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 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. When multiple valve sections are tested together, the allowable leakage shall be calculated for the shortest single section. There shall be no additional leakage allowed for service connections.

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

   e) Should any test of pipe laid disclose leakage greater than that specified above, the Extender 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 Presence*: The Authority or Authority Engineer shall monitor the pressure and leakage tests. The Extender shall notify the Authority of the test day at least 48 hours (2 working days) in advance.
   b) If test fails to meet test requirements, the Extender shall pay for all additional engineering personnel testing time.

c) *Weather*: No testing will be authorized unless air temperature is 35 degrees F. or higher.

d) *Acceptance*: Observation of successful testing of force mains by the Authority does not constitute acceptance of the system or any portion thereof. Upon completion of any determined portion of a total system, and successful testing thereof, the Authority Engineer may recommend final acceptance to the Authority. Only upon final inspection by the Authority and upon written acceptance for same will the system or portion thereof be considered acceptable. Upon such acceptance, the warranty period shall commence. If, during this final inspection, any irregularities are observed, the condition must be corrected at the Extender's expense prior to acceptance.

SECTION 8. RESTORATION AND CLEAN-UP OF SURFACE

8.1 Replacement of Property:

A. The Extender shall restore (unless otherwise stipulated) all sidewalks, curbing, gutters, shrubbery, fences, poles, sod, markings, traffic lines, 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.

8.2 Pavement Restoration

A. Restoration of State Highways shall be in accordance with Pennsylvania rules and regulations, PennDOT requirements, and the provisions of the highway occupancy permit. Restoration of Borough and Township Streets and other paved surfaces shall be in accordance with the requirements of the authority having jurisdiction.

8.3 Seeding Restoration

A. Lawn Restoration Materials:

1. *Permanent Seed Mixture*: PennDOT 408, Section 804, Formula B.

    a) *Kentucky Blue Grass*; a combination of improved certified varieties with no one variety exceeding 25 percent of the total Blue Grass component: 50 percent by weight.

    b) *Creeping Red or Chewing Fescue*: 30 percent by weight.

    c) *Perennial Ryegrass*; a combination of improved certified varieties with no one variety exceeding 50 percent of the total Ryegrass component: 20 percent by weight.

2. *Temporary Seed Mixture*: PennDOT 408, Section 804, Formula E. Annual Ryegrass: 100 percent.

3. Provide seed which complies with the Pennsylvania Seed Act of 1965, Act No. 187, and regulations of the Pennsylvania Department of Agriculture, Bureau of Plant Industry.

4. *Lime*: Pulverized agricultural limestone; PennDOT 408, Section 804.

5. *Mulching Material*: Oat or wheat straw, dry, free from weeds and foreign matter detrimental to plant life. Hay or chopped cornstalks are not acceptable.

6. *Mulching Material*: Wood cellulose fiber, free of growth or germination inhibiting ingredients.

7. *Planting Fertilizer*: Dry formulation of 10-20-20 analysis; PennDOT 408, Section 804.

8. *Slow-Release Nitrogen Fertilizer*: Dry formulation of 38-0-0 urea-form.

9. *Water*: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

B. Restoration of Lawns, Pastures, Meadows, and Cultivated Fields:

1. *General*:

a) Topsoil shall be free from subsoil, brush, weeds, or other litter, clay lumps and stones, but may contain decaying vegetable matter.

b) Comply with laws and regulations related to Sediment and Erosion Control.

c) Seed shall be not more than two years old. Germination tests of seeds shall be made not more than six months prior to seeding. Do not use seed which has become wet, moldy, or otherwise damaged.

d) Submit all seed mixture formulas to the Authority for approval prior to seeding.

e) The Extender shall be responsible for seeding all areas of bare soil which result from his construction operations and for producing a stand of grass in all seeded areas. Erosion, drought, or any other condition will not relieve the Extender of this requirement.

2. *Lawns*:

a) Prior to construction, strip and stockpile the full depth of existing topsoil, but no less than six inches, from all areas to be disturbed.

b) Scarify top of trench backfill to minimum depth of two inches before placing topsoil.

c) Use stockpiled topsoil to bring the trench area to final grade.

d) If stockpiled topsoil is not sufficient to provide at least six inches of topsoil over area to be restored, import sufficient topsoil to provide such coverage.

e) Use topsoil in relatively dry state. Place during dry weather.
f) Fine grade topsoil eliminating rough or low areas.

g) Remove stone, roots, grass, weeds, debris, and foreign material from topsoil while spreading.

h) Manually spread topsoil around trees, plants, building, and paving to prevent damage.

i) Lightly compact placed topsoil. Use roller weighing no more than 120 pounds per foot of roller width.

j) Remove surplus subsoil and topsoil from site.

k) Leave stockpile area and site clean and raked, ready to receive landscaping.

l) *Grading tolerance*: Finished surface of topsoil shall not deviate by more than 1/2 inch up or down from a straight edge or stringline placed across the trench and held on existing grade on both sides of the trench.

m) Apply lime at the rate of 800 pounds per 1,000 sq. yd.

n) Do no apply fertilizer sooner than three days after lime application.

o) Apply planting fertilizer at the rate recommended by manufacturer. Apply fertilizer after raking topsoil smooth and prior to roller compaction. Do not apply fertilizer at the same time or with the same machine as will be used to apply seed.

p) After spreading of fertilizer is complete, apply peat moss to a depth of 1/4-inch over the area to be seeded.

q) Mix lime, fertilizer, and peat moss thoroughly into the upper two inches of topsoil.

r) Lightly water to aid the dispersion of fertilizer.

s) Apply seed at a rate of 21 lbs. per 1,000 sq. yd evenly in two intersecting directions. Rake in lightly. Do not seed area in excess of that which can be mulched on same day.

t) *Planting season*: March 15 to June 1 and August 1 to October 15. Areas in which trench backfilling operations are completed in other time periods shall be seeded with annual Ryegrass (PennDOT 408, Section

804, Formula E) at the rate of 10 lbs. per 1,000 sq. yd to provide temporary protection. Permanent seeding shall then be applied later during the specified periods.

u) Do not sow seed immediately following rain, when ground is too dry, or during windy periods.

v) Roll seeded area with roller not exceeding 120 lbs. per foot of roller width.

w) Immediately following seeding and compacting, apply mulch at the rate of 1,200 pounds per 1,000 sq. yd for straw or 320 pounds per 1,000 sq. yd for wood cellulose fiber.

x) If straw is used for mulch, anchor straw with emulsified asphalt binder or other material approved by Engineer.

y) Apply water with a fine spray immediately after each area has been mulched.

z) At completion of Extender's work, apply slow-release nitrogen fertilizer to all seeded areas at the rate of 50 lbs. per 1,000 sq. yd.

aa) Re-seed areas which show bare spots prior to expiration of the Extender's warranty period.

3. *Pasture and Meadows*:

a) Prior to construction, strip and stockpile the full depth of the existing topsoil, but no less than 12 inches, from all areas to be disturbed. Use stockpiled topsoil to bring the trench area to final grade.

b) Remove all crushed stone and construction debris from the disturbed area.

c) *Planting season*: Perform seeding no later than the start of the next planting season following completion of trench backfilling. The planting season shall be as established by the U. S. Agricultural Service for the area of construction.

d) *Seed mixture*:

1)	Timothy	18%
2)	Orchard Grass (Pennlate or Pennmeade)	46%
3)	Redtop	18%
4)	Kentucky Bluegrass	18%

e) Spread the seed using an approved seeding procedure at the rate of 22 to 25 pounds per acre.

4. *Cultivated Fields*:

a) Prior to construction, strip and stockpile the full depth of existing topsoil, but no less than 12 inches, from all areas to be disturbed.

b) Upon completion of construction, remove all crushed stone and other construction debris.

c) Use stockpiled topsoil to bring the trench area to final grade.

d) Scarify to minimum depth of 10 inches all areas that have been compacted as a result of construction operations.

SECTION 9. CLEAN-UP AND MAINTENANCE DURING CONSTRUCTION WORK

9.1 Clean-Up

A. During construction, surfaces of all areas including, but not limited to, Streets and driveways shall be maintained on a daily basis to produce a safe, desirable, and convenient condition.

1. Streets shall be swept and flushed after trench backfilling, and re-cleaned as dust, mud, stones, and debris caused by the work, or related to the work, again accumulates.

2. Failure of the Extender to perform this work shall be cause for the Authority to order the work to be done by others and to charge all costs to the Extender.

3. During construction, Contractor is required to provide the necessary materials and equipment to maintain dust control.

9.2 Repair or Correction of Unsatisfactory Conditions

A. Any subnormal or dangerous condition caused by the work, on any surface, shall be repaired and/or corrected within two hours of observation or notification of its existence. If repairs are not made with this two-hour period, the Authority shall cause to have the work completed and the resulting cost will be charged to the Extender.

9.3 Temporary Pavement

A. The Authority and/or PennDOT may require that the Extender construct temporary pavement until conditions are suitable for placement of permanent pavement. The Extender shall continuously maintain temporary pavement until it is replaced with permanent pavement.

9.4 Temporary Sanitary Facility

A. The Authority and/or PennDOT may require that the Extender provide temporary sanitary facilities throughout the project. The Extender shall place these facilities at discrete location(s) as approved by the Authority.

SECTION 10. PUMPING STATIONS (BY SPECIAL EXCEPTION ONLY)

10.1 General

A. Use of pumping station systems will be approved by the Authority on a case-by-case basis. In order to obtain approval of a pumping station system, the Owner shall submit the following information to the Authority:

1. Capacity and horsepower for the proposed pump.

2. Size and construction of the dry well/wet well.

3. Details of the electrical power, control, and alarm systems.

4. Size and material of proposed pump discharge line and associated valves.

5. Details of the connection to the Sewer System.

6. Proposed location of all system components.

7. Design computations.

8. Copies of permits and approval notifications from agencies other than the Authority.

B. Plans and specifications for all proposed pumping station system must be reviewed and approved by the Authority before installation.

C. Following approval by the Authority, the Owner will be responsible for all costs associated with construction of the system, for all permit and approval costs, and for all costs which may result from damage to the Sewer System, or to other utilities and facilities, during construction of the system.

SECTION 11. GRINDER PUMPING SYSTEMS INCLUDING LOW PRESSURE (BY SPECIAL EXCEPTION ONLY)

11.1 General

A. Use of grinder pump systems will be approved by the Authority on a case-by-case basis. In order to obtain approval of a grinder pumping system, the Owner shall submit the following information to the Authority:

1. Capacity and horsepower for the proposed pump.

2. Size and construction of the wet well.

3. Details of the electrical power, control, and alarm systems.

4. Size and material of proposed pump discharge line and associated valves.

5. Details of the connection to the Sewer System.

6. Proposed location of all system components.

7. Design computations.

8. Copies of permits and approval notifications from agencies other than the Authority.

B. Plans and specifications for all proposed grinder pump systems must be reviewed and approved by the Authority before installation.

C. Following approval by the Authority, the Owner will be responsible for all costs associated with construction of the system, for all permit and approval costs, and for all costs which may result from damage to the Sewer System, or to other utilities and facilities, during construction of the system. The Owner shall be responsible for continuously maintaining the system after installation. Acceptable manufacturers and specifications: Meyers, Hydro-Matic, or approved equal.

SECTION 12. OIL AND GREASE INTERCEPTORS (WHEN DIRECTED BY AUTHORITY)

12.1 General

A. When Sanitary Sewage and/or Industrial Waste which is being discharged to the Authority Sewer System contains oil and/or grease in excess of the limits established in the Authority's Industrial Waste Resolution, oil and/or grease interceptors shall be installed.

B. Installation plans and specifications for proposed oil and grease interceptor systems shall be submitted to the Authority prior to the start of installation. Installation shall not be started until approval of the system has been obtained from the Authority.

SECTION 13. SAMPLING AND FLOW MEASUREMENT (WHEN DIRECTED BY AUTHORITY)

13.1 General

A. When required by the Authority, the Owner of any property serviced by the Sewer System shall install at his expense a suitable control manhole together with such meters and other appurtenances in the Building Sewer and/or Service Line to facilitate observation, sampling, and measurement of the waste generated on the Owner's property. All materials, use, and installation must be approved by the Authority prior to the installation of such system.

APPENDICES

APPENDIX 1

Sewer Testing Forms

SEWER FORCE MAIN PRESSURE TEST REPORT

MOUNT JOY BOROUGH AUTHORITY

SEWER FORCE MAIN
PRESSURE TEST REPORT

Date: _____ Computed By: _____

Development: _____ Checked By: _____

Drawing No.: _____ Sheet No. _____ of _____

Contractor: _____

Average Test Pressure: _____ Test Start: _____ Test Finish _____

L = Allowable Leakage in Gallons (GPH) _____ Location:

S = Length of Pipe Tested In Feet _____

D = Diameter of Pipe in Inches _____

P = Average Test Pressure in PSI _____

NOTE: 7.481 Gallons/FT_3

TEST DATA			
Time	Pressure	Loss or Make up Water	
			Start
			1/2 Hr. Reading
			Repressure
			1 Hr. Reading
			Repressure
			1-1/2 Hr. Reading
			Repressure
			2 Hr. Reading
			Repressure

Total Leakage for 2 Hour Period _____

Allowed Leakage for 2 Hour Period _____

Line Passes or Fails Test (circle one) ***PASS / FAIL***

NOTE: Allowed leakage based on shortest valve section in test.

CALCULATIONS

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

GRAVITY SEWER TEST REPORT

MOUNT JOY BOROUGH AUTHORITY

Gravity Sewer Test Report

Development: _____ Drawing No.: _____ Sheet No. _____ of _____

Contractor: _____ Inspected By: _____ Date: _____

Street	Between MH No.	MH No.	Pipe Size & Length Tested	Deflection Test	Time Start	Complete	Pressure Test PSIG Start	PSIG End	PSIG Loss	Result

forms\MJBA-Gravity-Sewer.xls

MANHOLE VACUUM TEST REPORT

MOUNT JOY BOROUGH AUTHORITY

Manhole Vacuum Test Report

Development: _____ Drawing No.: _____ Sheet No. _____ of _____

Contractor: _____ Inspected By: _____ Date: _____

Street	Manhole	Time		Vacuum (inches of Hg)			Result	
		Start	Stop	Start	Stop	Loss	Pass	Fail

NOTE: 4' Dia. = 60 sec. - 5' Dia. = 75 sec. - 6' Dia. = 90 sec.

Inspector: _____

LATERAL LOCATIONS

MOUNT JOY BOROUGH AUTHORITY

Lateral Locations

Development: _____

Contractor: _____

Material: _____ Distance: _____ Slope: _____

Street Name: _____ In a Right-of-Way: _____

Lot	Length	Depth	Station	**Manhole No. _____**	Station	Depth	Length	Lot

F
L
O
W

Manhole No. _____

Date Tested: _____ Drawing No.: _____

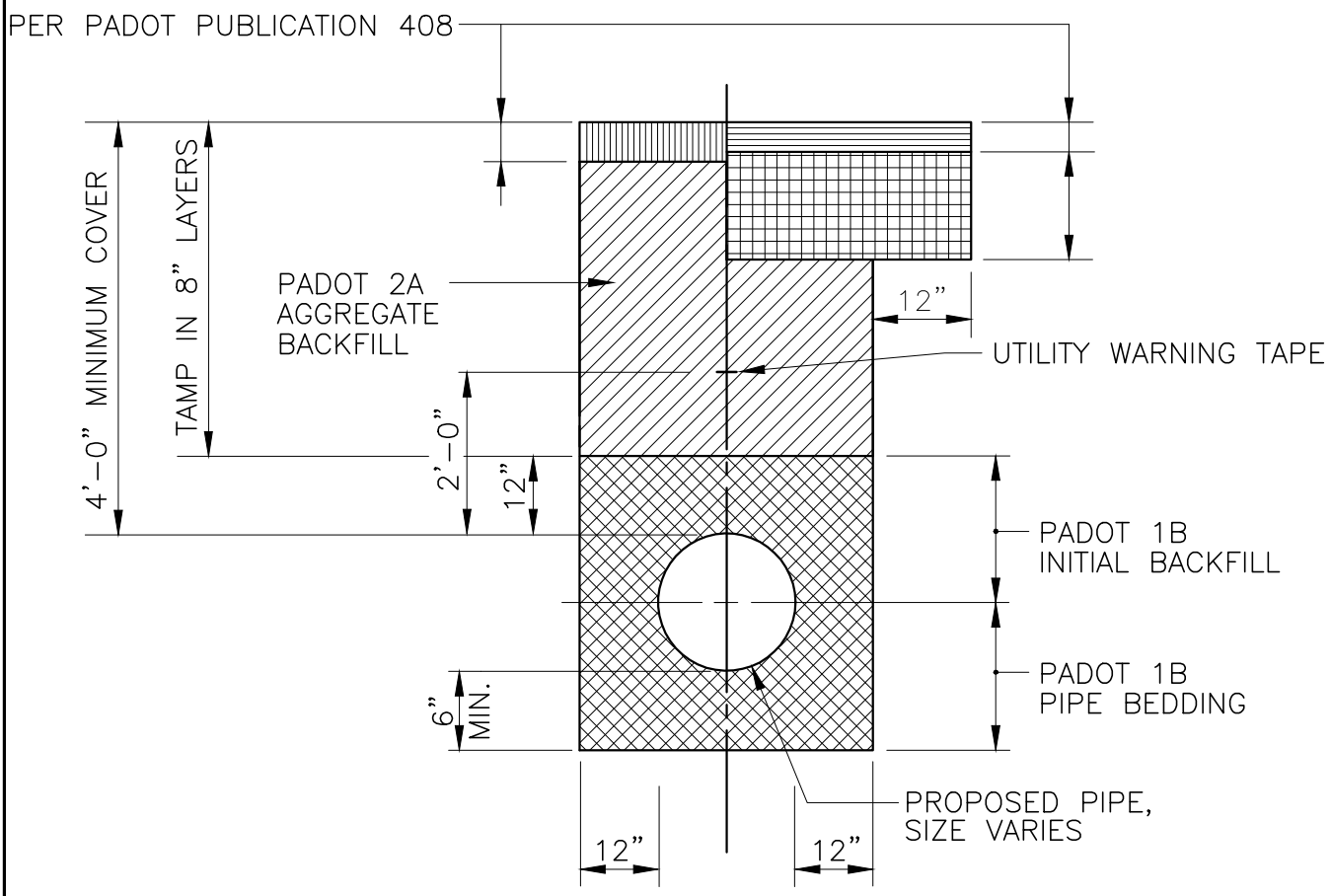
Inspector: _____ Prepared By: _____

APPENDIX 2

Standard Details

TEMPORARY

PERMANENT



ALL WORK TO BE DONE IN ACCORDANCE WITH PADOT PUBLICATION 408M WHEN IN PADOT R.O.W.

Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

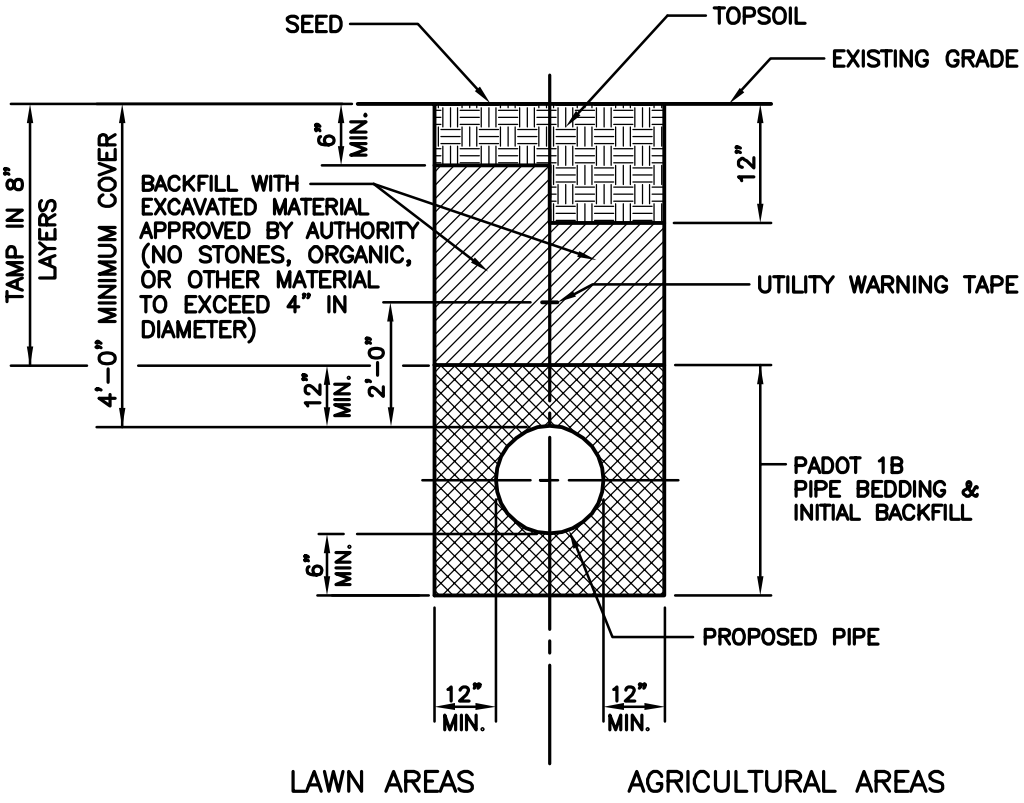
ARRO Consulting, Inc.

BACKFILL AND PAVEMENT RESTORATION DETAIL FOR STATE/BORO/TWP ROADS

DATE: JULY 2020

DETAIL: 1

Dwg. Name: 07036685.DWG Plotted: 7/7/2020 10:09 AM



Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

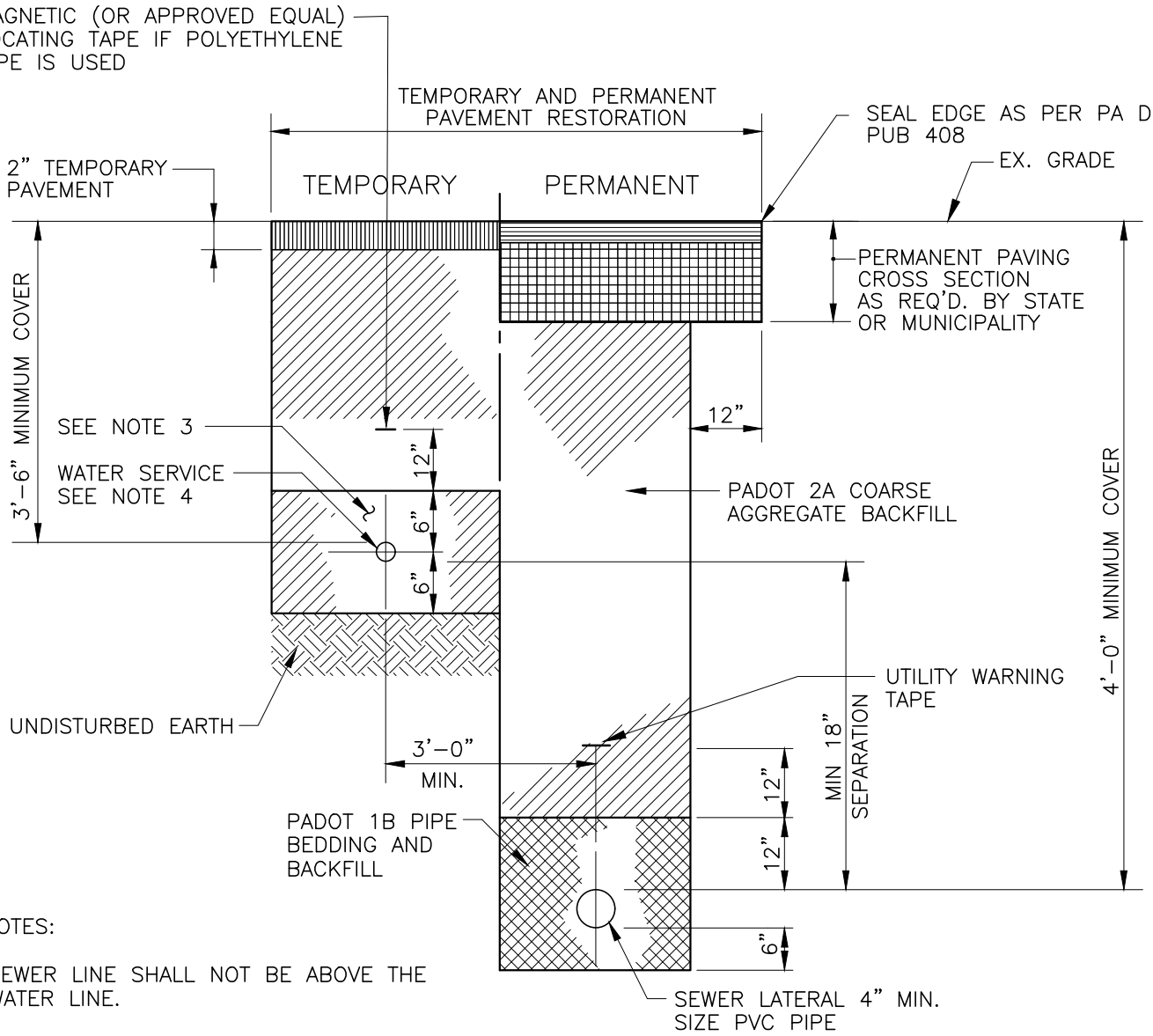
ARRO Consulting, Inc.

TRENCH RESTORATION LAWN/AGRICULTURAL AREAS

DATE: FEBRUARY 2010

DETAIL: 2

Dwg. Name: 07036621.DWG Last Revised: 02/17/10 11:17



NOTES:

1. SEWER LINE SHALL NOT BE ABOVE THE WATER LINE.
2. SEWER LINE SHALL NOT CROSS THE WATER LINE.
3. SILICA SAND (WHEN POLYETHYLENE SERVICE LINE IS USED, TRACER WIRE MUST BE INSTALLED)
4. WATER SERVICE LINE MIN. 3/4" TYPE K COPPER (MAIN TO CURB STOP) OR 3/4" SDR-9 POLYETHYLENE TUBING (CURB STOP TO BUILDING)

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

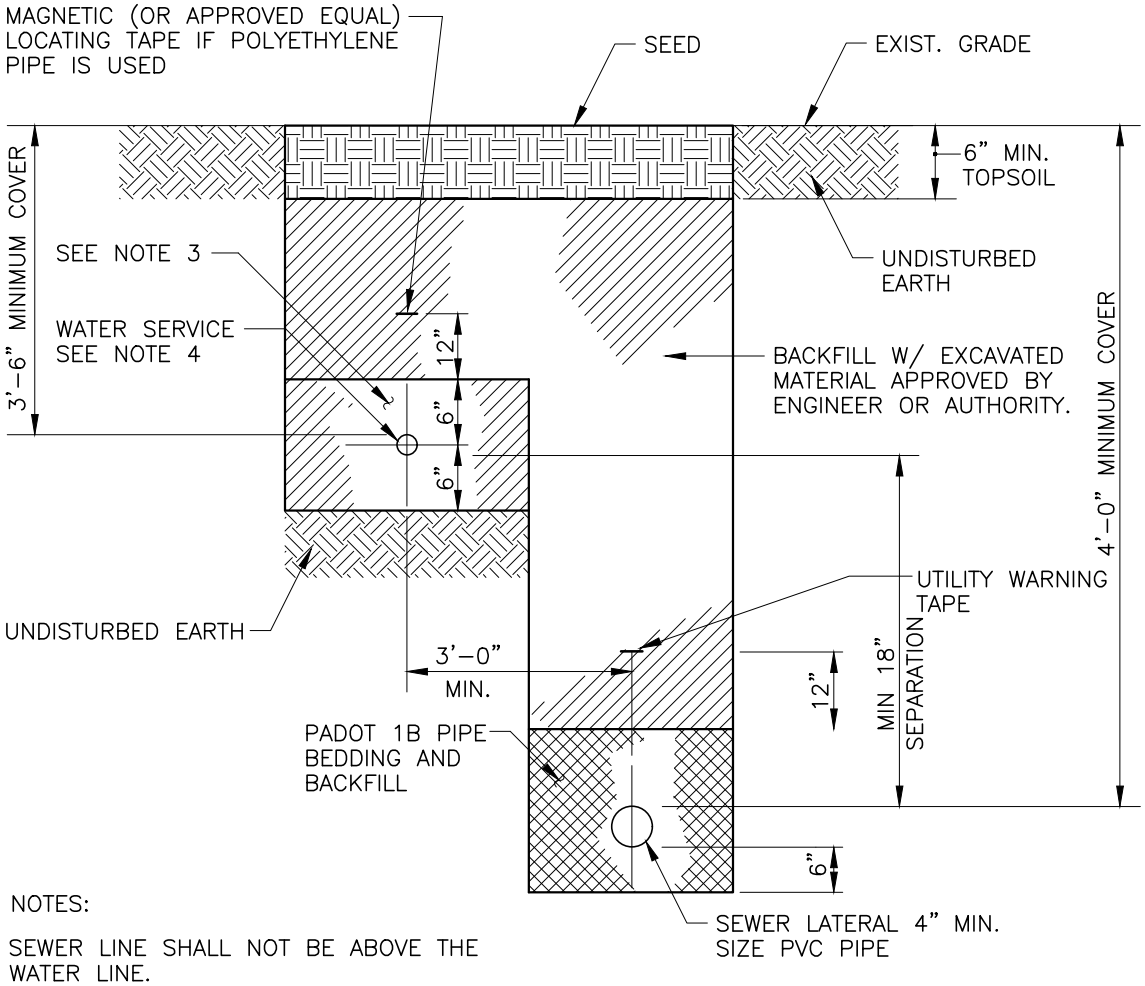
ARRO Consulting, Inc.

COMBINED TRENCH DETAIL SEWER LATERAL/ WATER SERVICE LINE STATE/BORO/TWP. ROADS

DATE: JULY 2020

DETAIL: 3

Dwg. Name: 07036537.DWG Plotted: 7/7/2020 10:07 AM



NOTES:

1. SEWER LINE SHALL NOT BE ABOVE THE WATER LINE.
2. SEWER LINE SHALL NOT CROSS THE WATER LINE.
3. 3. SILICA SAND (WHEN POLYETHYLENE SERVICE LINE IS USED, TRACER WIRE MUST BE INSTALLED)
4. WATER SERVICE LINE MIN. 3/4" TYPE K COPPER (MAIN TO CURB STOP) OR 3/4" SDR-9 POLYETHYLENE TUBING (CURB STOP TO BUILDING)

Mount Joy Borough Authority

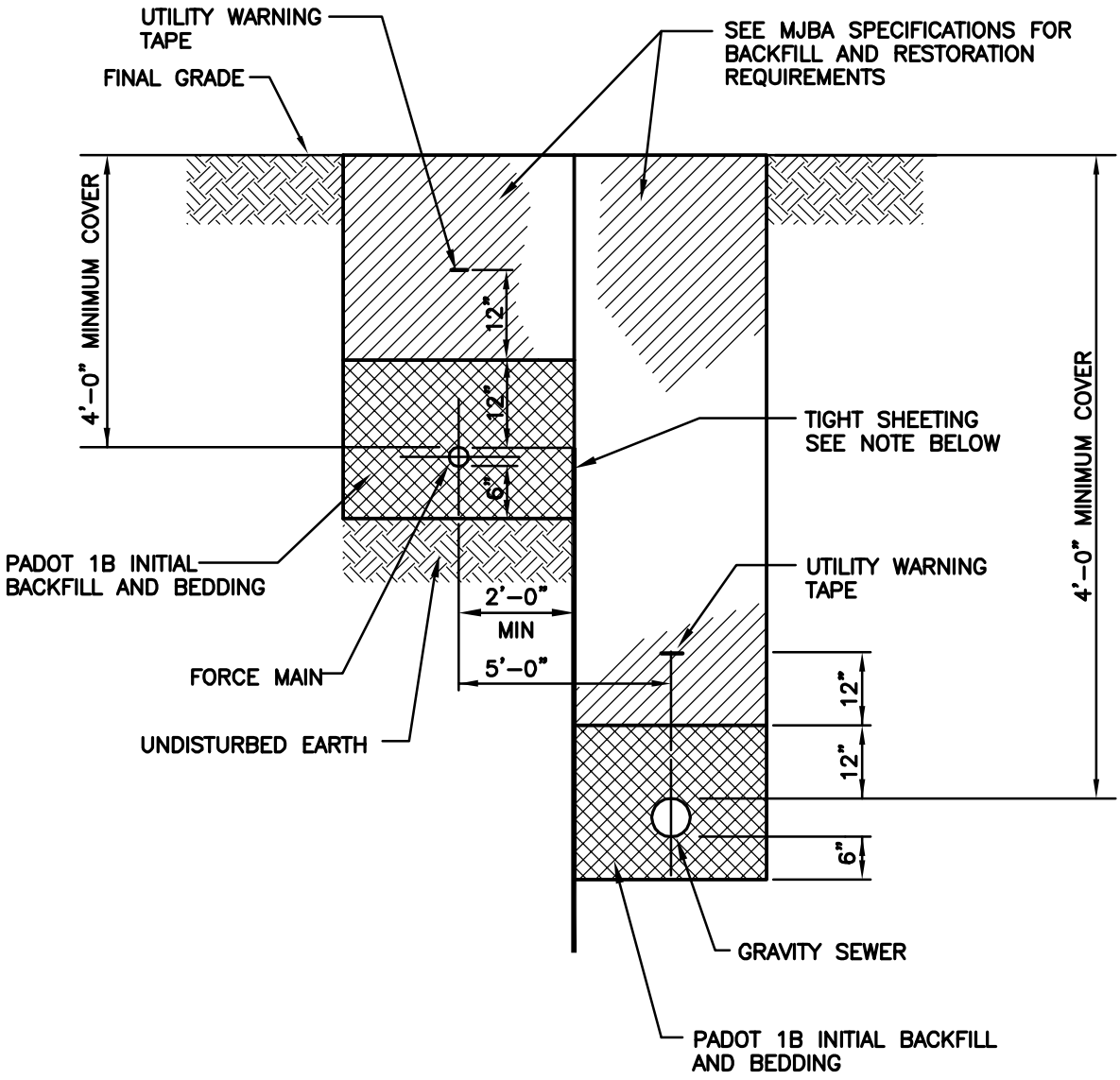
STANDARD DETAIL - SEWER SYSTEM

ARRO Consulting, Inc.

COMBINED TRENCH DETAIL SEWER LATERAL/ WATER SERVICE LINE LAWN/AGRICULTURAL AREAS

DATE: JULY 2020

DETAIL: 4



NOTE:

PROVIDE TIGHT STEEL SHEETING WHERE EXCAVATION FOR GRAVITY SEWER EXCEEDS 8 FT. SHEETING SHALL BE LEFT IN PLACE AND SHALL BE SUITABLE TO SUPPORT LOADS IMPOSED. ALL REQUIRED SHEETING DESIGN SHALL BE SEALED BY A PRROFESSIONAL ENGINEER.

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

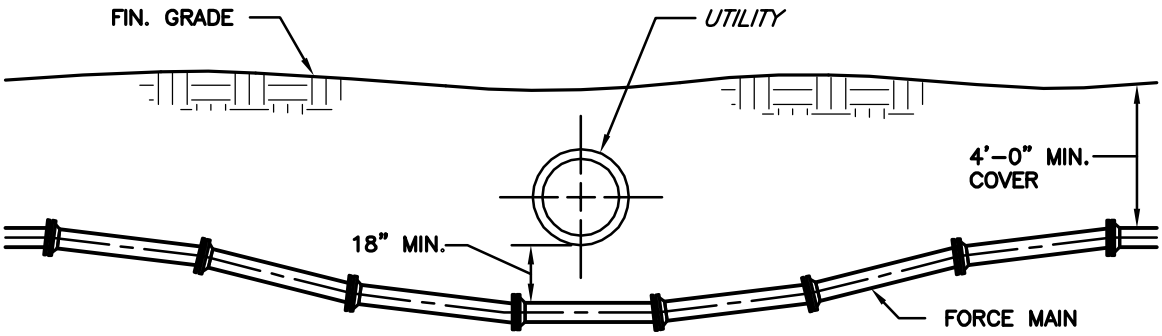
ARRO Consulting, Inc.

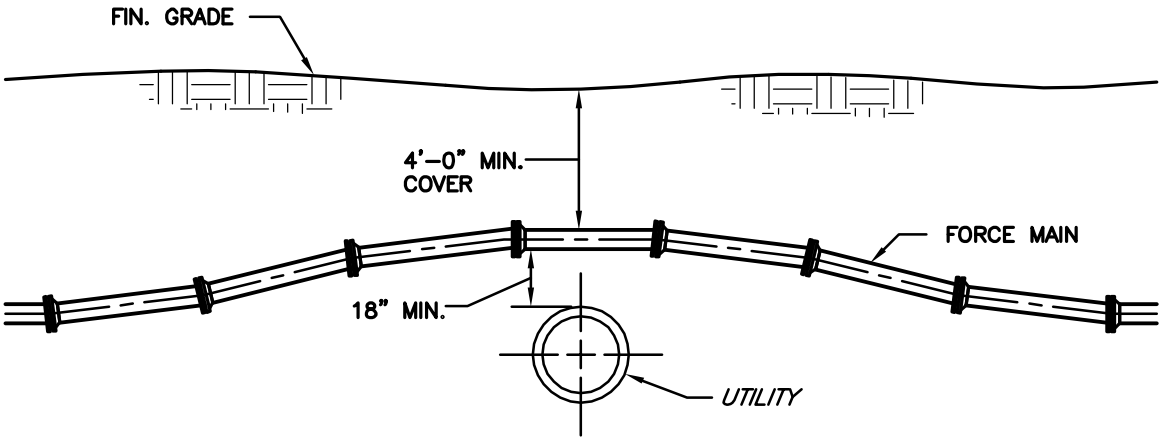
COMBINED TRENCH DETAIL FORCE MAIN/GRAVITY SEWER

DATE: FEBRUARY 2010

DETAIL: 5

Dwg. Name: 07036793.DWG Last Revised: 02/18/10 15:34





NOTE:
AN AIR VALVE MAY BE REQUIRED AT THE APEX OF THE FORCE MAIN.

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

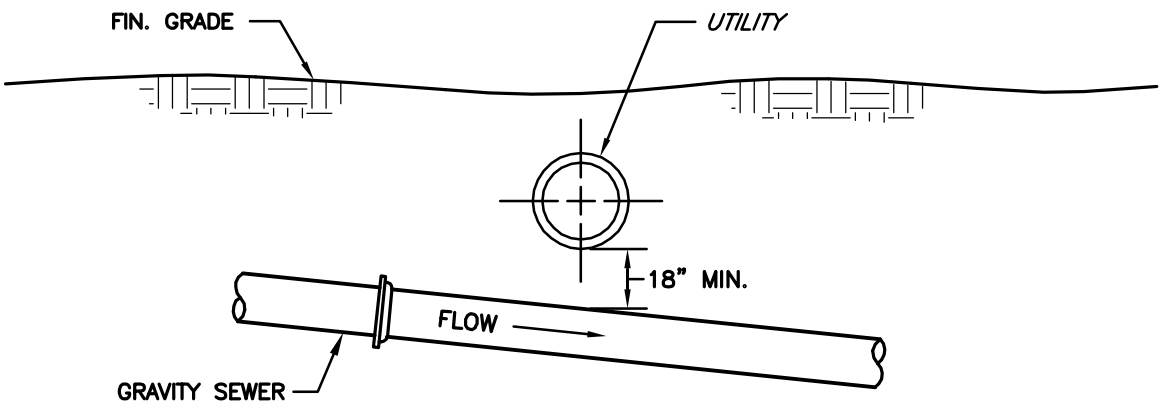
ARRO Consulting, Inc.

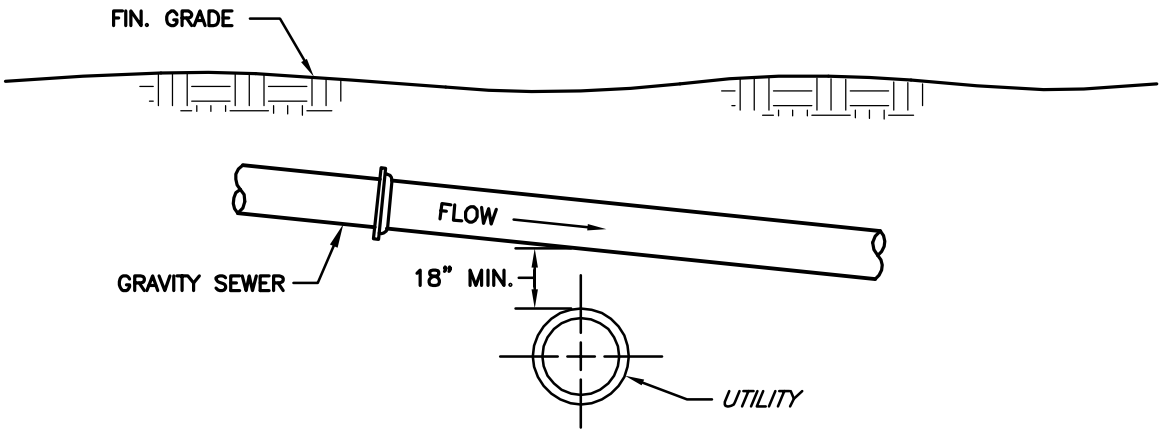
FORCE MAIN CROSSING UTILITY DETAIL (USING DEFLECTING JOINTS)

DATE: DECEMBER 2008

DETAIL: 6

Dwg. Name: 07036681.DWG Last Revised: 12/01/08 11:09





NOTE: MAINTAIN SLOPE OF PROPOSED SEWER AT ALL CROSSINGS.

Mount Joy Borough Authority

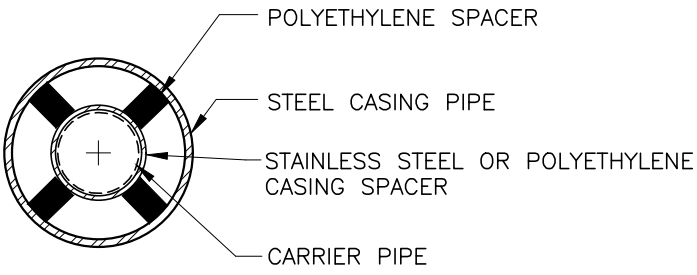
STANDARD DETAIL - SEWER SYSTEM

ARRO Consulting, Inc.

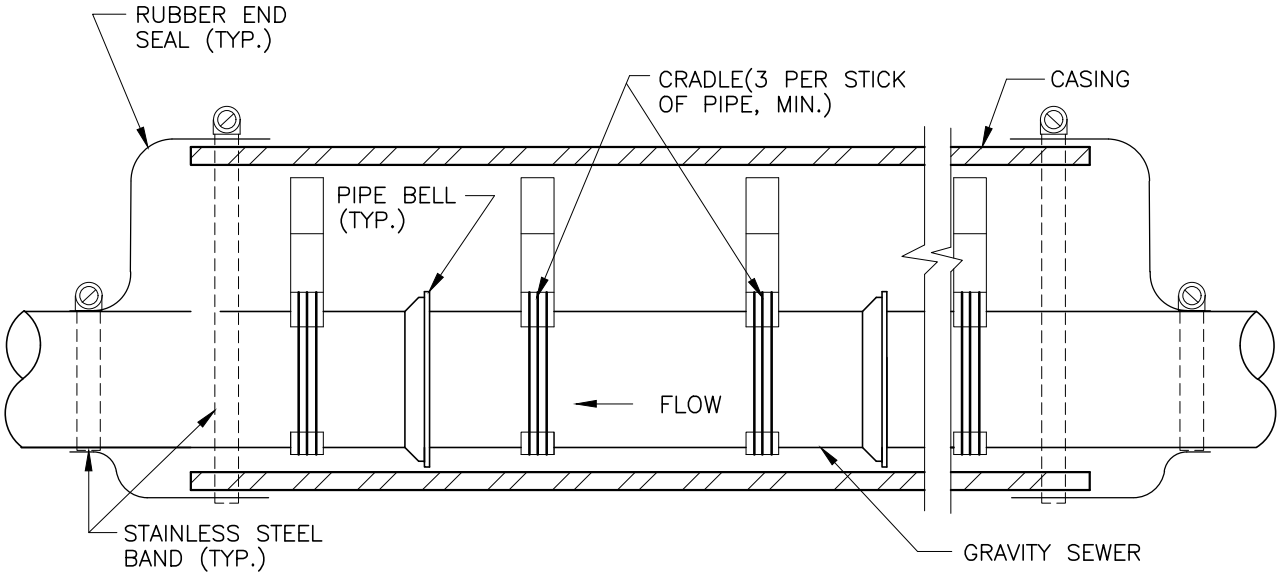
GRAVITY SEWER CROSSING UTILITIES DETAIL

DATE: DECEMBER 2008

DETAIL: 7



SECTION



ELEVATION

Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

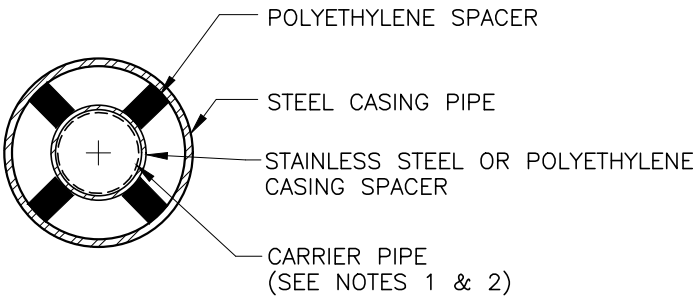
ARRO Consulting, Inc.

CASING CRADLE DETAIL – GRAVITY SEWER INSTALLATION VIA BORING/JACKING

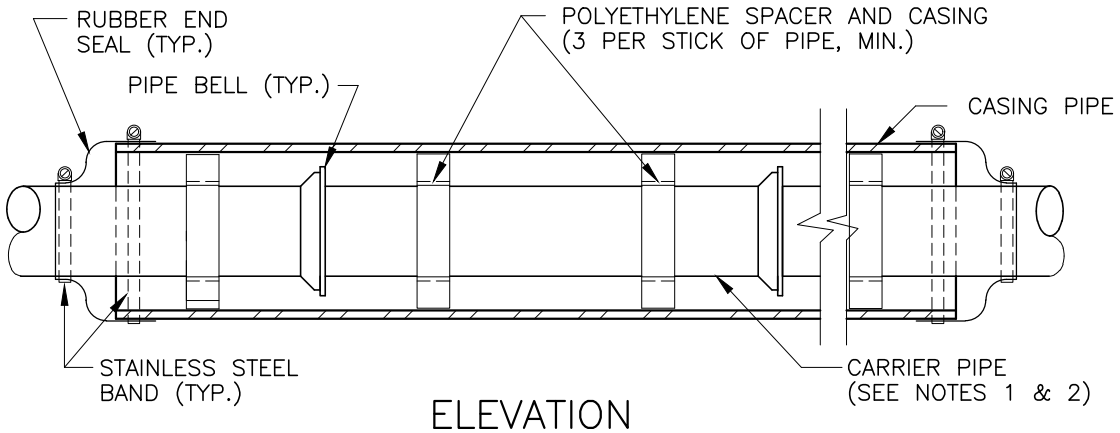
DATE: JULY 2020

DETAIL: 8

Dwg. Name: 07036680.DWG Plotted: 7/7/2020 10:33 AM



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.

Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

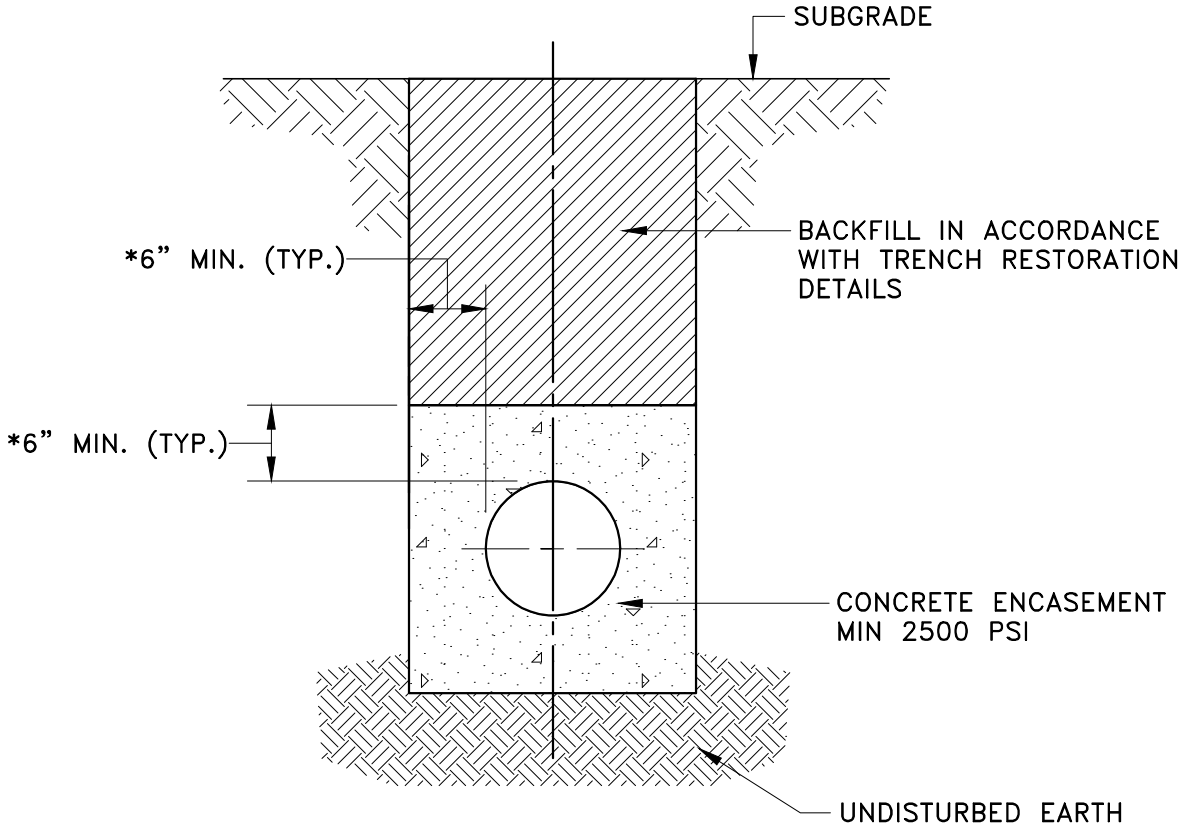
ARRO Consulting, Inc.

CASING CRADLE DETAIL (OPEN CUT OR FORCE MAIN)

DATE: JULY 2020

DETAIL: 9

Dwg. Name: 07036622.DWG Plotted: 7/7/2020 10:37 AM



* 6" MINIMUM THICKNESS FOR PIPES UP TO 24 INCHES DIAMETER.
9" MINIMUM THICKNESS FOR PIPES 24 INCHES DIAMETER AND GREATER.

Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

ARRO Consulting, Inc.

STANDARD CONCRETE ENCASING DETAIL (BY SPECIAL EXCEPTION ONLY)

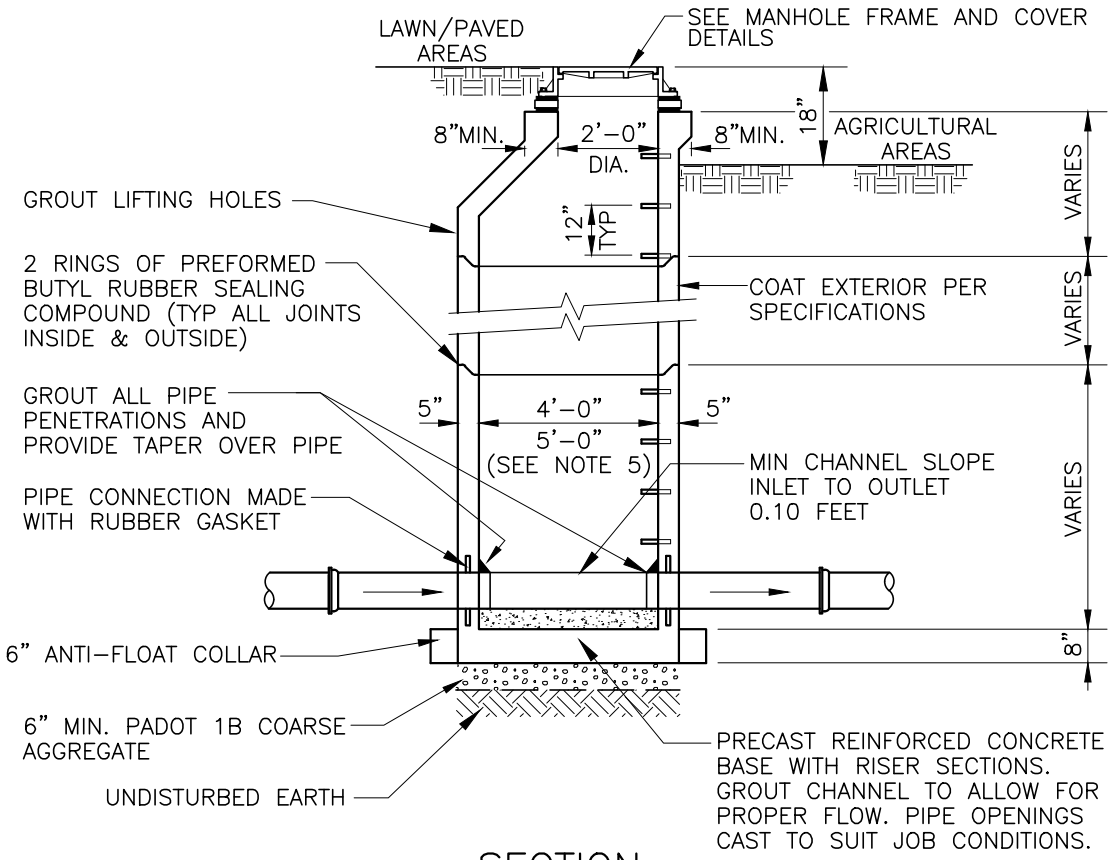
DATE: JULY 2020

DETAIL: 10

Dwg. Name: 02757470.DWG Plotted: 7/8/2020 7:48 AM

NOTES:

1. ADJUST TO GRADE WITH CONCRETE GRADE RINGS (MAX. VERT. ADJUST. 6"). SEE MANHOLE 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 6", PROVIDE INSIDE DROP MANHOLE. SEE DETAIL 15.
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. INSIDE DIAMETER DETERMINED BY CHANNEL CONFIGURATION. SEE PRECAST CHANNEL DETAILS



SECTION

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

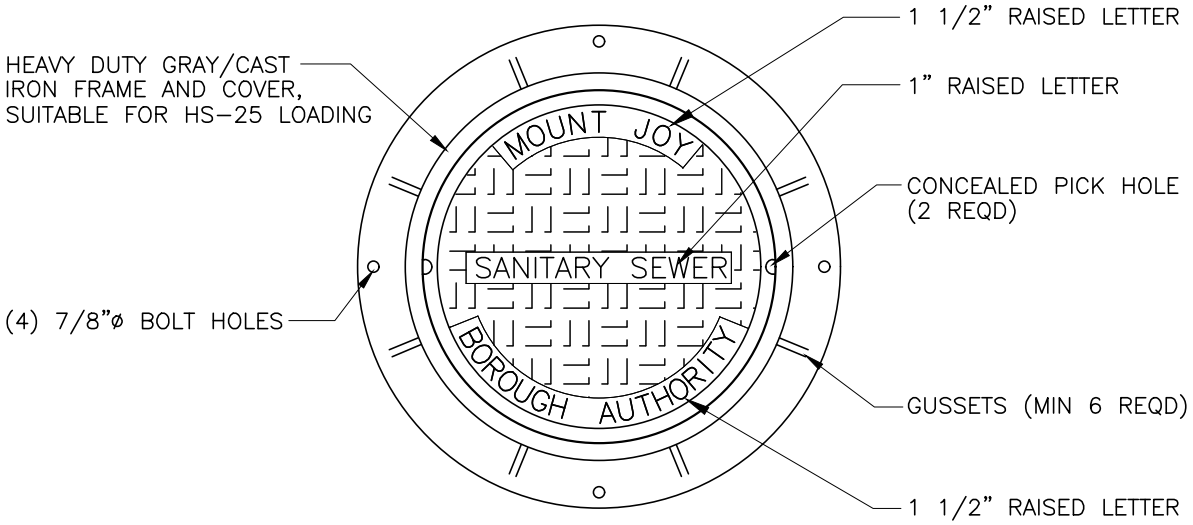
ARRO ENGINEERING & ENVIRONMENTAL CONSULTANTS
108 West Airport Road
Lititz, Pennsylvania 17543
Tel 717.569.7021

PRECAST MANHOLE DETAIL 8'' THRU 24'' SEWERS

DATE: JULY 2020

DETAIL: 11

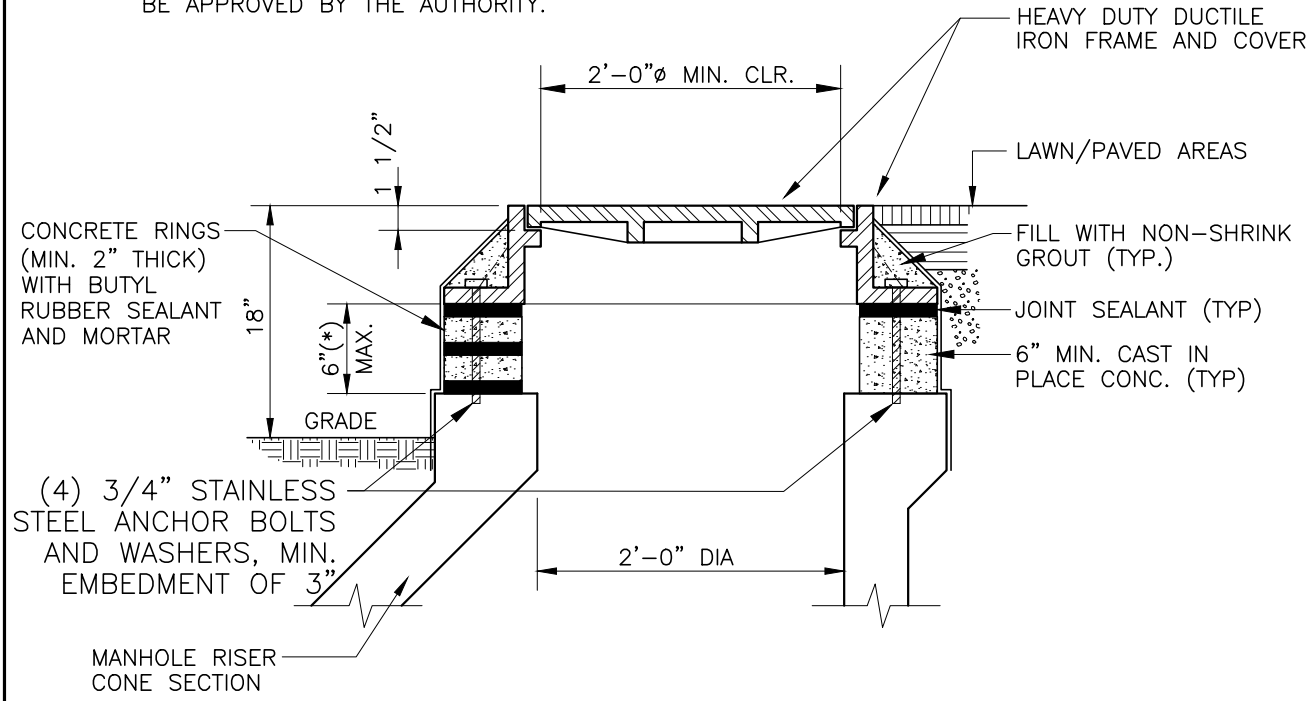
Dwg. Name: 07036627.DWG Plotted: 7/7/2020 11:09 AM



COVER PATTERN

NOTES:

1.) IF FRAME AND COVER EXISTS IN PADOT R.O.W., GRADE RINGS SHALL BE PER PADOT SPEC.'S AND MUST BE APPROVED BY THE AUTHORITY.



Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

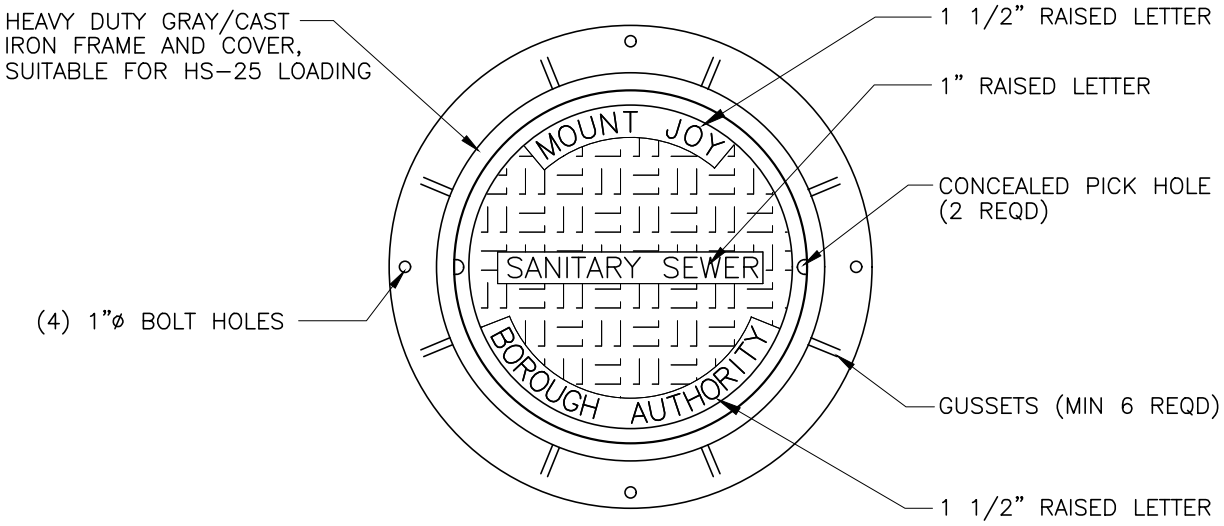
ARRO
ENGINEERING & ENVIRONMENTAL CONSULTANTS
108 West Airport Road
Lititz, Pennsylvania 17543
Tel 717.569.7021

STANDARD MANHOLE FRAME & COVER DETAIL

DATE: JULY 2020

DETAIL: 12

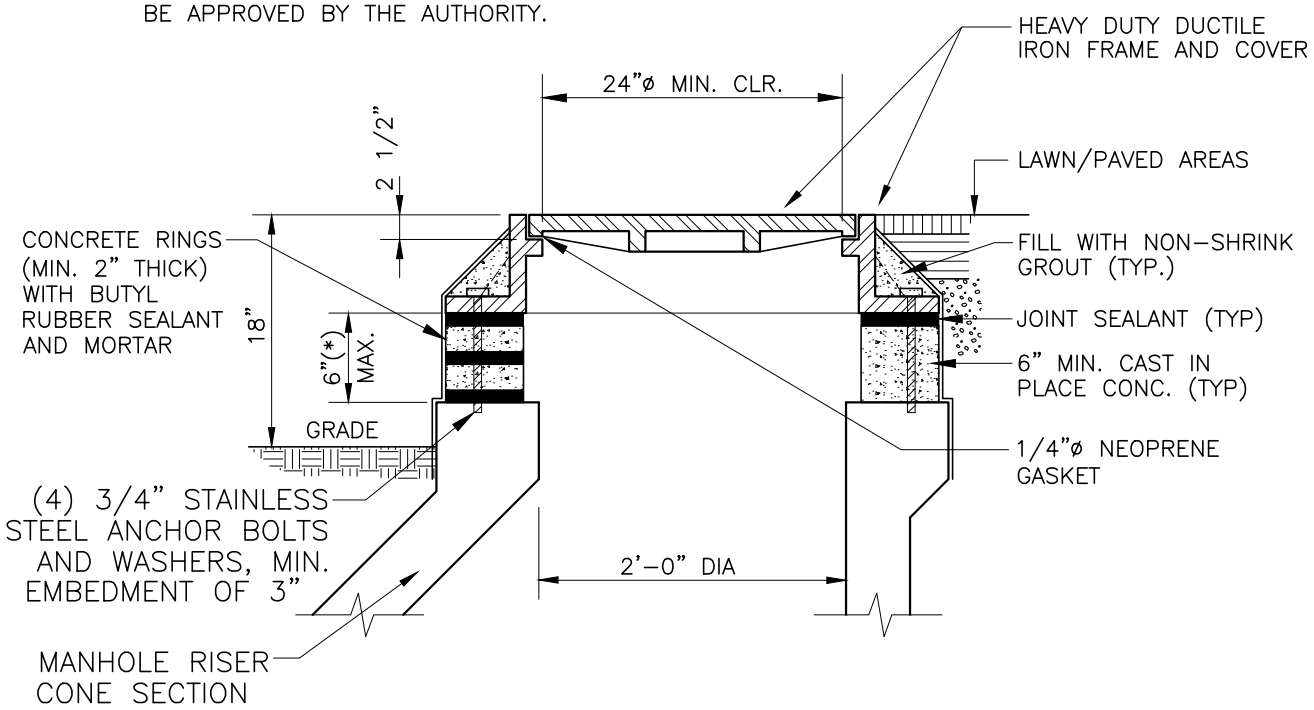
Dwg. Name: 07036618.DWG Plotted: 7/7/2020 11:17 AM



COVER PATTERN

NOTES:

1.) IF FRAME AND COVER EXISTS IN PADOT R.O.W., GRADE RINGS SHALL BE PER PADOT SPEC.'S AND MUST BE APPROVED BY THE AUTHORITY.



Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

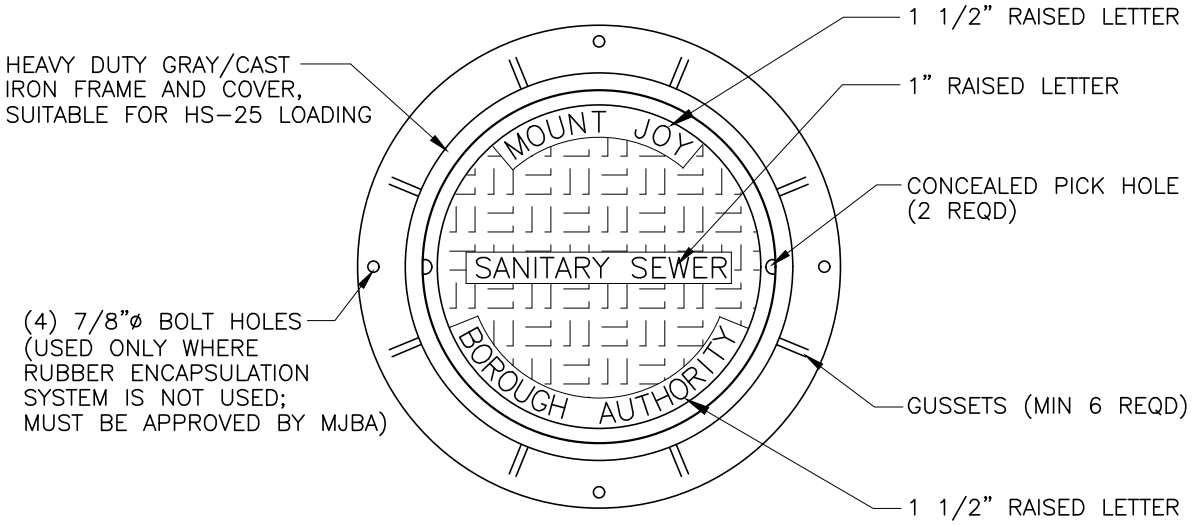
ARRO ENGINEERING & ENVIRONMENTAL CONSULTANTS
108 West Airport Road
Lititz, Pennsylvania 17543
Tel 717.569.7021

'HIGH TRAFFIC' MANHOLE FRAME & COVER DETAIL (AUTH. APPROVAL REQ'D.)

DATE: JULY 2020

DETAIL: 13

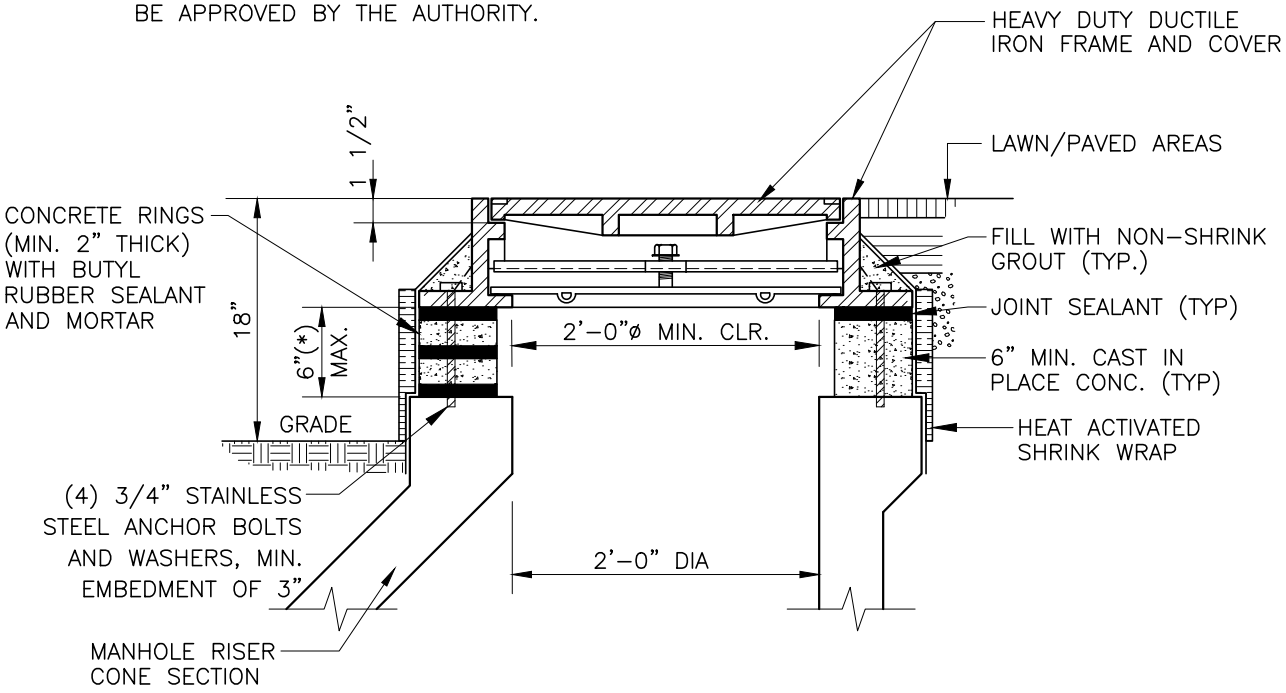
Dwg. Name: 07036630.DWG Plotted: 7/7/2020 11:13 AM



COVER PATTERN

NOTES:

1.) IF FRAME AND COVER EXISTS IN PADOT R.O.W., GRADE RINGS SHALL BE PER PADOT SPEC.'S AND MUST BE APPROVED BY THE AUTHORITY.



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

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

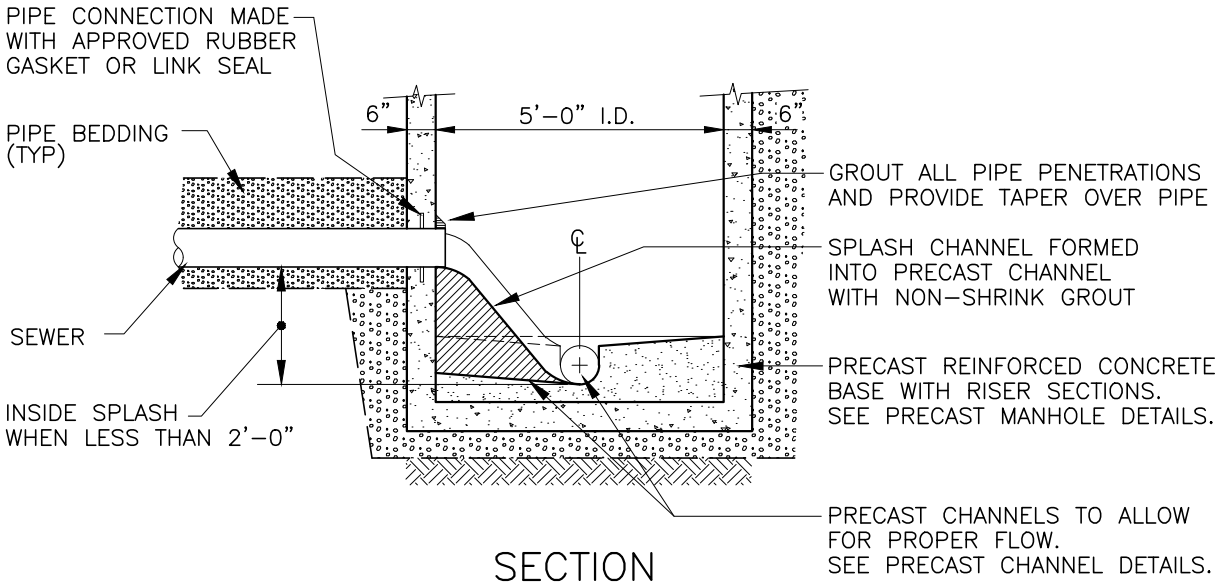
ARRO
ENGINEERING & ENVIRONMENTAL CONSULTANTS
108 West Airport Road
Lititz, Pennsylvania 17543
Tel 717.569.7021

WATERTIGHT MANHOLE FRAME & COVER DETAIL

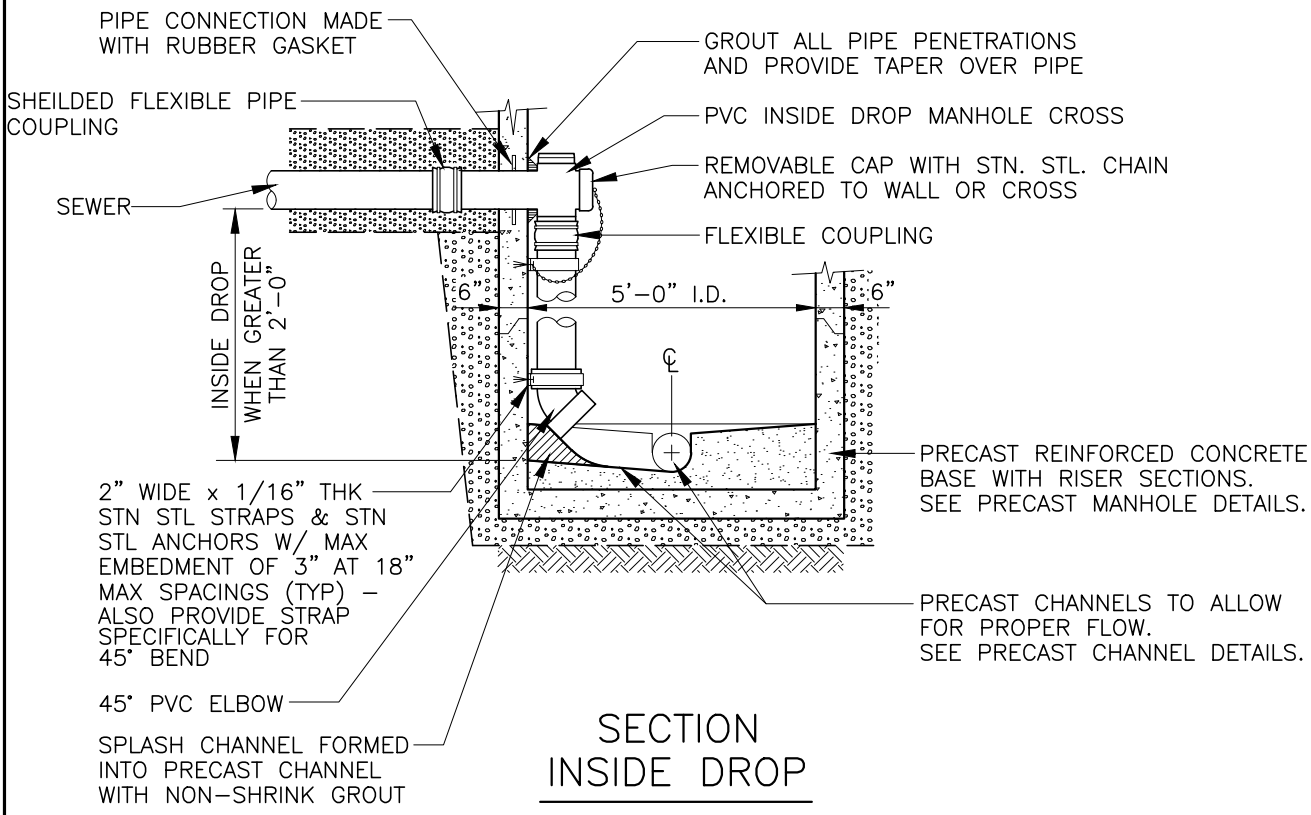
DATE: JULY 2020

DETAIL: 14

Dwg. Name: 07036619.DWG Plotted: 7/7/2020 11:19 AM



SECTION INSIDE SPLASH



SECTION INSIDE DROP

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

ARRO Consulting, Inc.

PRECAST SANITARY MANHOLE INSIDE SPLASH/ INSIDE DROP CONNECTION (8"-10" SEWERS)

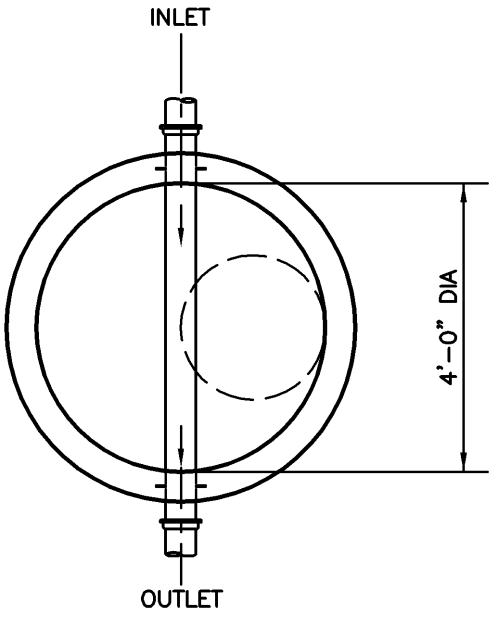
DATE: JULY 2020

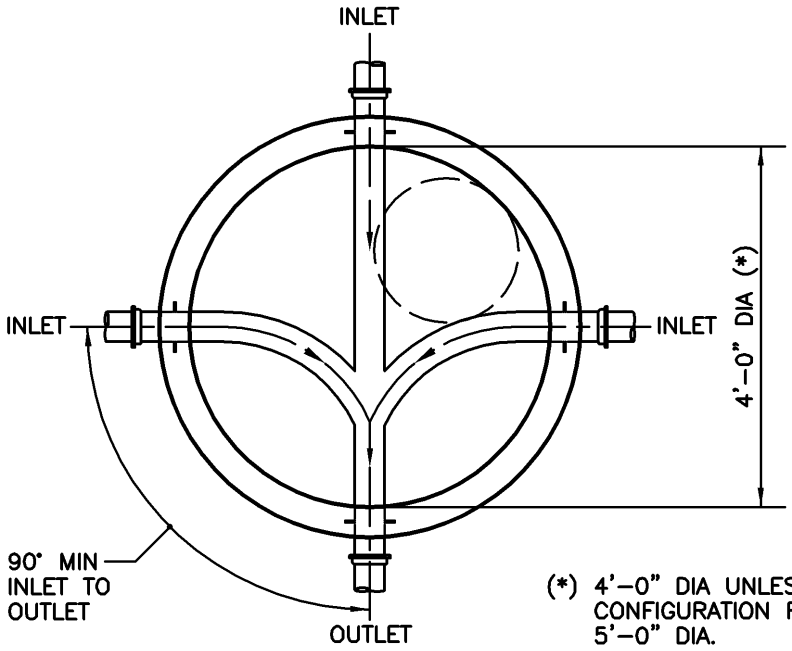
DETAIL: 15

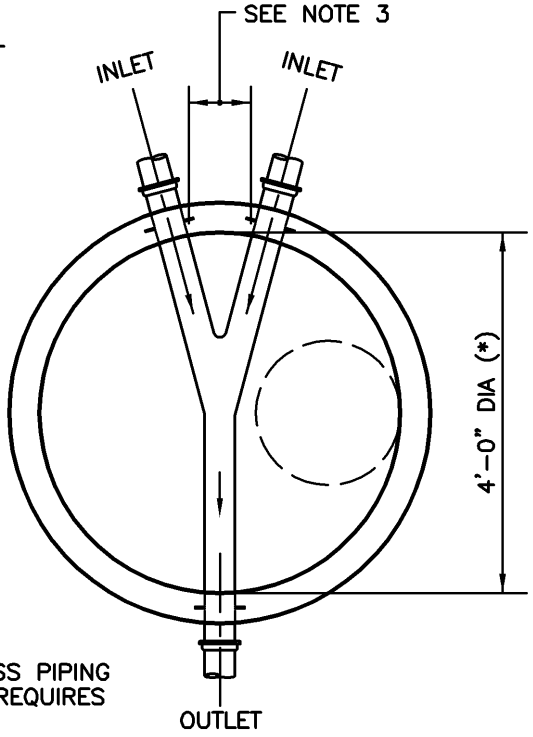
Dwg. Name: 07036780.DWG Plotted: 7/7/2020 11:22 AM

NOTES:

1. THREE INLET PIPES AND ONE OUTLET PIPE MAX INTO MANHOLE.
2. NO LATERALS INTO MANHOLES, EXCEPT BY SPECIAL EXCEPTION FROM MOUNT JOY BOROUGH AUTHORITY.
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. MANHOLE SIZE:
   1 INLET PIPE – 4 FT DIA
   2 AND 3 INLET PIPES – 4 FT DIA (*)
6. ALL CHANNELS SHALL BE PRECAST, UNLESS OTHERWISE SPECIFICALLY NOTED OR APPROVED.
7. THESE DETAILS APPLY TO PRECAST & FIELD–FORMED CHANNELS IN NEW & EXISTING MANHOLES.
8. CHANNEL BENCH AT PIPE SHALL MATCH CROWN ELEVATION OF PIPE AND RISE 1/2" PER FOOT TO THE MANHOLE WALLS.
9. 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.
10. MIN. DEPTH OF CHANNEL SHALL MATCH DIAMETER OF LARGEST PIPE ENTERING MANHOLE.
11. CROWN OF ALL PIPES ENTERING AND EXITING MANHOLE SHALL BE SET AT THE SAME ELEVATION.







(*) 4'–0" DIA UNLESS PIPING CONFIGURATION REQUIRES 5'–0" DIA.

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

ARRO Consulting, Inc.

PRECAST CHANNEL DETAILS

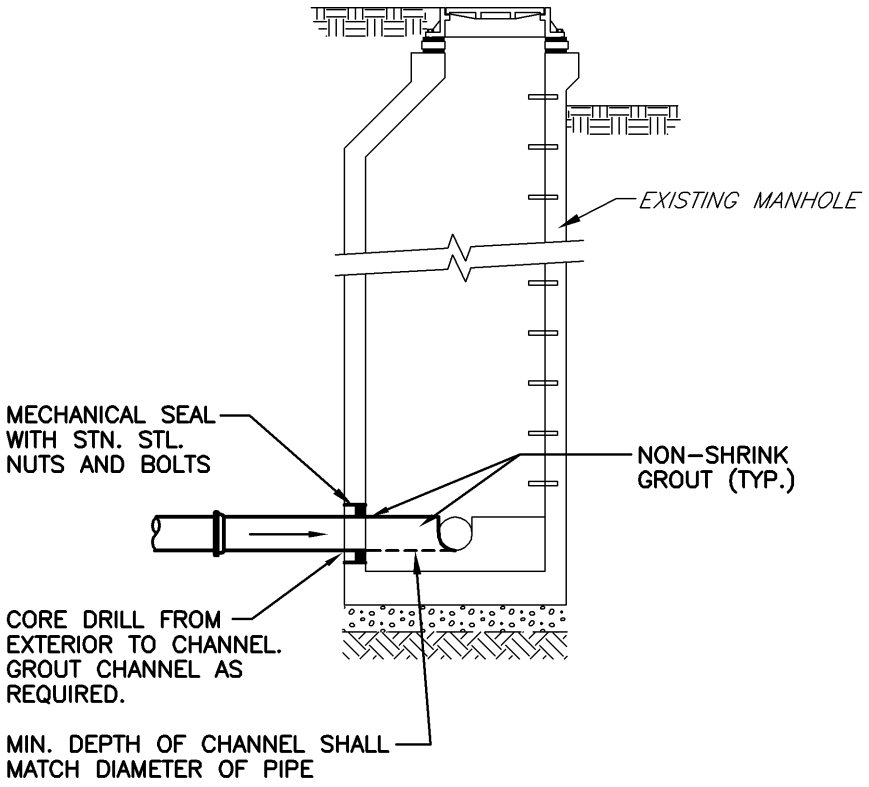
DATE: DECEMBER 2008

DETAIL: 16

Dwg. Name: 07036782.DWG Last Revised: 12/01/08 11:41

NOTE:

1. TOP OF PROPOSED PIPE ELEV. SHALL MATCH TOP OF EXISTING PIPE ELEVATION.



SECTION

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

ARRO Consulting, Inc.

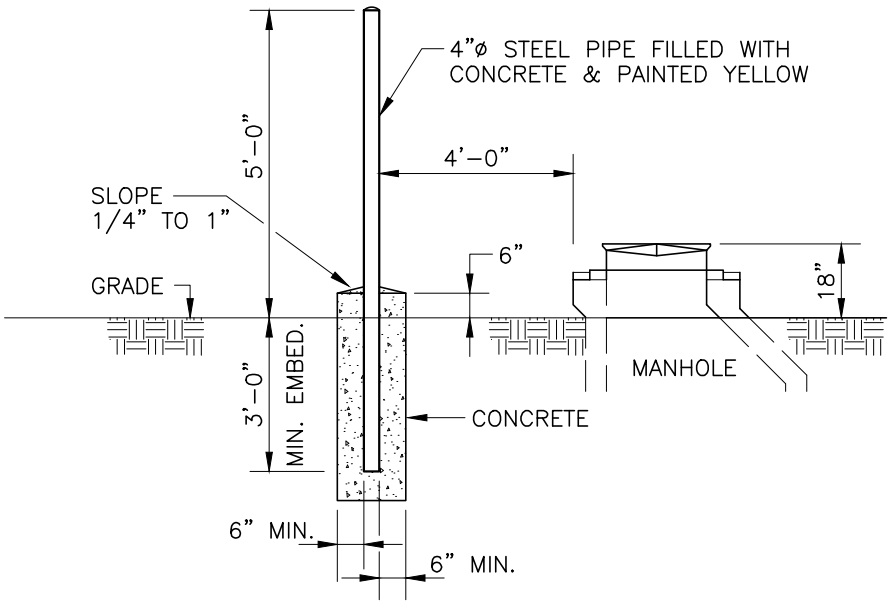
GRAVITY SEWER CONNECTION TO EXISTING MANHOLE DETAIL

DATE: DECEMBER 2008

DETAIL: 17

Dwg. Name: 07036624.DWG Last Revised: 12/01/08 11:43

NOTE:
POSTS SHALL BE LOCATED WHERE
DIRECTED OTHERWISE BY THE AUTHORITY.



ELEVATION

Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

ARRO Consulting, Inc.

MANHOLE PROTECTION POSTS (AGRICULTURAL AREAS)

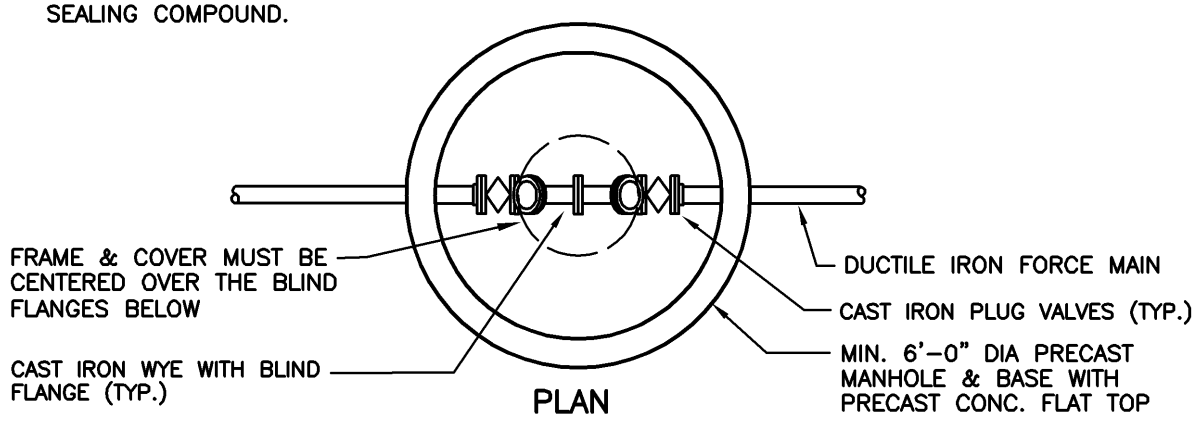
DATE: JULY 2020

DETAIL: 18

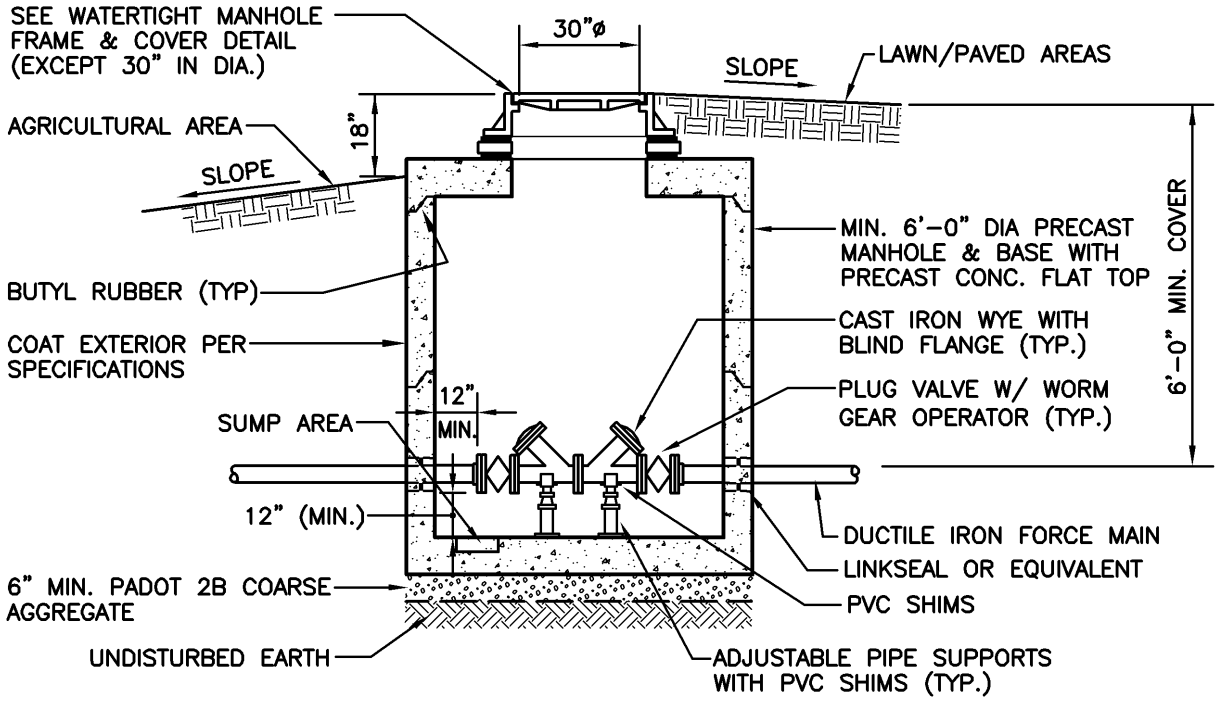
Dwg. Name: 07036679.DWG Plotted: 7/7/2020 11:24 AM

NOTES:

1. ADJUST TO GRADE WITH CAST IN PLACE CONCRETE. SEE MANHOLE FRAME AND COVER DETAILS.
2. MECHANICALLY VIBRATED PRECAST CONCRETE SHALL CONFORM TO A.S.T.M. C-478.
3. SEAL ALL JOINTS INSIDE & OUTSIDE WITH PREFORMED BUTYL RUBBER SEALING COMPOUND.
4. IF SO APPROVED BY MJBA, MANHOLE FRAME & COVER MAY BE REPLACED WITH AN ACCESS HATCH AS DESCRIBED IN MJBA'S TECHNICAL SPECIFICATIONS.



PLAN



SECTION

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

ARRO Consulting, Inc.

FORCE MAIN VALVE & C.O. DETAIL MANHOLE TYPE 1

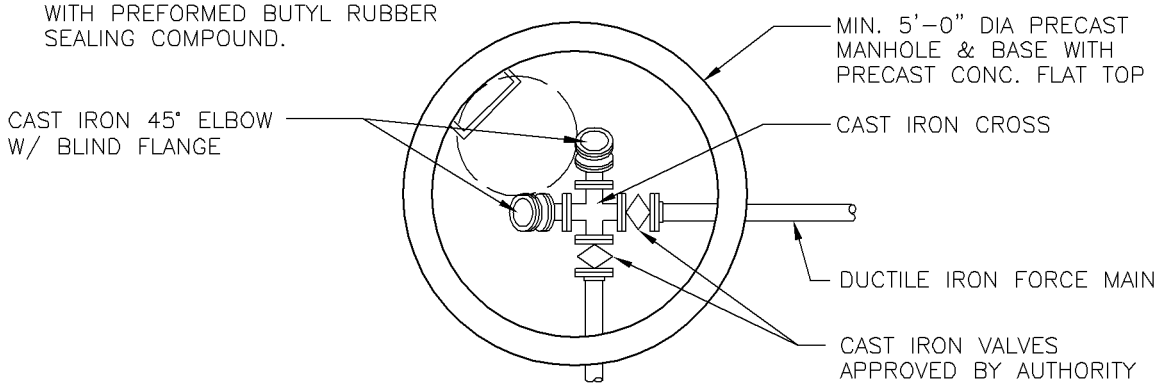
DATE: FEBRUARY 2010

DETAIL: 19

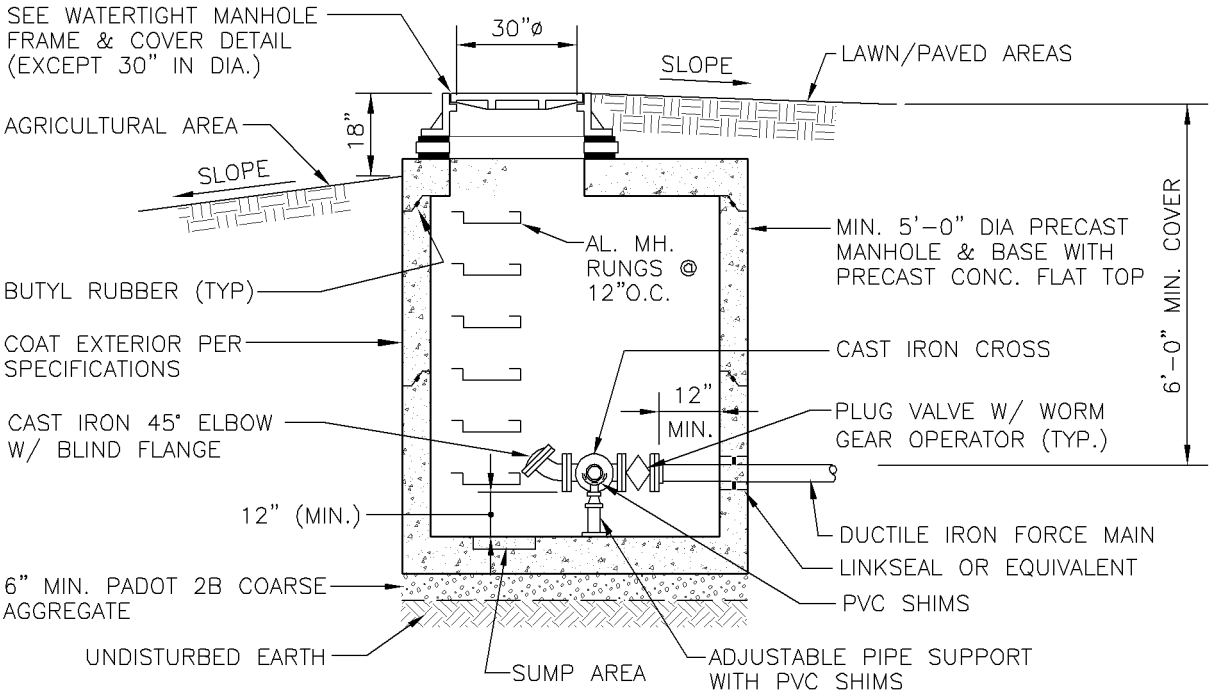
Dwg. Name: 07036628.DWG Last Revised: 03/23/10 13:18

NOTES:

1. ADJUST TO GRADE WITH CONCRETE RINGS (MIN. 2" THICK) WITH BUTYL RUBBER SEALANT AND MORTAR.
2. MECHANICALLY VIBRATED PRECAST CONCRETE SHALL CONFORM TO A.S.T.M. C-478.
3. SEAL ALL JOINTS INSIDE & OUTSIDE WITH PREFORMED BUTYL RUBBER SEALING COMPOUND.
4. IF SO APPROVED BY MJBA, MANHOLE FRAME & COVER MAY BE REPLACED WITH AN ACCESS HATCH AS DESCRIBED IN MJBA'S TECHNICAL SPECIFICATIONS.



PLAN



SECTION

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

ARRO Consulting, Inc.

FORCE MAIN VALVE & C.O. DETAIL MANHOLE TYPE 2

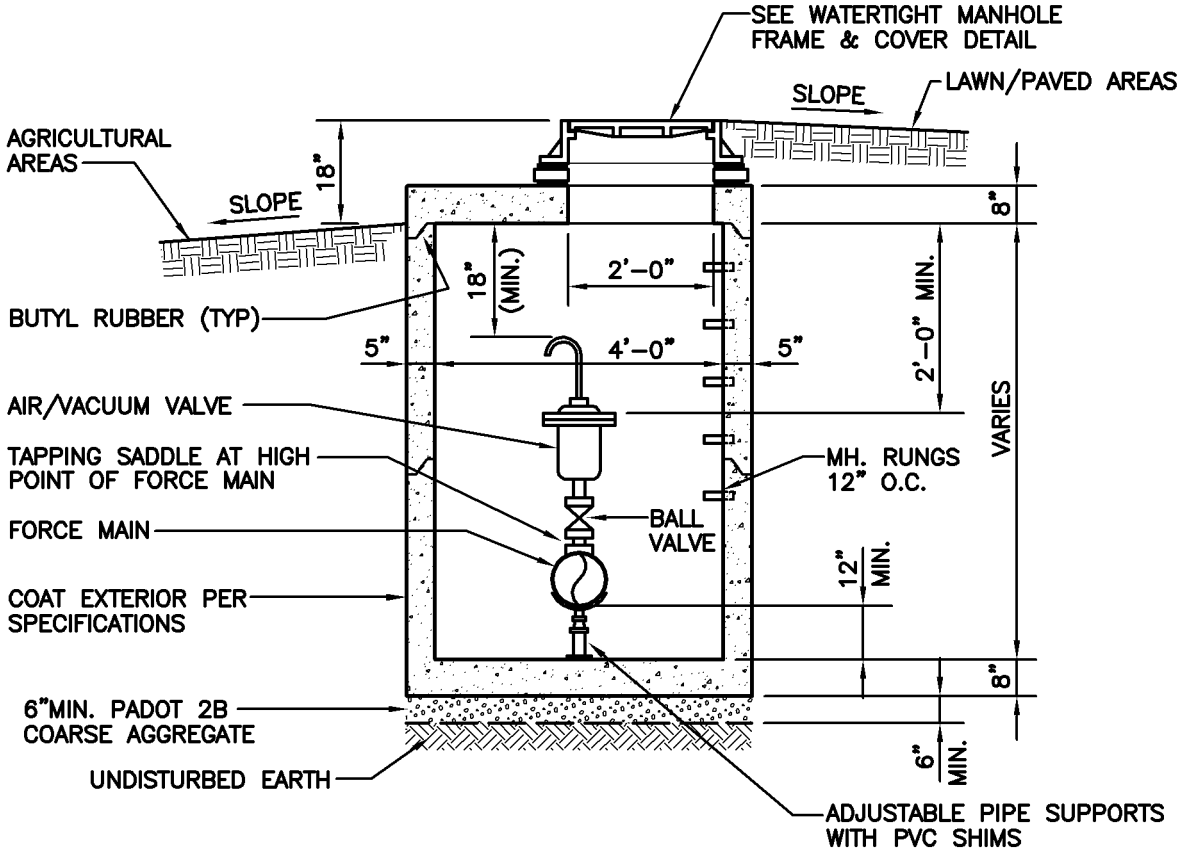
DATE: MARCH 2012

DETAIL: 20

Dwg. Name: 07036629.DWG Last Revised: 03/14/12 09:49

NOTES:

1. ADJUST TO GRADE WITH CONCRETE RINGS (MIN. 2" THICK) WITH BUTYL RUBBER SEALANT AND MORTAR.
2. MECHANICALLY VIBRATED PRECAST CONCRETE SHALL CONFORM TO A.S.T.M. C-478.
3. SEAL ALL JOINTS INSIDE & OUTSIDE WITH PREFORMED BUTYL RUBBER SEALING COMPOUND.
4. IF SO APPROVED BY MJBA, MANHOLE FRAME & COVER MAY BE REPLACED WITH AN ACCESS HATCH AS DESCRIBED IN MJBA'S TECHNICAL SPECIFICATIONS.
5. ALL VALVE VAULT PIPE PENETRATIONS SHALL BE SEALED BY LINK-SEAL OR EQUIVALENT.
6. AIR/VACUUM VALVE SHALL BE A.R.I. USA, CONTRACTOR SHALL SUPPLY SHOP DRAWINGS FOR AUTHORITY APPROVAL.



SECTION

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

ARRO Consulting, Inc.

AIR/VACUUM VALVE DETAIL (FORCE MAIN ONLY)

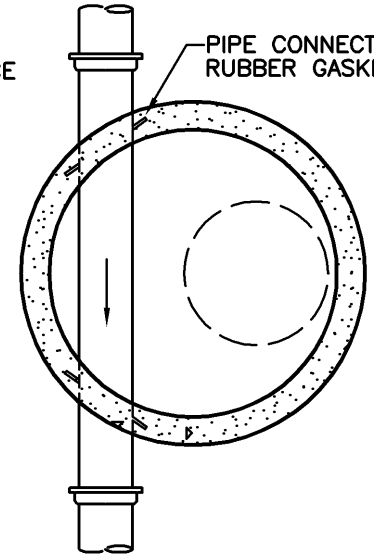
DATE: MARCH 2012

DETAIL: 21

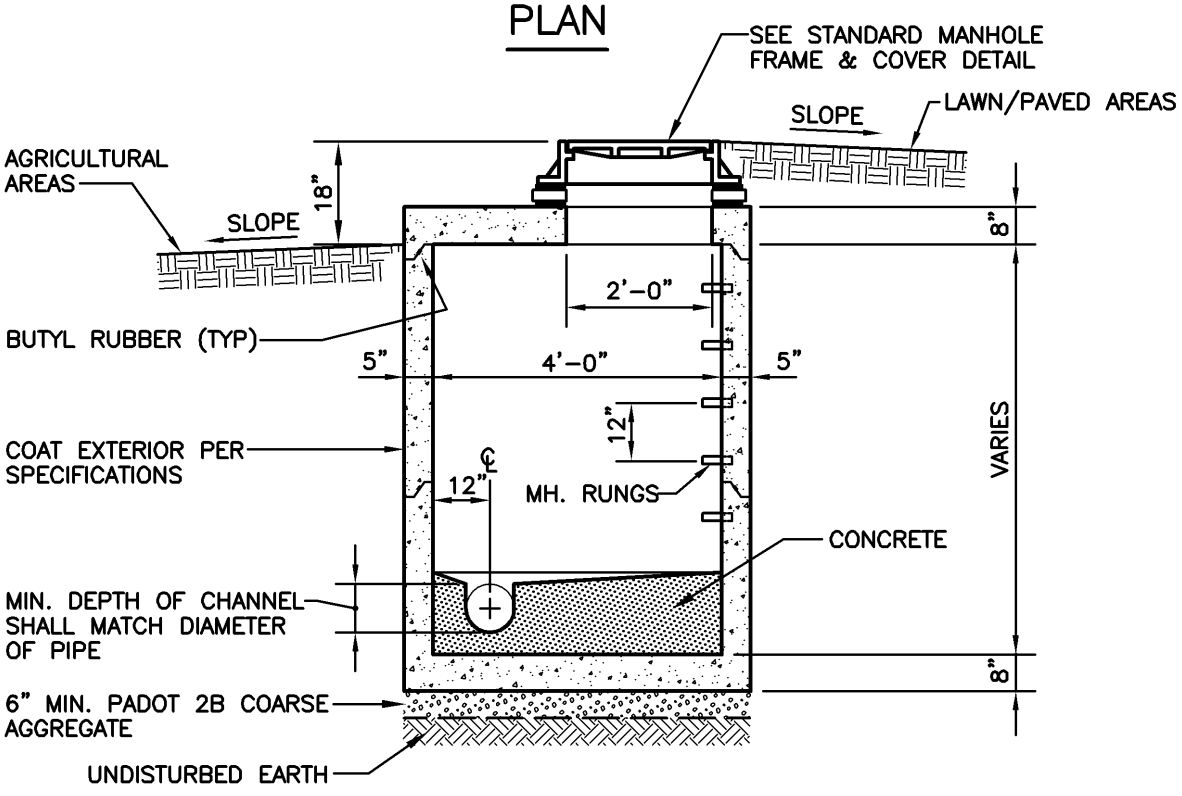
Dwg. Name: 07036626.DWG Last Revised: 03/14/12 09:52

NOTES:

1. ADJUST TO GRADE WITH CAST IN PLACE CONCRETE. SEE STANDARD MANHOLE FRAME & COVER DETAIL.
2. MECHANICALLY VIBRATED PRECAST CONCRETE SHALL CONFORM TO A.S.T.M. C-478.
3. SEAL ALL JOINTS INSIDE & OUTSIDE WITH PREFORMED BUTYL RUBBER SEALING COMPOUND.



PLAN



SECTION

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

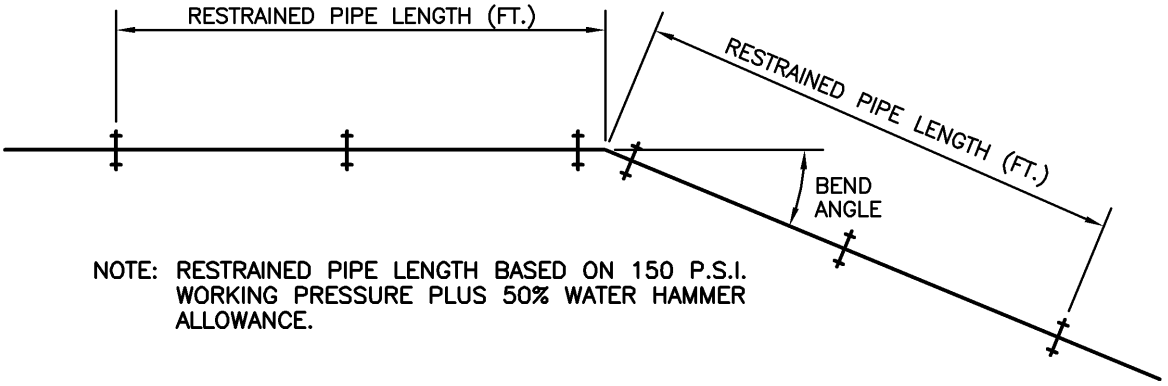
ARRO Consulting, Inc.

SAMPLING MANHOLE PLAN & SECTION

DATE: DECEMBER 2008

DETAIL: 22

Dwg. Name: 07036625.DWG Last Revised: 12/01/08 12:46



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

HORIZONTAL RESTRAINED PIPE LENGTH SCHEDULE (DUCTILE IRON PIPE)					
PIPE DIAMETER	HORIZONTAL ELBOW DEFLECTION ANGLE				TEES & PLUGS
	90°	45°	22 1/2°	11 1/4°	
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'	

* ADD 40% TO LENGTH IF PIPE IS POLYETHYLENE ENCASED.

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

* ADD 40% TO LENGTH IF PIPE IS POLYETHYLENE ENCASED.

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

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

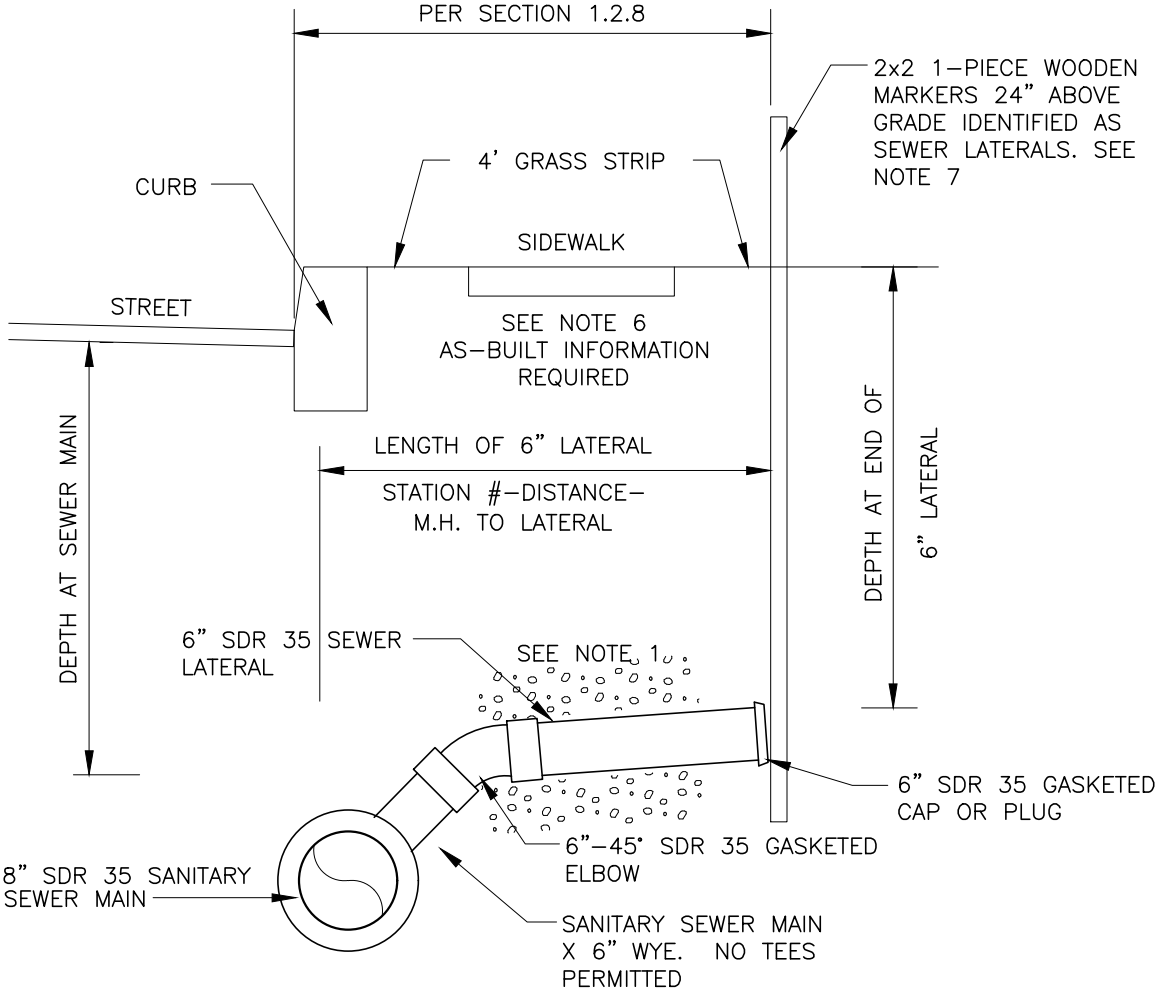
ARRO Consulting, Inc.

RESTRAINED PIPE LENGTH SCHEDULE (DUCTILE IRON PIPE)

DATE: DECEMBER 2008

DETAIL: 23

Dwg. Name: 07036683.DWG Last Revised: 12/01/08 12:49



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 = 4 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) INFORMATION THAT IS REQUIRED FOR RECORD PLANS (SEE DETAIL 29)
7) DEVELOPER/CONTRACTOR RESPONSIBLE TO MAINTAIN THE LATERAL MARKER

Mount Joy Borough Authority

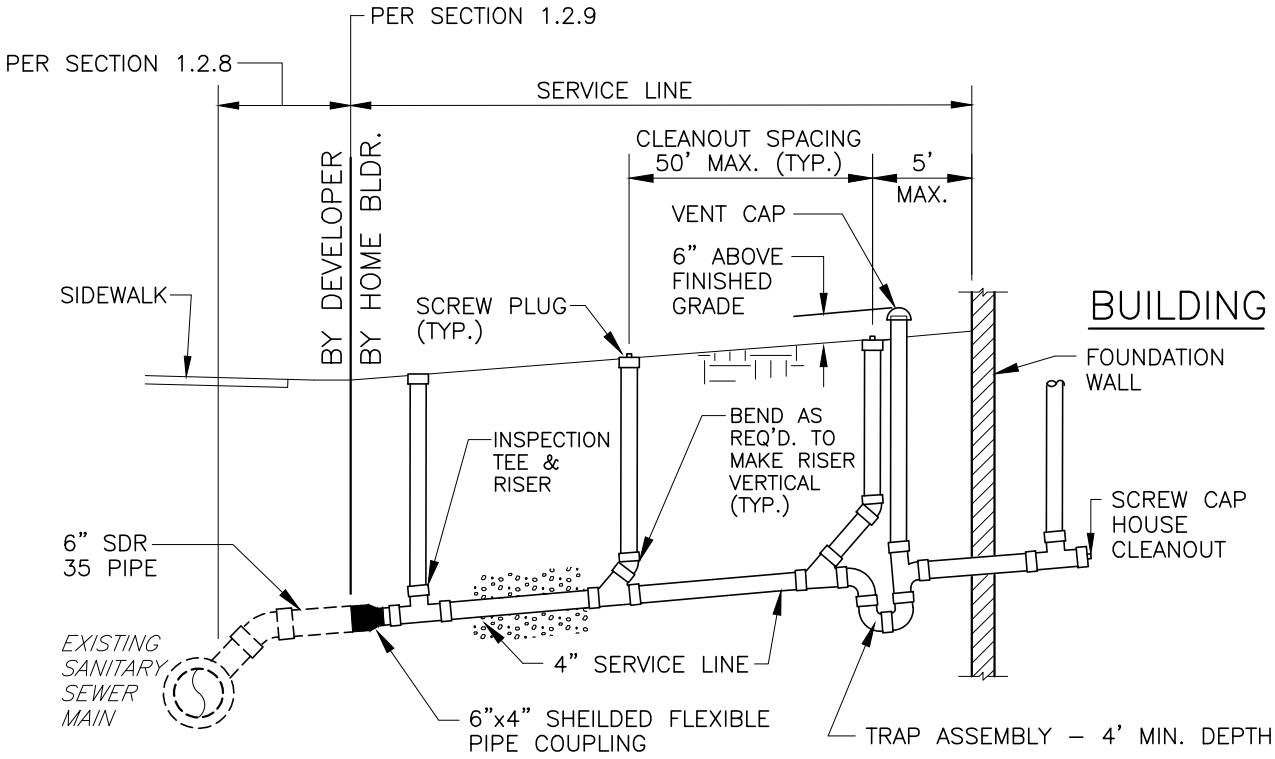
STANDARD DETAIL – SEWER SYSTEM

SEWER LATERAL INSTALLATION DETAIL

ARRO Consulting, Inc.

DATE: JULY 2012

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) SEWER SERVICE LINE SHALL NOT CROSS THE WATER SERVICE LINE
4) PIPE MATERIALS:
   SERVICE LINE – 4" PVC SCH 40– SOLVENT WELD JOINTS W/ CLEANER OR 4" GASKETED SDR 35; 4" GASKETED SCH 40 COUPLING; 4"x6" SHIELDED FERNCO ADAPTER
5) NO SEWER SERVICE LINE VENT CAPS SHALL BE INSTALLED WITHIN A 100–YR FLOOD PLAIN OR WITHIN FLOOD PRONE AREAS.
6) NO VENT CAPS OR CLEANOUTS SHALL BE INSTALLED IN DRIVEWAYS OR OTHER PAVED AREAS, UNLESS SPECIFICALLY APPROVED BY MJBA.
7) 90° BENDS SHALL NOT BE PERMITTED ON SERVICE CONNECTIONS, LATERAL SEWER, SERVICE LINES AND TRAP ASSEMBLIES. WHEN DIRECTIONAL CHANGES ARE NECESSARY, TWO (2) 45° BENDS CONFIGURED WITH A MINIMUM ONE FOOT LONG STICK OF PIPE BETWEEN EACH SHALL BE USED.

Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

ARRO Consulting, Inc.

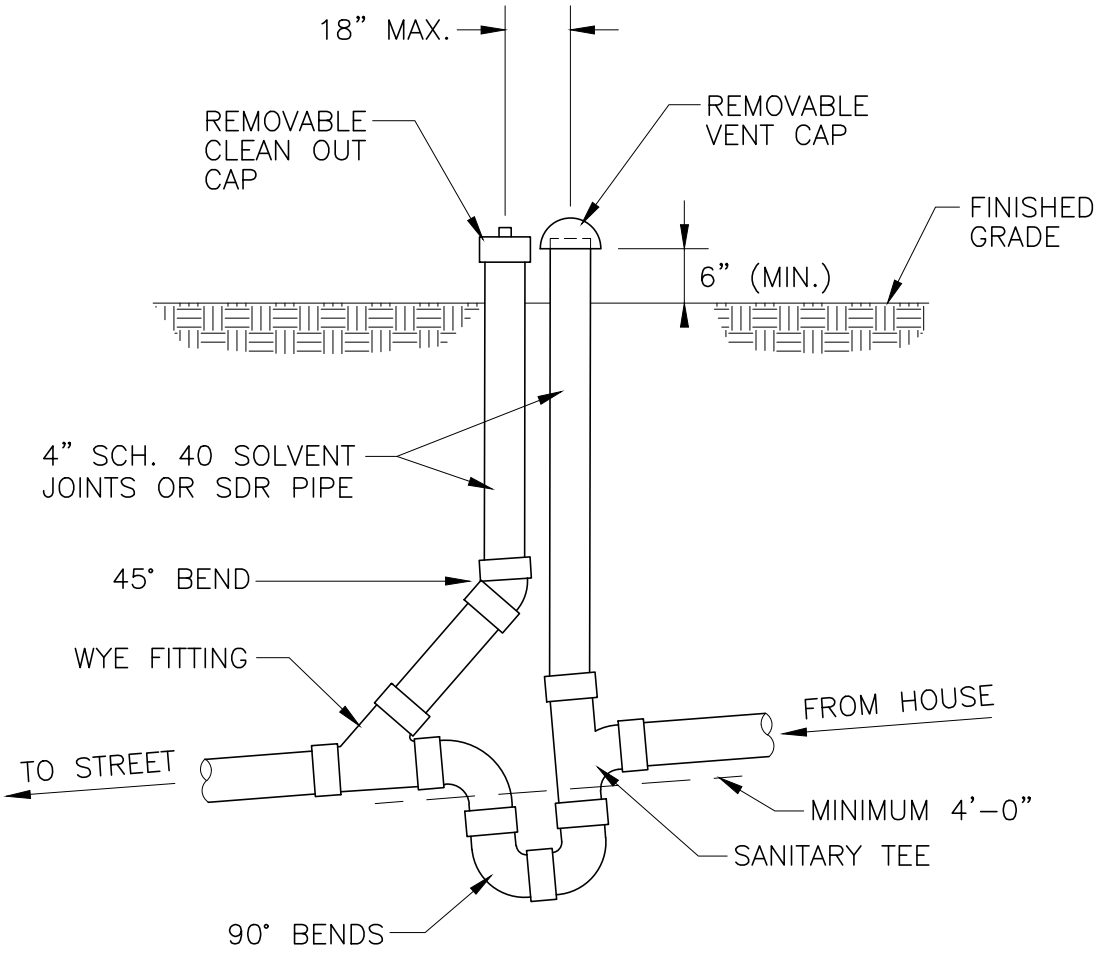
GRAVITY SERVICE LINE INSTALLATION DETAIL

DATE: JULY 2020

DETAIL: 25

Dwg. Name: 25-07036932.DWG Plotted: 7/7/2020 11:37 AM

NOTE:
CAPS TO REMAIN ABOVE GRADE AT ALL TIMES DURING & AFTER INSTALLATION.



Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

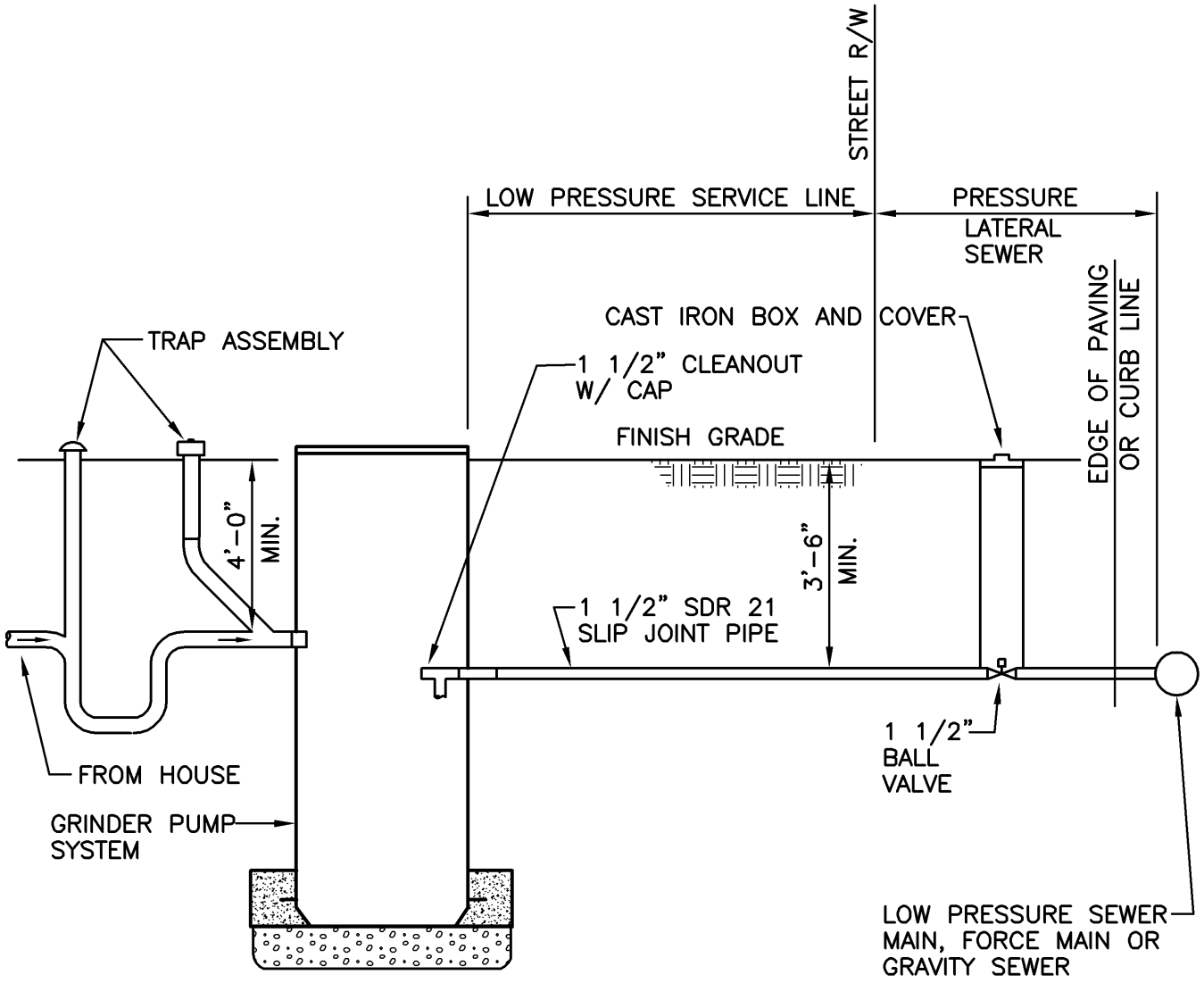
ARRO Consulting, Inc.

TYPICAL TRAP ASSEMBLY

DATE: JULY 2020

DETAIL: 26

Dwg. Name: 26-07036500.DWG Plotted: 7/7/2020 11:39 AM



NOTES:

1. PROVIDE ISOLATION VALVES AND CHECK VALVE IN PUMP PIT.
2. PROVIDE ONE (1) ISOLATION VALVE AT R/W LINE.
3. PROVIDE TEE WITH CLEANOUT CAP IN PUMP PIT.

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

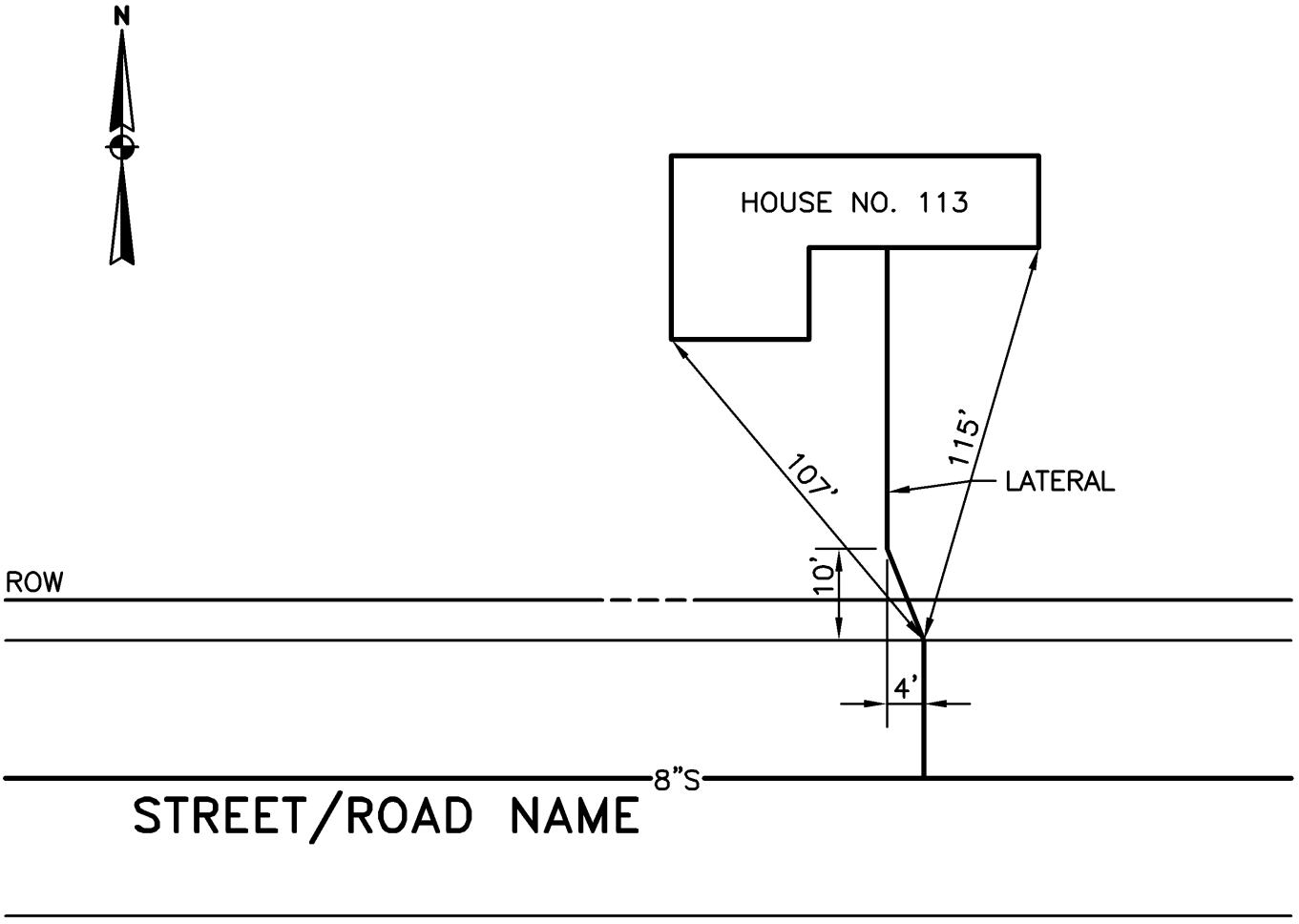
ARRO Consulting, Inc.

SIMPLEX GRINDER PUMP PLUMBING DETAIL

DATE: DECEMBER 2008

DETAIL: 27

Dwg. Name: 07036678.DWG Last Revised: 12/01/08 13:03



Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

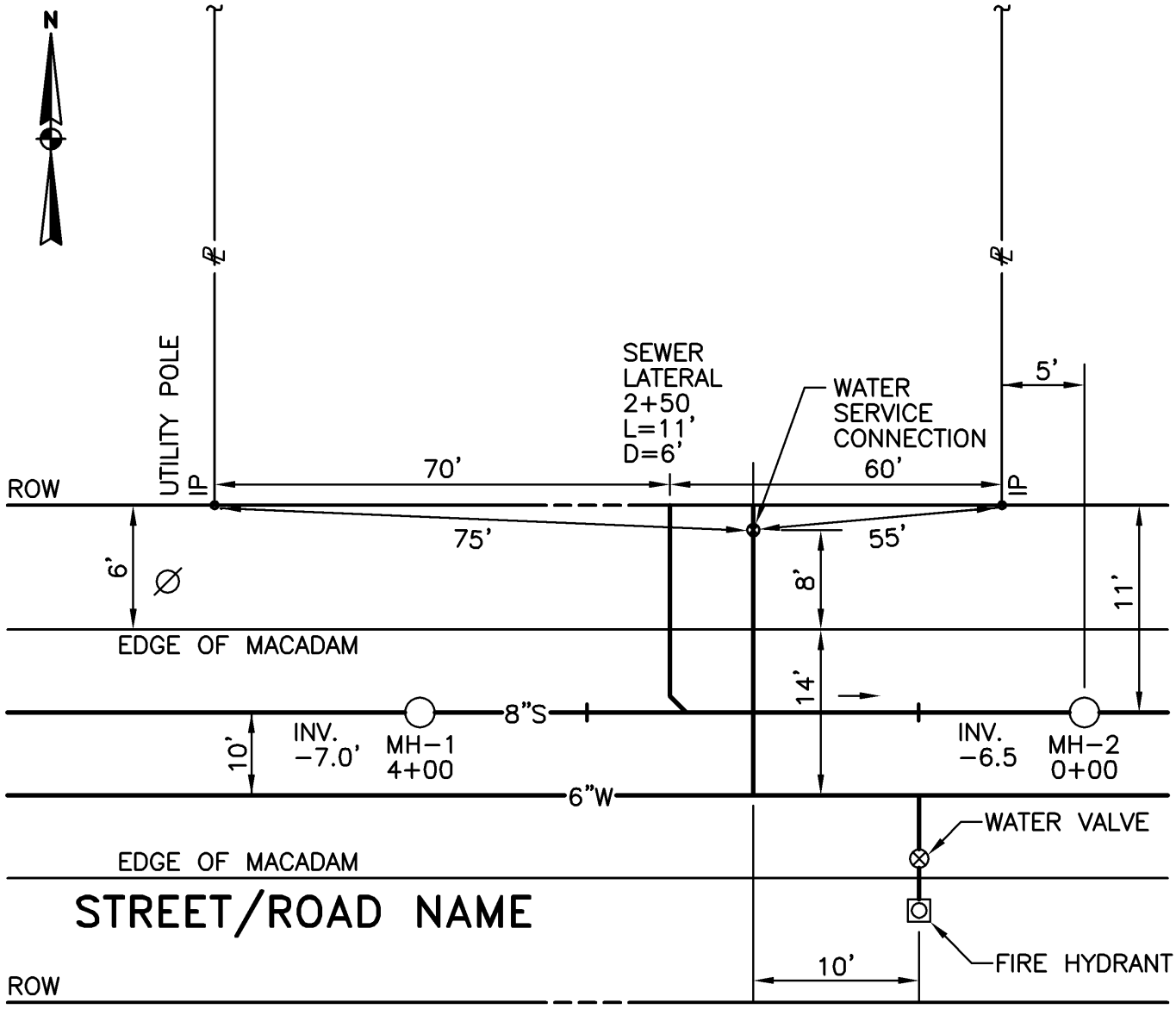
ARRO Consulting, Inc.

TYPICAL DIMENSIONED SKETCH OF NEW SERVICE INSTALLATION

DATE: DECEMBER 2008

DETAIL: 28

Dwg. Name: 02757478.DWG Last Revised: 12/01/08 13:10



MH-1 TO MH-2
TOTAL LENGTH = 400 L.F.

NOTES:
1. DIMENSIONS OF WATER AND SEWER UTILITIES SHALL BE PROVIDED ON A FULL SET OF APPROVED FINAL SUBDIVISION PLANS.

2. AS A MINIMUM, LOCATE SERVICE LINE AND CURB BOX FROM TWO PROPERTY PINS AND ANY OTHER AVAILABLE PERMANENT STRUCTURES.

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

ARRO Consulting, Inc.

TYPICAL DIMENSIONED SKETCH OF NEW UTILITY INSTALLATION

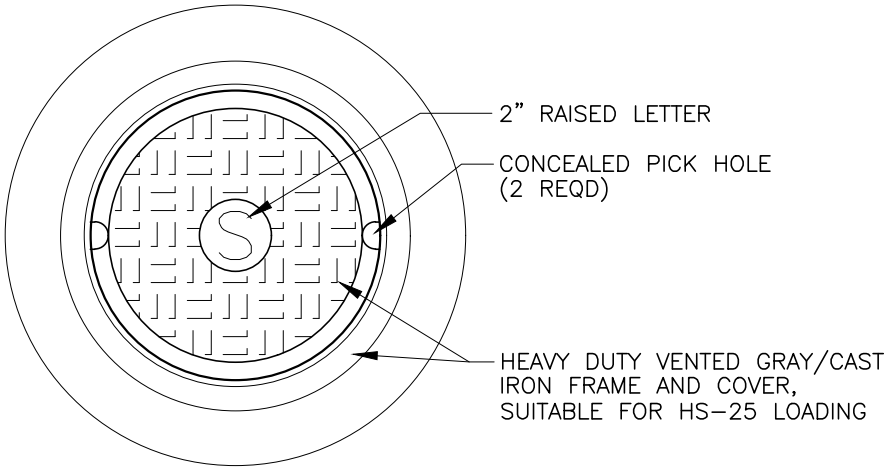
DATE: DECEMBER 2008

DETAIL: 29

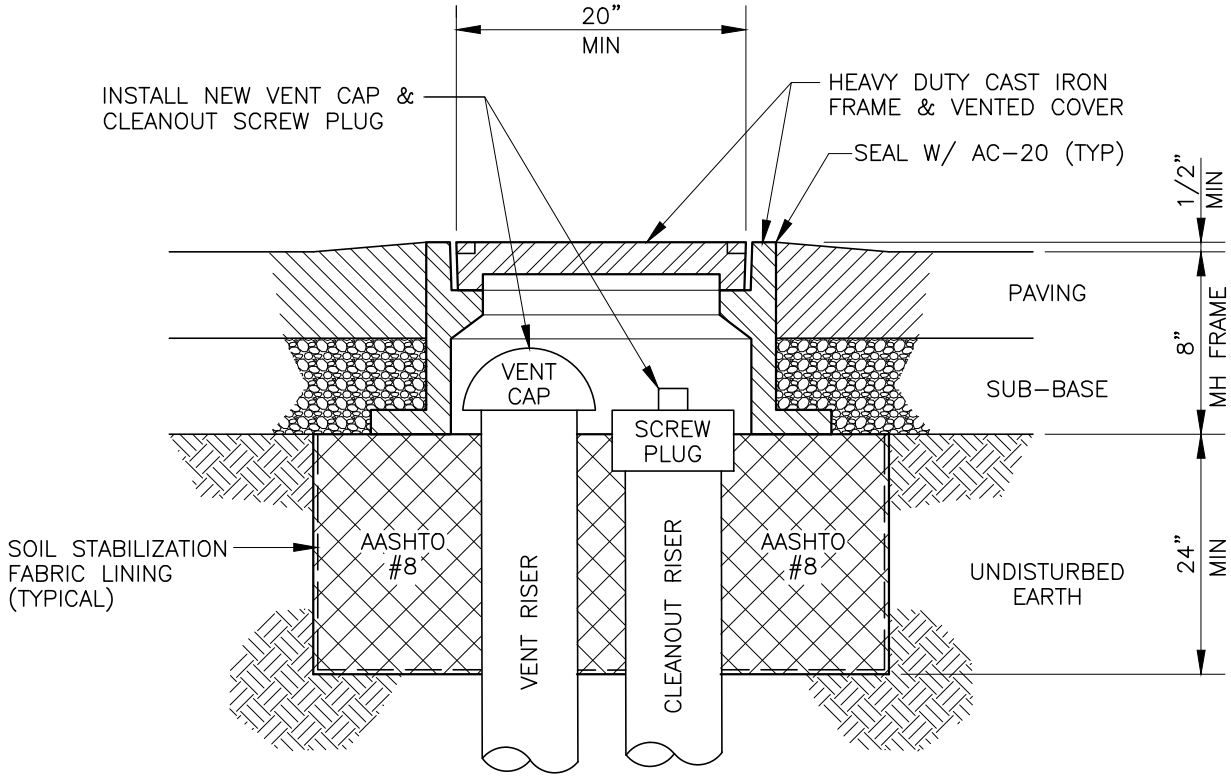
Dwg. Name: 02577677.DWG Last Revised: 12/01/08 13:12

NOTES:

1. EACH DRAIN WILL BE TESTED FOR DRAINAGE.



COVER PATTERN



SECTION

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

ARRO
ENGINEERING & ENVIRONMENTAL CONSULTANTS
108 West Airport Road
Lititz, Pennsylvania 17543
Tel 717.569.7021

VENTS & CLEANOUTS IN PAVED AREA DETAIL

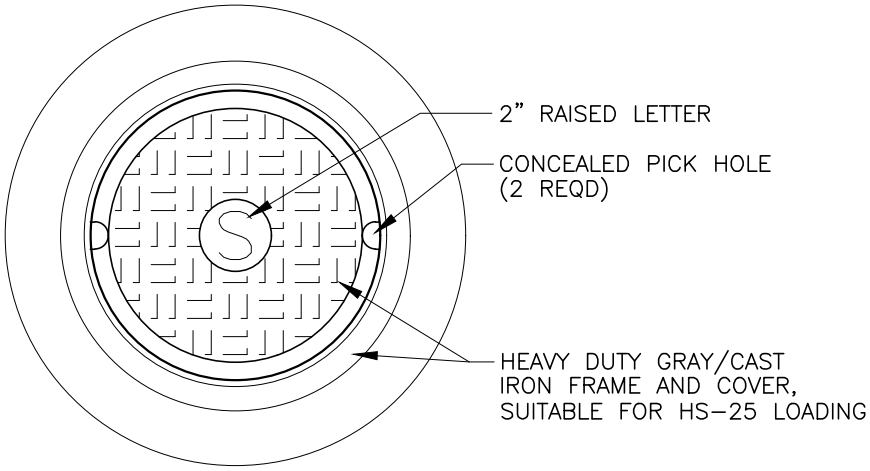
DATE: JULY 2020

DETAIL: 30

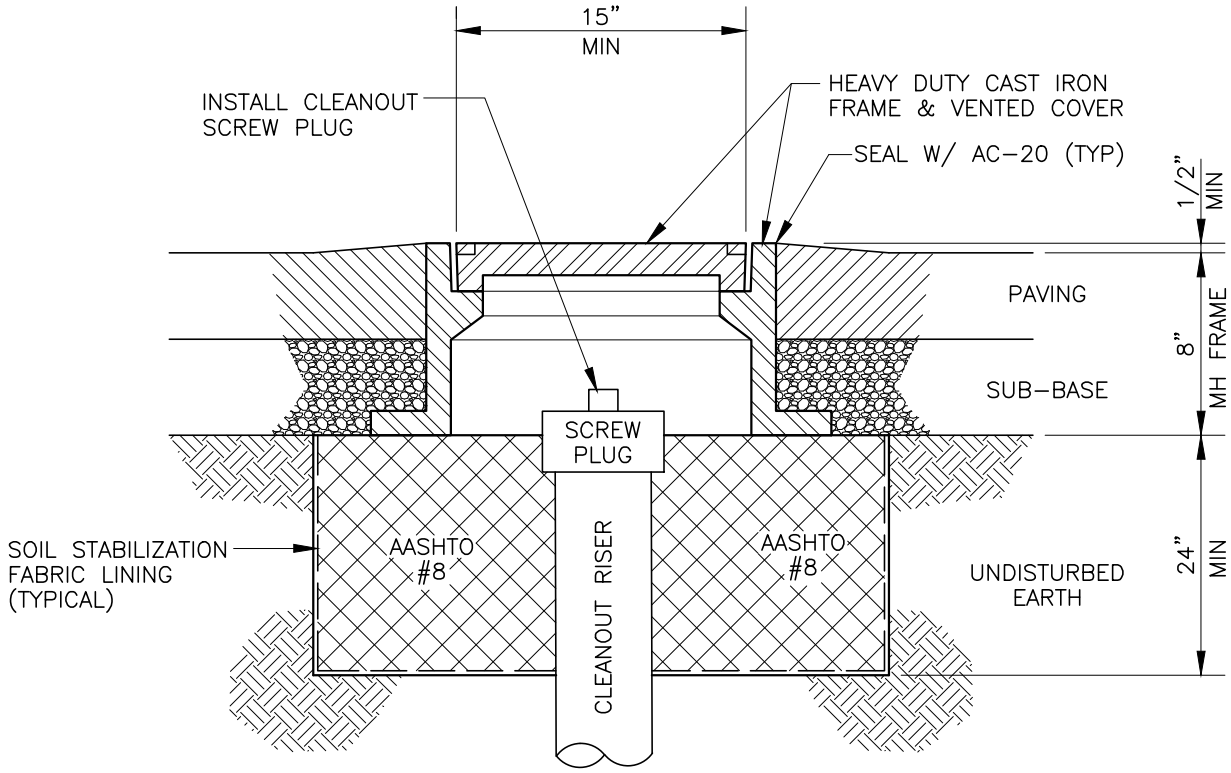
Dwg. Name: 07036274.DWG Plotted: 7/7/2020 12:30 PM

NOTES:

1. EACH DRAIN WILL BE TESTED FOR DRAINAGE.



COVER PATTERN



SECTION

Mount Joy Borough Authority

STANDARD DETAIL - SEWER SYSTEM

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ENGINEERING & ENVIRONMENTAL CONSULTANTS
108 West Airport Road
Lititz, Pennsylvania 17543
Tel 717.569.7021

CLEANOUTS IN PAVED AREA DETAIL

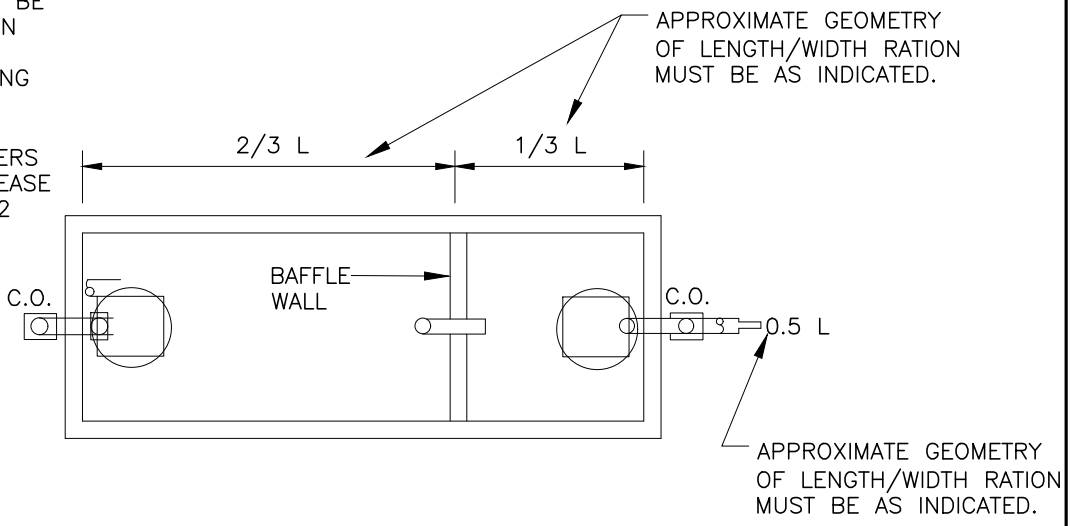
DATE: JULY 2020

DETAIL: 31

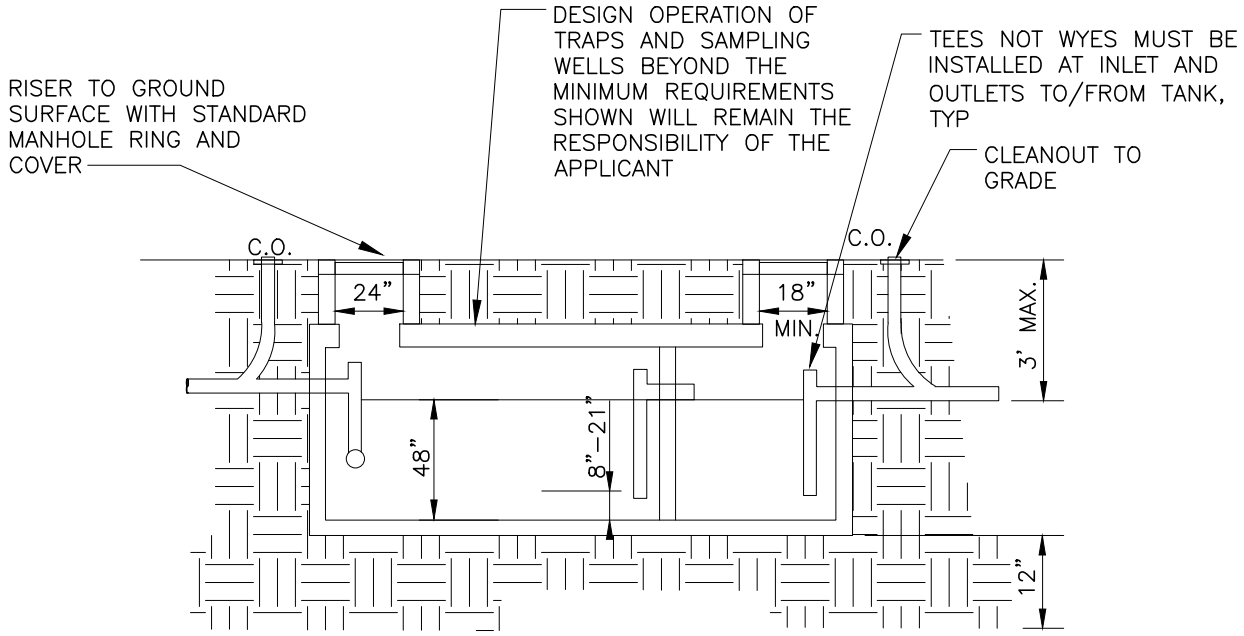
Dwg. Name: 07036274.31.DWG Plotted: 7/7/2020 12:58 PM

NOTES:

1. SAMPLE WELLS WILL BE REQUIRED IF IDENTIFIED IN WRITING.
2. A SEPARATE SAMPLING PORT MAY BE REQUIRED WHERE DEPTH FROM INSPECTION/ACCESS COVERS TO TOP OF SLAB OF GREASE TRAP IS GREATER THAN 2 FEET.



PLAN



SECTION

Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

ARRO Consulting, Inc.

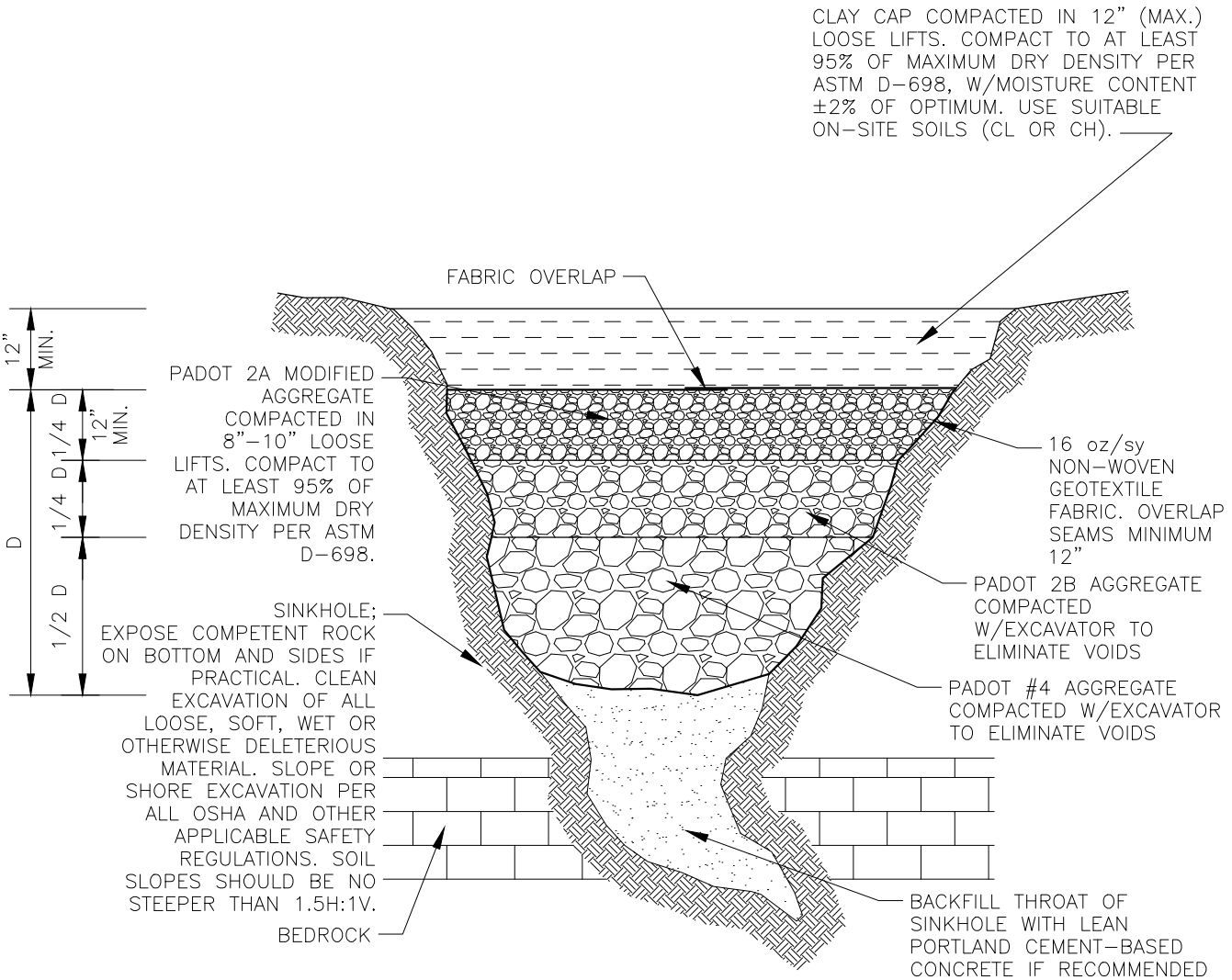
GREASE INTERCEPTOR PLAN & SECTION

DATE: JULY 2020

DETAIL: 32

Dwg. Name: GREASE TRAP.DWG Plotted: 7/7/2020 1:10 PM

NOTE: AT NO TIME SHALL CONCRETE BE PLACED WITHIN 6" OF A SEWER MAIN OR SERVICE LATERAL.



TYPICAL SINKHOLE REPAIR DETAIL BEDROCK THROAT ENCOUNTERED

NO SCALE

Mount Joy Borough Authority

STANDARD DETAIL - SEWER

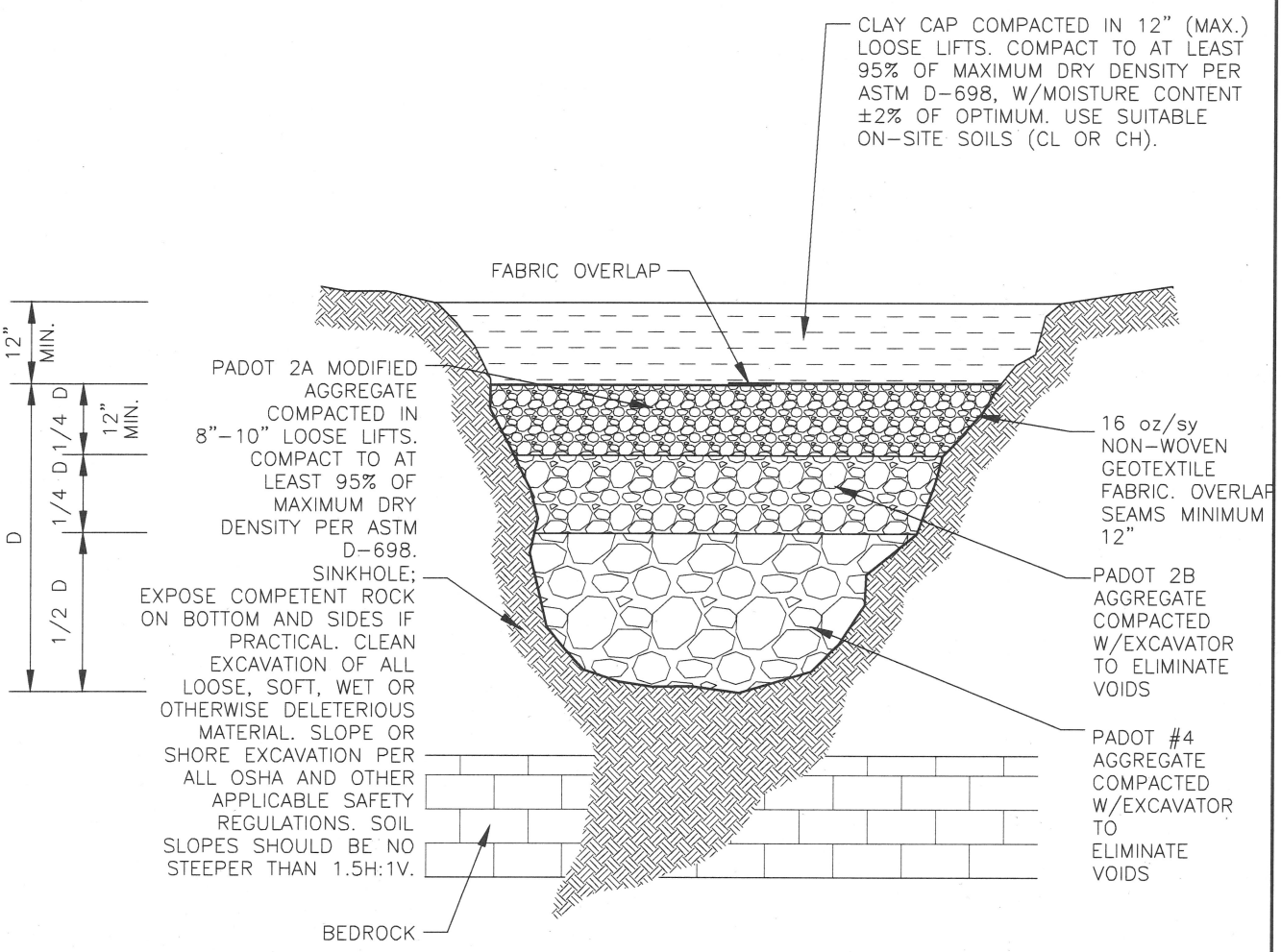
ARRO Consulting, Inc.

SINKHOLE REPAIR DETAIL BEDROCK THROAT ENCOUNTERED

DATE: JULY 2020

DETAIL: 33

Dwg. Name: SINK HOLE REPAIR.DWG Plotted: 7/7/2020 1:14 PM



TYPICAL SINKHOLE REPAIR DETAIL
BEDROCK THROAT NOT ENCOUNTERED

NO SCALE

Mount Joy Borough Authority

STANDARD DETAIL - SEWER

ARRO Consulting, Inc.

SINKHOLE REPAIR DETAIL
BEDROCK THROAT NOT ENCOUNTERED

DATE: JULY 2020

DETAIL: 34

Dwg. Name: SINK HOLE REPAIR.DWG Plotted: 7/7/2020 1:14 PM

MAXIMUM PAY-LINE WIDTHS

Nominal Pipe Diameter (Inches)	Aggregate Backfill and Temporary Pavement (Trench Width Inches)	Final Pavement Restoration and Reseeding over Trench (Width Inches)
8 thru 12	48	72
15 thru 24	60	84
27 thru 36	72	96
42 thru 48	84	108

AT VALVE PITS AND OTHER STRUCTURES, THE PAY-LINE SHALL BE MEASURED AS TWO (2) FEET OUTSIDE THE WALL FOR EXCAVATION AND FOUR (4) FEET OUTSIDE THE WALL FOR RESTORATION.

Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

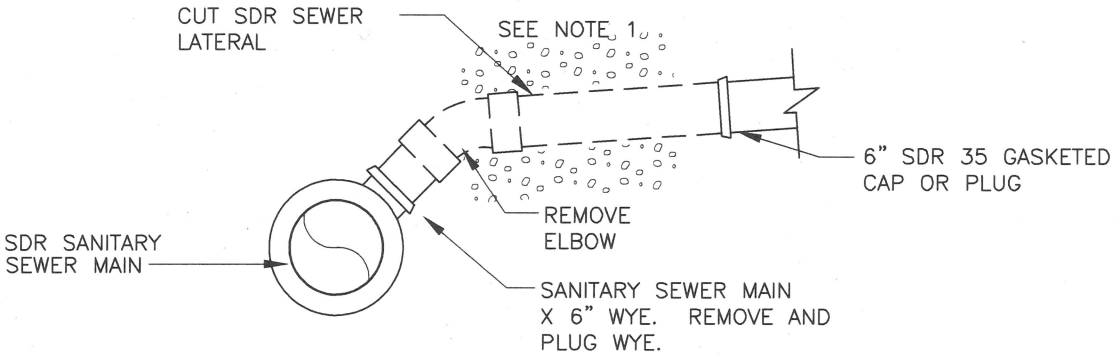
ARRO Consulting, Inc.

PAY WIDTH DETAIL
SEWER SERVICE LINE STATE/BORO/TWP. ROADS

DATE: JULY 2020

DETAIL: 35

Dwg. Name: PAYWIDTHDETAIL.DWG Plotted: 7/7/2020 1:18 PM



NOTES:

1) PROVIDE 6" OF AASHTO NO. 8 (1B) STONE BELOW PIPE AND 12" ABOVE PIPE (TYPICAL ENTIRE LENGTH OF LATERAL).

2) INFORMATION THAT IS REQUIRED FOR RECORD PLANS (SEE DETAIL 29)

Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

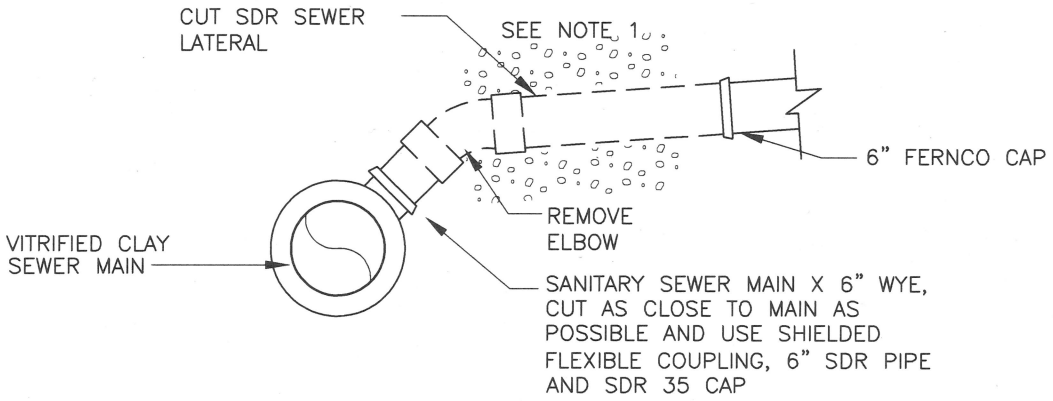
ARRO Consulting, Inc.

CUT & CAP PVC SEWER LATERAL

DATE: JULY 2020

DETAIL: 36

Dwg. Name: 36-07036931.DWG Plotted: 7/7/2020 1:26 PM



NOTES:

1) PROVIDE 6" OF AASHTO NO. 8 (1B) STONE BELOW PIPE AND 12" ABOVE PIPE (TYPICAL ENTIRE LENGTH OF LATERAL).

2) INFORMATION THAT IS REQUIRED FOR RECORD PLANS (SEE DETAIL 29)

Mount Joy Borough Authority

STANDARD DETAIL – SEWER SYSTEM

ARRO Consulting, Inc.

CUT & CAP CLAY SEWER LATERAL

DATE: JULY 2020

DETAIL: 37

Dwg. Name: 24-07036933.DWG Plotted: 7/7/2020 1:36 PM