

DOVER TOWNSHIP CONSTRUCTION SPECIFICATION YORK COUNTY, PENNSYLVANIA NOVEMBER 2015



PREPARED BY:



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SECTION 01010 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide labor, materials, equipment, and services and perform all operations required for completion, installation of all items and Work in these Specifications and as indicated on the Drawings.
- B. Drawings shall be Subdivision and Land Development construction drawings approved by Dover Township and/or its Engineer or drawings prepared by the Township for construction. Construction drawings shall include all required signatures and approvals.
- C. The terms "Developer" and "Contractor" are interchangeable in these specifications.

1.2 REFERENCED STANDARDS AND SPECIFICATIONS

- A. Standards and other publications referenced in these Specifications shall be of the issues in effect at time of construction and form a part of these Specifications.
- B. Reference in the State Specifications to 'State', 'Chief Engineer', or 'Department' shall be interpreted as Dover Township or its ENGINEER. When particular articles or sections are referred to, all paragraphs other than those relating to measurement and payment shall apply.
- C. Contractor/Developer shall comply with all Township ordinances and regulations including but not limited to subdivision land development ordinances and zoning ordinances.

1.3 WORK CONDITIONS

- A. Construct the work in stages to provide for public convenience.

Do not close off public use of facilities until completion of one stage of construction will provide alternative usage.
- B. Conduct construction operations to ensure the least inconvenience to the general public.
- C. Take measure to control traffic when working on or near public roads and streets.

Employ traffic control measures in accordance with Pennsylvania Department of Transportation Publication No. 203, "Work Zone Traffic Control".
- D. Restore existing paving outside the limits of the work that is damaged by the Developer's operations, to its original condition at the expense of the Developer.

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- E. Continuously keep rights-of-way, storage areas, streets, roads, highways and adjacent properties free from accumulations of waste materials, excess excavation, rubbish and windblown debris resulting from construction operations.

- F. Protection of Existing Utilities and Structures:

Take all precautions and utilize all facilities required to protect existing utilities and structures. In compliance with Act 38 of the General Assembly of Pennsylvania, advise each Utility Company at least 3 working days in advance of intent to excavate, do demolition work or use explosives and give the location of the job site. Request cooperative steps of the Utility Company and suggestions for procedures to avoid damage to its lines.

Advise each person in physical control of powered equipment or explosives used in excavation or demolition work of the type and location of utility lines at the job site, the Utility Company assistance to expect, and procedures to follow to prevent damage.

Immediately report to the Utility Company, the Township and its Engineer any break, leak or other damage to the lines or protective coatings made or discovered during the work and immediately alert the occupants of affected premises of any emergency created or discovered.

Allow free access of Utility Company personnel at all times for purposes of maintenance, repair and inspection.

1.4 PENNDOT HIGHWAY OCCUPANCY PERMIT

- A. The Developer's attention is directed to Chapter 459, Occupancy of Highways by Utilities under Title 67 Transportation of the Pennsylvania Code. The Developer will pay the cost of the highway occupancy permit and the costs of the permit inspection fees, if any. The Township will be designated as the permittee. The Developer shall pay all costs in connection with the highway occupancy permit or permits, including but not limited to all costs for special insurances and bonds. The Developer/Contractor is responsible for scheduling final inspection and obtaining final PENNDOT approval.

1.5 PERMITS

- A. The Developer shall secure and pay the cost for the Department of Environmental Protection Water Quality Management Permit.
- B. The Developer shall secure and pay for all other permits required to comply with Federal, State, and local ordinances and regulations.

1.6 TOWNSHIP ROAD OCCUPANCY PERMIT

- A. Developer/Contractor must obtain a road occupancy permit prior to commencing work.

1.7 SEWAGE PUMPING STATIONS

- A. Design of pumping stations will be in accordance with the Township Engineer's recommendations. The type of station to be designed (precast, cast-in-place, Submersible, Wetwell/Drywell) will be decided upon in a meeting with the Township Engineer prior to commencing design on the station. The developer is responsible for providing telephone and electrical service to the station along with provisions for emergency power supply.

1.8 GRINDER PUMPING STATIONS

- A. Design of grinder pumping stations will be in accordance with the Township Engineer's recommendations. The details of the station to be designed will be decided upon in a meeting with the Township Engineer prior to commencing design on the station.

1.9 WATER BOOSTER STATION

- A. Design of water booster stations will be in accordance with the Township Engineer's recommendations. The type of station including details of pumping equipment, materials of construction and control features will be decided upon in a meeting with the Township Engineer prior to commencing design on the station. The Developer is responsible for providing telephone and electrical service to the station along with provisions for emergency power supply.

1.10 SUBMITTALS AND CERTIFICATES

- A. All materials and products requiring submission of manufacturer's information must be approved by the Township Engineer prior to purchasing and installing.
- B. The Developer/Contractor shall provide any additional information required by the Township Engineer to assure compliance with these specifications.
- C. Provide three (3) copies (plus the number of copies the contractor wants returned) of all submittals and certificates to the Township Engineer.

PART 2 - EXECUTION

2.1 PROCEDURE

- A. Confer and verify with other contractors as to locations and extent of their work, to the end that interferences and deletions between trades are prevented and embedded or required items are installed in conjunction with the work under this contract. Interconnections between work of other contracts shall be made by the Developer whose work is erected last unless otherwise specifically stated in the Contract Documents, required by the Township Engineer or necessitated by the nature or extent of the work.

2.2 DEVELOPER'S USE OF PREMISES

- A. Confine construction equipment, the storage of materials and equipment, and operations of workmen to within the permanent and temporary rights-of-way.
- B. Pipeline materials may be stored appropriately along the route of the Work provided such stored materials do not unduly restrict public use or infringe on private property.
- C. Assume full responsibility for materials stored on site.
- D. Provide dumpsters for disposal of waste materials. Do not stock pile waste materials on site.
- E. The Developer/Contractor shall provide self-contained toilet units (Jiffy-John type facilities) at the site.

2.3 SEWER AND WATER MAIN SEPARATION

- A. Horizontal Separation:

Sewers, including manholes, should be separated at least 10 feet, horizontally, from any existing or proposed water mains. Should local conditions prevent a lateral separation of 10 feet, a sewer may be closer than 10 feet to a water main if:

- (a) it is laid in a separate trench; and
- (b) the elevation of the top (crown) of the sewer is at least 18 inches below the bottom of the bottom (invert) of the water main.
- (c) or based upon recommendations from the Township Engineer. Vertical Separation:

Whenever sewers cross under water mains, the top of the sewer shall be at least 18 inches below the bottom of the water main.

When the elevation of the sewer cannot be varied to provide the required 18" vertical separation, relocate the water main, for a distance of 10 feet extending on each side of the sewer, with one full length of water main centered over the sewer so that both joints will be as far from the sewer as possible.

Water main should be constructed of slip-on or mechanical-joint ductile iron pipe, or protected steel pipe. Both sewer and water main services shall be pressure tested to assure watertightness prior to backfilling.

Where a water main crosses under a sewer, provide adequate structural support for the sewer to prevent damage to the water main. Provide at least 18 inches vertical separation.

B. Special Conditions:

Where it is impossible to obtain proper horizontal and vertical separation as specified, construct the pipelines as specified above and, in addition, encase the sewer line with minimum 6" cement concrete for 10 feet on either side of the water main. All encased pipelines shall be ductile iron pipe and extend from downstream MH to upstream MH.

2.4 SOIL EROSION AND SEDIMENTATION CONTROL PLAN

- A. The Developer/Contractor is required to provide soil erosion and sedimentation control measures as indicated in the Soil Erosion and Sedimentation Control Plan which will be completed as necessitated by the nature or extent of the work. An approved copy of the Soil Erosion and Sedimentation Control Plan shall be submitted to the Township.

2.5 FIELD OBSERVATION

- A. Field observation shall be at the discretion of the Township. The Township's Inspector shall have the authority to halt construction if, in his opinion, construction is not being done according to specifications and/or construction drawings. Any construction not being performed in accordance with Township Specifications shall be reported to Township and Engineer for direction. Periodic field visits will occur on all construction activities, unless special circumstances warrant additional time. The Developer/Contractor is responsible for payment of Engineer's inspection and administrative fees to Dover Township.

2.6 PRECONSTRUCTION MEETING

- A. Before starting the work, a conference will be held at the Township office to review the project and to establish a working understanding between the parties as to the Project. Present at the conference will be the Developer or his representative, the Township Engineer, the Township's Inspector, the Contractor and the Superintendent. At the preconstruction meeting, the Developer or Contractor shall supply a schedule for construction activities and a list of materials/products to be used on the Project. The list should identify manufacturers, model numbers and sufficient data to assure compliance with these Specifications.

2.7 RECORD DRAWINGS

- A. The Contractor is required to keep an up-to-date set of Record Drawings (As-Constructed Drawings) for the project.
- B. The Contractor shall identify the location of all newly installed, existing to remain, and piping to be abandoned pipe and conduit as it is installed or uncovered during the construction period.

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- C. No trenching for pipe or conduit shall be backfilled until the piping has been located and recorded by the Contractor.
- D. Up-to-date is defined as containing modifications for work performed within the past 30 days.
- E. The Contractor shall verify As-Constructed elevations of sanitary sewer and storm sewer inverts and road profiles.
- F. At the end of the project, the Contractor's record drawings shall be turned over the Engineer in Auto CADD format as indicated in the Subdivision Ordinance.
- G. The Engineer will review the Contractor's record drawings. If the record drawings do not meet the requirements stated above, final adoption of the improvements will not be approved.
- H. The Contractor shall provide detailed locations of all sanitary sewer locations, depth and length. The Contractor shall provide lateral detailed locations of all water service locations, depth and length. Sewer laterals shall be located using manholes as a reference point and stationary from that point. Water service curb stops shall be located using distance from property owners.

2.8 FINAL ACCEPTANCE

- A. There will be no final acceptance of sewer and water lines until all other utilities are installed.

END OF SECTION

SECTION 02100 - CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work of this section includes, but is not limited to:
 - 1. Clearing
 - 2. Grubbing
 - 3. Stripping and stockpiling topsoil
 - 4. Debris disposal

- B. Related Work specified elsewhere:
 - 1. Section 02220 - Excavation for Structures
 - 2. Section 02221 - Trenching, Backfilling & Compacting
 - 3. Section 02485 - Finish Grading and Seeding

- C. Definitions:
 - 1. Clearing is defined as the removal of trees, brush, down timber, rotten wood, rubbish, any other vegetation, and objectionable material at or above original ground elevation not designated to be saved; clearing also includes removal of fences, walls, guard posts, guard rail, signs, and other obstructions interfering with the proposed work.
 - 2. Grubbing is defined as the removal from below the surface of the natural ground of stumps, roots and stubs, brush, organic materials and debris.

1.2 JOB CONDITIONS

- A. The Developer/Contractor may clear all obstructions within the permanent and construction rights-of-way or property except those specifically indicated on the Right-of-Way Limits and Drawings or specified to be saved or restored.

- B. Obstructions specifically designated to be saved or restored will be marked by the Township's Engineer.

1.3 SUBMITTALS

- A. Permits for Disposal of Debris:
 - 1. Arrange for disposal of debris resulting from clearing and grubbing to locations outside the Township's Right-of-Way and obtain written agreements with the owners of the property where the debris will be deposited.
 - 2. Submit two copies of the agreement with each property owner releasing the Township from responsibility in connection with the disposal of the debris.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Temporary Fencing:
 - 1. Undamaged picket snow fence, 4' high, formed of wooden slats, tightly woven with wire cable.
 - 2. Soil-set fence posts, studded "T" type, 6' high.
 - 3. Plastic construction fencing.
- B. Wood Tree Guards:
 - 1. Wood posts: 2"x4"
 - 2. Wood stringers: 2"x2"
- C. Wrapping Materials:
 - 1. Burlap: AASHTO M182, Class 1
 - 2. Krinkle-kraft waterproof paper: 4" width
- D. Tree Wound Dressing: Antiseptic and waterproof, asphalt base.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Mark areas to be cleared, the areas to be grubbed, and items to be saved with stakes, flags, paint or plastic colored ribbon for the approval of the Township Engineer.
- B. Protect benchmarks, utilities, existing trees, shrubs and other landscape features designated for preservation with temporary fencing or barricades satisfactory to the Township Engineer. No material shall be stored or construction operation carried on within 4-feet of any tree to be saved or within the tree protection fencing.
- C. When a private enclosure fence encroaches on the work area, notify the property owner at least 5 days in advance of the clearing/grubbing operations to permit the owner to remove it, construct a supplemental fence, or make such other arrangements as may be necessary for security purposes; in failure of the property owner to reasonably proceed with the work required to secure his property, carefully remove the fence, in whole or in part, and neatly pile the materials onto the owner's property.

3.2 UTILITY RELOCATIONS

- A. Inform utility companies, individuals and others owning or controlling facilities or structures within the limits of the work which have to be relocated, adjusted or reconstructed in sufficient time for the utility to organize and perform such work in conjunction with or in advance of the Developer's/Contractor's operations.
- B. Comply with the provisions of Act 38, Pennsylvania Underground Utility Protection Law.

3.3 CLEARING

- A. Confine clearing to within the permanent and construction rights-of-way or property.
- B. The Township reserves the right to specify and designate which trees, shrubs and other items are to be retained. A minimum of 48 hours advance notification shall be given to the Township before clearing work.
- C. Fell trees in a manner that will avoid damage to trees, shrubs, and other installations which are to be retained.
- D. Where stumps are not required to be grubbed, flush-cut with ground elevation.

3.4 GRUBBING

- A. Grub areas within the construction limits to remove roots and other objectional material to a minimum depth of 8".
- B. Remove all stumps within the cleared areas unless otherwise authorized by the Township.

3.5 STRIPPING AND STOCKPILING TOPSOIL

- A. Strip topsoil to whatever depth it may occur from areas to be excavated, filled, or graded and stockpile at a location approved by the Township Engineer for use in finish grading.

3.6 DEBRIS DISPOSAL

- A. Trees, logs, branches, brush, stumps, and other debris resulting from clearing and grubbing operations shall become the property of the Developer/Contractor and shall be legally disposed of.
- B. Do not deposit or bury on the site debris resulting from the clearing and grubbing work.
- C. Proper state/local permits shall be obtained prior to any burning activity.

3.7 RESTORATION

- A. Repair all injuries to bark, trunk, limbs, and roots of remaining plants by properly dressing, cutting, tracing and painting, using approved arboricultural practices and materials.
- B. Replace trees, shrubs and plants designated to be saved which are permanently injured or die during the life of the Contract as a result of construction operations with like species acceptable to the property owner affected.
- C. Remove protective fences, enclosures and guards upon the completion of the project.
- D. Restore guard posts, guard rail, signs and other interferences to the condition equal to that existing before construction operations.

END OF SECTION

SECTION 02220 - EXCAVATION FOR UTILITY STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work Of This Section Includes, but is not limited to:

Excavation and Backfill for Structures
Dewatering
Sheeting and Shoring Site
Grading

- B. Related Work Specified Elsewhere:

1. Section 02221 - Trenching, Backfilling & Compacting

1.2 QUALITY ASSURANCE

- A. Testing Agency:

Compaction testing shall be performed by an independent soils testing laboratory engaged and paid for by the Contractor where directed by the Engineer.

- B. Referenced Standards:

American Society for Testing and Materials (ASTM):

C33 Specification for Concrete Aggregates
D698 Tests for Moisture-Density Relations of Soils Using 5.5 Lb. Rammer and 12" Drop
D1556 Test for Density of Soil-in-Place by the Sand-Cone Method

1.3 JOB CONDITIONS

- A. Proceed with caution in the areas of utility facilities and expose them by hand or other excavation methods acceptable to the utility owner.
- B. Erect sheeting, shoring, and bracing as necessary for protection of persons, improvements, and excavations.
- C. Furnish and maintain barricades, signs and markings for excavated areas. Unattended excavations shall be protected by plating, and/or fencing for protection of vehicular and pedestrian traffic. The Township reserves the right to secure unattended excavations at the expense of the contractor.
- D. Select and install a system of dewatering to accomplish groundwater control in excavations.
- E. Preserve, protect and maintain operable existing drainage ways, drains and sewers.

1.4 SUBMITTALS

A. Certificates:

Submit a Certificate of Compliance, together with supporting data, from the materials supplier attesting that the composition analysis of backfill materials meets specification requirements.

Submit certified compaction testing results from the soils testing laboratory.

PART 2 - PRODUCTS

2.1 MATERIALS FOR BACKFILLING, EMBANKMENTS OR FILLS

- A. Well-graded soil aggregate mixture consisting of Groups SW, SC, and SP soils of the Unified Soils Classification.
- B. Total content of gravel or rock fragments larger than 1/2" shall not exceed 20% by weight of the mass.
- C. Backfill shall not contain stones larger than 8" in any dimension, topsoil, organic matter, debris, cinders, or frozen material.
- D. Select material stone backfill

2.2 PERVIOUS MATERIAL

- A. Natural, clean, free-draining sand or gravel conforming to the requirements of ASTM C33 except:
Material passing a No. 100 sieve not to exceed 8%
Material passing a No. 200 sieve not to exceed 5%

2.3 SOURCE OF MATERIALS

- A. Use materials for fill from this Contract if they meet the requirements specified herein. If sufficient material meeting these requirements is not available from required excavation, obtain requisite material from other sources.
- B. Use only material which has been approved as to quality, location of source and zone of placement in the fill.
- C. The Township's Engineer has the right to reject material at the job site by visual inspection, pending sampling and testing.

2.4 SUITABLE BACKFILL MATERIAL

- A. State highways, Township roads and driveways: Crushed stone or aggregate (same as page 02221-3; 2.02A)

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavate in sequence and stages which will not subject permanent or temporary structures, installations, or surfaces to unstable conditions.
- B. Excavate as required to provide sufficient working space to permit placing, inspection, and completion of the structures.
- C. Support the sides of excavations as specified by OSHA.
- D. Keep excavations free from water.
- E. Haul excavated materials to fill, stockpile or disposal locations.
- F. Fill all openings and fractures in the excavation bottom and sides with approved materials. Obtain Township's Engineer's written approval of the foundation excavation before placing any foundation stone bedding or construction concrete.

3.2 BLASTING

- A. Blasting will be permitted except in areas where the proximity of structures, underground facilities, or public safety precludes the use of explosives. Nothing in this Section shall relieve the Contractor of his responsibilities for damages, nor shall it result in any responsibility to the Owner or the Engineer precluded in the General Conditions.
- B. Blasting work shall be supervised by licensed and experienced personnel and performed in conformance with applicable Federal, State and local codes.
- C. Township notification: Name and license number of blaster to be filed with the Township. In Zone 1 and Zone 2 of the Well Head Protection Areas, Blasting Plans must be filed with the Township for review 7 days in advance of blasting. Township must be notified of all blasting activity a minimum 48 hours in advance.

3.3 BACKFILLING STRUCTURES

- A. Do not commence backfilling around any structure until such structure has been examined and approved by the Engineer.
- B. Do not place backfill until the requirements for concrete curing and waterproofing have been complied with and, if required, until the test cylinders for the particular structure indicate that the concrete has attained the compressive strength specified.
- C. When backfilling against structures and where applicable, place backfill material in equal lifts and to similar elevations on opposite sides of structures in order to equalize opposing horizontal pressures. Place material in uniform increments over fill area.
- D. Protect structures from damage by construction activity, equipment, and vehicles. Repair or replace damaged structures to the satisfaction of the Owner.

- E. Conduct backfilling to obtain compaction requirements as specified. If compaction is not obtained, the Developer/Contractor shall, at his own expense, remove, replace, and retest as many times as is required to obtain the specified compaction.
- F. Place fill in layers of uniform thickness for the entire width so that each layer can be uniformly compacted.
 - 1. Adjust moisture content of the material to within the specified limits by discing or harrowing, if excessively wet; by wetting and thoroughly mixing, if excessively dry. Any fill in place that is disturbed by adjustment of moisture shall be recompacted to the specified range of compaction before placement of the next lift of backfill.
 - 2. Leave sheeting and shoring in place as long as possible, compatible with the placing and compacting of backfill.

3.4 COMPACTION

- A. Compact each layer of material to 95% of the maximum density at optimum moisture content as determined by ASTM D698, Method D.

- B. **Compaction Testing:**

Conduct compaction tests at locations where directed by the Engineer during backfilling operations.

3.5 ROUGH GRADING

- A. Rough grade to uniform finish contours. Form the bases for terraces, banks and paved areas.
- B. Grade areas to be paved to depths required for placing subbase and paving materials.
- C. Grade embankments and fills to smooth compact surface.
- D. The minimum degree of finish for all graded areas shall be that ordinarily obtained from bladegrader operations.

3.6 SHORING, SHEETING AND BRACING

- A. Install shoring, sheeting and bracing to comply with federal, state and local code requirements. Responsibility for the safety of the work, personnel and structures rests solely with the Contractor.
- B. Carry the bottom of the support system to depth below the main excavation, adequate to prevent ground movement.

- C. Follow the excavation closely with sheeting and shoring placement. Do not allow the maximum height of the unsheeted excavations to exceed OSHA specifications in predominantly clayey soils and three feet in sandy soils.
- D. Perform excavation for the installation of sheeting carefully to minimize the formation of voids.
- E. If unstable material is encountered during excavation, take measures to contain it in place and prevent ground displacement.
- F. Have sufficient quantity of material on hand at all times for sheeting, shoring, bracing and other operations for the protection of the work and for use in case of accident or emergency.

3.7 SURFACE DRAINAGE

- A. Intercept and divert surface drainage away from the excavation by the use of dikes, curb walls, ditches, pipes, sumps or other means.
- B. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.
- C. Remove the surface drainage system when no longer required.
- D. Remove debris and restore the site or sites to original condition.

3.8 DRAINAGE AND DEWATERING OF EXCAVATED AREAS

- A. Provide and maintain ditches to collect surface water and seepage which may enter the excavations and divert the water into a sump so that it can be pumped into drainage channels.
- B. Install a dewatering system to keep excavations dry and free of water.
- C. Maintain continuous and complete effectiveness of the installation at all times.
- D. Maintain water level below subgrade until concrete work or backfill, or both, have been completed to offset uplift pressures.
- E. Dispose of precipitation and subsurface water clear of the work. Comply with provisions of the Sediment and Erosion Control Plan.
- F. During dewatering operations, water discharged to a watercourse must be clear and free of silt, mud and other deleterious materials. Construct and maintain settling ponds to prevent stream degradation. Comply with the requirements for dewatering or discharging to a watercourse as required by Federal, state or local codes.
- G. Backfill drainage ditches, sumps, and settling basins when no longer required with granular material, or other material as approved by the Engineer.

3.9 FINISHING

- A. On completion of the work, clean ditches and channels and finish the site in a neat and presentable condition. Slope areas to provide positive drainage.
- B. Place topsoil and seed all areas disturbed by construction as specified in Section 02485, Finish Grading and Seeding, unless otherwise indicated.

END OF SECTION

SECTION 02221 - TRENCHING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work of This Section Includes, but is not limited to:

Trench excavation, backfill and compaction
Support of excavation
Pipe bedding requirements
Control of excavated material
Rough grading
Restoration of unpaved surfaces

- B. Related Work Specified Elsewhere:

1. Section 02100 - Clearing and Grubbing
2. Section 02220 - Excavation for Structures
3. Section 02485 - Finish Grading and Seeding
4. Section 02575 - Paving Restoration
5. Section 02610 - Sanitary Sewer Pipe
6. Section 02615 - Water Mains

- C. Applicable Standard Details:

5177 Pipe Bedding Details
5178A Pipe Trench Detail
5179 Concrete Cradle and Encasement Details
5180A Stream Crossing Detail
5190 Clay Dike Detail
5195 Thrust Block for Vertical Bends
5196 Thrust Block for Bends, Tees, and Caps

1.2 QUALITY ASSURANCE

- A. Testing Agency:

Compaction testing shall be performed by a Soils Testing Laboratory engaged and paid for by the Developer/Contractor and approved by the Township Engineer.

- B. Referenced Standards:

Pennsylvania Department of Transportation (PENNDOT):

Regulations Governing Occupancy of Highways by Utilities (67 PA Code, Chapter 459)
Publication 408 Specifications
Pennsylvania Test Method, PTM 106

Pennsylvania Test Method, PTM 402
Publication 203, Work Zone Traffic Control
PENNDOT Design Manual 2

American Society for Testing and Materials (ASTM):

D698 Tests for Moisture-Density Relations of Soils
D1556 Test for Density of Soil-in-Place by the Sand-Cone Method
D2922 Test for Density of Soil and Soil Aggregate in Place by Nuclear Methods

C. Compaction Testing:

Conduct compaction tests plus one test for each 1,000 linear feet of pipeline may be required. Conduct compaction tests at locations as where and when directed by the Township Engineer during backfilling operations.

Determine compaction in state highways and shoulders by the testing procedure contained in Pennsylvania Test Method PM 106 Method B, or PTM 402.

Determine compaction in areas other than state highways and shoulders by the testing procedure contained in ASTM D1556 or ASTM D2922.

1.3 SUBMITTALS

A. Certificates:

Submit, prior to delivery of the material to the job site, a Statement of Compliance from the materials supplier, together with supporting data, attesting that the composition analysis of pipe bedding and select material stone backfill materials meets specification requirements. Should a change in source of materials be made during construction, submit a new Statement of Compliance from the new source for approval before the material is delivered to the job site.

Submit certified compaction testing results from the soils testing laboratory.

B. Compaction Equipment List:

Submit a list of all equipment to be utilized for compacting, including the equipment manufacturer's lift thickness limitations.

C. Agreements with Property Owners:

Prior to storing or disposing of excavated materials on private property, submit a copy of the written agreement with the property owner.

1.4 JOB CONDITIONS

A. Classification of Excavation:

All excavation work performed under this contract is UNCLASSIFIED, and includes excavation and removal of all soil, shale, rock, boulders, fill, and all other materials encountered of whatever nature.

B. Control of Traffic:

Employ traffic control measures in accordance with Pennsylvania Department of Transportation Publication 203 "Work Zone Traffic Control".

C. Protection of Existing Utilities and Structures:

Take all precautions and utilize all facilities required to protect existing utilities and structures. In compliance with PA Underground Utility Protection Law of the General Assembly of Pennsylvania, advise each Utility at least 3 working days in advance of intent to excavate, do demolition work or use explosives and give the location of the job site. Request cooperative steps of the Utility and suggestions for procedures to avoid damage to its lines.

Advise each person in physical control of powered equipment or explosives used in excavation or demolition work of the type and location of utility lines at the job site, the Utility assistance to expect, and procedures to follow to prevent damage.

Immediately report to the Utility and the Township Engineer any break, leak or other damage to the lines or protective coatings made or discovered during the work and immediately alert the occupants of premises of any emergency created or discovered.

Allow free access to Utility personnel at all times for purposes of maintenance, repair and inspection.

PART 2 - PRODUCTS

2.1 PIPE BEDDING MATERIAL

A. Type IV Bedding Material:

Crushed stone or gravel aggregate conforming to AASHTO No. 57 or AASHTO No. 8 as specified in Section 703.2, Publication 408 Specifications.

2.2 BACKFILL MATERIAL

A. Select Material Stone Backfill:

Crushed stone or gravel aggregate conforming to Select Granular Material, Section 703.3, Publication 408 Specifications.

B. Suitable Backfill Material (State Highways, Township Roads, Shoulders, Embankments and Driveways):

From top of pipe bedding material to subgrade elevation:

Select Material Stone Backfill.

- C. Suitable Backfill Material (State roads and shoulders, Township roads and Driveways):

(Select - Material Stone Backfill)

From top of pipe bedding material to 24" over top of pipe:

Material excavated from the trench if free of stones larger than 2" in size and free of wet, frozen, or organic materials.

From 24" above pipe to subgrade elevation:

Material excavated from the trench if free of stones larger than 6" in size and free of wet, frozen, or organic materials.

2.3 RIP RAP STONE

- A. Field stone or rough unhewn quarry stone of approximate rectangular shape; hard and angular and of such quality that it will not disintegrate on exposure to water or weathering.
- B. 9" minimum thickness, measured perpendicular to face, with no face dimension less than the thickness of the stone.

Size rip rap based on 25-year storm velocities:

- C. Not less than 70% of the individual pieces weighing minimum of 150 lbs; not more than 10% of the individual pieces weighing less than 100 lbs.
- D. Rip rap shall conform to Section 850 of PENNDOT 408.

PART 3 - EXECUTION

3.1 MAINTENANCE AND PROTECTION OF TRAFFIC

- A. Coordinate the work to ensure the least inconvenience to traffic and maintain traffic in one or more unobstructed lanes unless closing the street is authorized.
- B. Maintain access to all streets and private drives.
- C. Provide and maintain signs, flashing warning lights, barricades, markers, and other protective devices as required to conform with construction operations and to keep traffic flowing with minimum restrictions.
- D. Comply with state and local codes, permits and regulations.

3.2 CUTTING PAVED SURFACES

- A. Where excavation includes breaking a paved surface, make cuts in a neat uniform fashion forming straight lines parallel with the centerline of the trench. Cut offsets at right angles to the centerline of the trench. Saw cut surfaces. No paving shall be broken except that which has been previously cut.
- B. Protect edges of cut pavement during excavation to prevent raveling or breaking; square edges prior to pavement replacement.

3.3 BLASTING

- A. Blasting will be permitted except in areas where the proximity of structures, underground facilities, or public safety precludes the use of explosives. Nothing in this section shall relieve the Contractor of his responsibilities for damages, nor shall it result in any responsibility to the Owner or the Township Engineer precluded in the General Conditions.
- B. Blasting work shall be supervised by licensed and experienced personnel and performed in conformance with applicable Federal, State and local codes.
- C. Township notification:

Name and license number of blaster to be filed with the Township. Township must be notified of blasting activity 48 hours in advance.

3.4 TRENCH EXCAVATION

- A. Topsoil Stripping and Stockpiling:

Strip topsoil encountered during trench excavation to its full depth and stockpile for reuse.

- B. Depth of Excavation: Gravity

Pipelines:

Excavate trenches to the depth and grade shown on the profile drawings for the invert of the pipe plus that excavation necessary for placement of pipe bedding material.

Excavation for laterals shall provide a straight uniform grade from the main pipeline or riser stack to the elevation at the right-of-way line, plus that excavation necessary for placement of pipe bedding material.

Pressure Pipelines:

Excavate trenches to the minimum depth necessary to place required pipe bedding material and to provide 4' from the top of the pipe to the finish ground elevation, except where specific depths are otherwise indicated on the Contract Drawings.

Where unsuitable bearing material is encountered in the trench bottom, continue excavation until the unsuitable material is removed, solid bearing is obtained or can be established, or concrete cradle can be placed. If no concrete cradle is to be installed, refill the trench to required pipeline grade with pipe bedding material.

Where the Developer/Contractor, by error or intent, excavates beyond the minimum required depth, backfill the trench to the required pipeline grade with pipe bedding material.

C. Width of Excavation:

Excavate trenches, including laterals, to a width necessary for placing and jointing the pipe and for placing and compacting bedding and backfill around the pipe.

Shape trench walls completely vertical from trench bottom to at least 24" above the top of the pipe.

For pressure pipeline fittings, excavate trenches to a width that will permit placement of concrete thrust blocks. Provide earth surfaces for thrust blocks that are perpendicular to the direction of thrust and are free of loose or soft material.

D. Length of Open Trench:

Do not advance trenching operations more than 100' ahead of completed pipeline except as specified in PENNDOT and OSHA standard specifications.

E. Protection of open trenches.

3.5 SUPPORT OF EXCAVATION

- A. Support excavations with sheeting, shoring, and bracing or a "trench box" as required to comply with Federal and State laws and codes. Install adequate excavation supports to prevent ground movement or settlement to adjacent structures, pipelines or utilities. Damage due to settlement because of failure to provide support or through negligence or fault of the Developer/Contractor in any other manner, shall be repaired at the Developer/Contractor's expense.
- B. Withdraw shoring, bracing, and sheeting as backfilling proceeds unless otherwise directed by the Township or its Engineer.

3.6 CONTROL OF EXCAVATED MATERIAL

- A. Keep the ground surface, within a minimum of 2' of both sides of the excavation free of excavated material.
- B. Provide temporary barricades to prevent excavated material from encroaching on private property, walks, gutters, and storm drains.
- C. Maintain accessibility to all fire hydrants, valve pit covers, valve boxes, curb boxes, fire and police call boxes, and other utility controls at all times. Keep gutters clear or provide other satisfactory facilities for street drainage. Do not obstruct natural water courses. Where necessary, provide temporary channels to allow the flow of water either along or across the site of the work.

- D. Do not place or store excavated material on private property without a written agreement signed by the property owner.
- E. In areas where pipelines parallel or cross streams, ensure that no material slides, is washed, or dumped into the stream course. Remove cofferdams immediately upon completion of pipeline construction. Contractor must obtain a DEP Stream Crossing Permit and supply a copy of permit to Township and keep a copy of permit on-site during construction.

3.7 DEWATERING

- A. Keep excavations dry and free of water. Dispose of precipitation and subsurface water clear of the work.
- B. Maintain pipe trenches dry until pipe has been jointed, inspected and backfilled, and concrete work has been completed. Prevent trench water from entering pipelines under construction.
- C. Intercept and divert surface drainage away from excavations. Maintain storm drainage facilities, gutters, and natural surface water courses open and in operation. Provide and install temporary facilities to maintain excavations free of water as required. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water. When mechanical equipment is utilized to control water conditions, provide and maintain sufficient standby units onsite.
- D. Comply with Federal and State requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control. Comply with the Sediment and Erosion Control Plan.

3.8 PIPE BEDDING REQUIREMENTS

- A. Type IV Bedding:

Depth of bedding material aggregate as shown on Standard Detail 5177.

Provide Type IV bedding for all pipe.

- B. Shape recesses for the joints or bell of the pipe by hand. Assure that the pipe is supported on the lower quadrant for the entire length of the barrel.

3.9 PIPE LAYING

- A. Lay pipe as specified in the appropriate Section of these Specifications for pipeline construction.

3.10 THRUST RESTRAINT

- A. Provide pressure pipe with concrete thrust blocking or use restrained joint fittings at all bends, tees, valves, and changes in direction, in accordance with Section 02615, paragraph 3.06.

3.11 BACKFILLING TRENCHES

- A. After pipe installation and inspection, backfill trenches from trench bottom or from the top of pipe bedding material, whichever is greater, to 12" above the crown of the pipe with specified backfill

material hand placed and carefully compacted with hand-operated mechanical tampers in layers of suitable thickness to provide specified compaction around and under the haunches of the pipe. Backfill and compact the remainder of the trench with specified backfill material. Refer to Backfill and Surface Restoration Requirements Table in Section 02575 for backfill material and compaction requirements.

B. Exposed Joints for Testing:

The Developer/Contractor has the option to test the pipe prior to backfilling the trench. If this option is selected, install reaction blocks where required and place 2' of thoroughly compacted backfill over the pipe leaving pipe joints partially exposed.

If the Contractor elects to completely backfill the trench prior to testing he shall be responsible for locating and uncovering leaks which may cause the test to fail.

C. Lift Thickness Limitations:

Submit a list of the compaction equipment to be utilized on the project, the recommendations of the equipment manufacturer as to the maximum lift thickness which can be placed, and the method of compaction to be used with this equipment to achieve the required compaction. In no case shall maximum lift thickness placed exceed the maximum limits specified by the manufacturer's recommendations. However, if the equipment manufacturer's lift thickness recommendation is followed and the specified compaction is not obtained, the Developer/Contractor shall, at his own expense, remove, replace, and retest as many times as is required to obtain the specified compaction.

Lift thickness limitations specified for state highways, shoulders, or embankments govern over the compaction equipment manufacturer's recommendations.

Notwithstanding the specified requirements for trench backfill compaction, trenches that settle below the surrounding grade prior to final completion shall be filled to surrounding grade level with appropriate materials.

D. Uncompacted Backfill:

Where uncompacted backfill is indicated on the Drawings, backfill the trench from one foot above the pipe to the top of the trench with material excavated from the trench, crowned over the trench to a sufficient height to allow for settlement to grade after consolidation.

E. Unsuitable Backfill Material:

Where the Township or its Engineer deems backfill material to be unsuitable and rejects all or part thereof due to conditions prevailing at the time of construction, remove the unsuitable material and replace with select material stone backfill or suitable foreign backfill material.

3.12 STREAM CROSSINGS

A. Construct pipeline stream crossings as shown on Standard Detail 5180A. Comply with provisions of the Sediment and Erosion Control Plan.

B. After backfilling, protect the surfaces of the disturbed area in stream channel and a minimum of five

feet from the top of bank on both sides with a one foot thick layer of rip rap stone.

3.13 CLAY DIKES

- A. Install clay dikes adjacent to stream crossings as shown on Standard Detail 5180A and where indicated on the Contract Drawings.
- B. Construct dikes impervious to the flow of water by backfilling the trench with compacted clay as shown on Standard Detail 5190.

3.14 UTILITY MARKING TAPE

- A. Install detectable utility marking tape above all plastic pressure pipelines, 12"-18" below final grade.

3.15 DISPOSAL OF EXCAVATED MATERIAL

- A. Excavated material remaining after completion of backfilling shall remain the property of the Developer/Contractor, removed from the construction area, and legally disposed of.

3.16 ROUGH GRADING

- A. Rough grade areas disturbed by construction to a uniform finish. Form the bases for terraces, banks, lawns and paved areas.
- B. Grade areas to be paved to depths required for placing subbase and paving materials. Rough grade areas to be topsoiled and seeded to 3" below indicated finish contours.

3.17 RESTORATION OF UNPAVED SURFACES

- A. Restore unpaved surfaces disturbed by construction to equal the surface condition prior to construction.
- B. Restore grassed areas in accordance with Section 02485, Finish Grading and Seeding.

3.18 RESTORATION OF PAVED SURFACES

- A. Restore paved surfaces in accordance with Section 02575, Paving Restoration.

3.19 UTILITIES CROSSING STREETS OR ROADS

- A. All electrical, telephone and TV cables crossing roads shall be installed in conduits or carrier pipes.

END OF SECTION

SECTION 02222 - SITE EXCAVATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work Of This Section Includes, but is not limited to:
 - 1. Excavation and Backfill for parking lot areas, and Roadways
 - 2. Dewatering
 - 3. Site Grading

- B. Related Work Specified Elsewhere:
 - 1. Clearing and Grubbing: Section 02100
 - 2. Trenching, Backfilling & Compacting: Section 02221
 - 3. Finish Grading and Seeding: Section 02485
 - 4. Paving Restoration: Section 02575
 - 5. Paving: Section 02576
 - 6. Site Drainage: Section 02800

- B. Classification of Excavation: All excavation work under this Contract shall be UNCLASSIFIED, and includes excavation and removal of all soil, rock, boulders, fill, and all other materials encountered of whatever nature.

1.2 QUALITY ASSURANCE

- A. Testing Agency: Soils testing and compaction testing shall be performed by an independent soils testing laboratory engaged and paid for by the Developer/Contractor and approved by the Township Engineer.

- B. Compaction Testing:
 - 1. Conduct compaction tests at locations as directed by the Township Engineer.
 - 2. Determine compaction by the testing procedure contained in ASTM D-698.

- C. Referenced Standards:
 - 1. Pennsylvania Department of Transportation (PENNDOT) Publication 408 Specifications, 1990, as amended.

1.3 JOB CONDITIONS

- A. Utilities: Protection of existing utilities shall be as specified in Section 02221.

- B. Tree and Shrub Protection: Protect existing trees and shrubs designated to remain from damage.

- C. Shoring, Sheeting and Bracing: Erect sheeting, shoring, and bracing as necessary for protection of persons, improvements, and excavations.

- D. Site Protection: Furnish and maintain barricades, signs and markings for excavated areas.

- E. Drainage:
 - 1. Select and install a system of dewatering to accomplish groundwater control in excavations.
 - 2. Preserve, protect and maintain operable existing drainage ways, drains and sewers.
 - 3. Comply with all local and state regulations for Soil Erosion and Sedimentation Control shown on the Drawings as specified herein.

1.4 SUBMITTALS

- A. Submit certified compaction results from the independent soils testing laboratory.

1.5 SUBSURFACE CONDITIONS

- A. The Developer/Contractor shall make his own investigation of existing subsurface conditions, and shall assume all responsibility for excavation work.

PART 2 - PRODUCTS

2.1 BACKFILL AND FILL MATERIALS

- A. Compacted Structural Fill: Excavated or borrow materials free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, organic and other deleterious matter which are approved by the Township Engineer.

PART 3 - EXECUTION

3.1 GENERAL

- A. Examine the areas and conditions under which excavating, filling, and grading are to be performed and remedy any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Township.
- B. Excavating and filling shall be done as required to bring the ground to the finished grades indicated on the Drawings, making allowance for paving thickness, topsoil, and to elevations not designated which are necessary for the completion of the work. All soil areas beyond the back of curb shall be graded within plus or minus 0.1 foot of the specified elevations and all areas within the roadway from face of curb to face of curb shall be graded within 0.2 foot. Once grading has begun the Developer/Contractor shall proceed with grading of the roadway, and parking lot areas to subgrade elevations as promptly as possible. Graded areas which do not receive other surface improvements shall then be seeded as soon as permitted or required by Section 02485.

3.2 EXCAVATION

- A. Excavation shall conform to the lines and grades as shown on the Drawings.
- B. Excavate in sequence and stages which will not subject permanent or temporary structures, installations, or surfaces to unstable conditions.
- C. Excavate as required to provide sufficient working space to permit placing, inspection, and completion of the structures.

- D. Support the sides of excavations as specified or as required for safe work conditions in accordance with OSHA, state, and local requirements.
- E. Keep excavations free from water.
- F. Haul excavated materials to fill, stockpile or disposal locations.

3.3 BLASTING

- A. Blasting will be permitted except in areas where the proximity of structures, underground facilities, or public safety precludes the use of explosives. Nothing in this Section shall relieve the Developer/Contractor of his responsibilities for damages, nor shall it result in any responsibility to the Township.
- B. Blasting work shall be supervised by licensed and experienced personnel and performed in conformance with applicable Federal, State and local codes.
- C. Township shall be notified 48 hours prior to blasting. Contractor shall deliver to Township copy of blaster's current state license prior to the start of blasting.
- D. In Zone 1 and Zone 2 of the Well Head Protection Area, blasting plans must be filed with the Township for review a minimum of 7 days in advance of blasting.

3.4 BACKFILLING

- A. Backfill shall be material as defined in paragraph 2.01A. Backfill shall be placed and compacted to 95% of maximum density at optimum moisture content as determined by ASTM D-698.
- B. When fill is required, the material used shall be compacted structural fill as defined in paragraph 2.01A. Degree of compaction shall be 95% of maximum density at optimum moisture content as determined by ASTM D-698.
- C. Subgrade: The construction of subgrades shall conform to the requirements of Section 210 of PENNDOT Specifications using the above backfill or fill materials. Compaction of subgrades shall be 95% of ASTM D-698.
- D. Fills more than 5 feet from paved areas in proposed grass areas shall be placed and compacted to 90% of maximum density in accordance with ASTM D-698 using approved on-site excavation.
- E. Conduct compaction tests at locations as directed by the Township Engineer during fill and embankment placement. Determine compaction by the testing procedure contained in ASTM D-698.

3.5 DISPOSAL OF EXCAVATED MATERIAL

- A. Remove excess excavated materials from the project site.

3.6 SURFACE DRAINAGE

- A. Intercept and divert surface drainage away from the excavation by the use of dikes, curb walls, ditches, pipes, sumps or other means. Avoid drainage onto adjacent properties.
- B. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.
- C. Remove the surface drainage system when no longer required.
- D. Remove debris and restore the site or sites to original condition.

3.7 DRAINAGE AND DEWATERING OF EXCAVATED AREAS

- A. Provide and maintain ditches to collect surface water and seepage which may enter the excavations and divert the water into a sump so that it can be pumped into drainage channels.
- B. Install a dewatering system to keep excavations dry and free of water.
- C. Maintain continuous and complete effectiveness of the installation at all times.
- D. Maintain water level below subgrade until concrete work or backfill, or both, have been completed to offset uplift pressures.
- E. Dispose of precipitation and subsurface water clear of the work.
- F. During dewatering operations, water discharged to a watercourse must be clear and free of silt, mud and other deleterious materials. Construct and maintain settling ponds to prevent stream degradation. Comply with the requirements for dewatering or discharging to a watercourse as required by Federal, state or local codes. Avoid drainage onto adjacent properties.

3.8 FINISHING

- A. Upon completion of the work, clean ditches and channels and finish the site in a neat and presentable condition.
- B. Slope areas to provide positive drainage.
- C. Place topsoil and seed all areas disturbed by construction as specified in Section 02485, Finish Grading and Seeding, unless otherwise indicated.

END OF SECTION

SECTION 02444 - CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work of This Section Includes, but is not limited to:

Chain-Link Fencing

Zinc-coated (Galvanized) steel fabric

Top rail, bottom tension wire

Gates: (Size and swing as required by the Township's Engineer)

Barbed Wire

Three strands of barbed wire

Accessories

1.2 QUALITY ASSURANCE

- A. Referenced Standards:

American Society for Testing and Materials (ASTM):

A120 Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless

A123 Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

A392 Zinc-Coated Steel Chain-Link Fence Fabric

1.3 SUBMITTALS

- A. Manufacturer's Product Data:

Submit manufacturer's latest publications of descriptive literature and product data.

- B. Compliance Statement:

Submit a statement compliance from the material suppliers together with supporting data attesting that the fencing materials meet or exceed specified requirements.

- C. Shop Drawings:

Submit shop drawings of fence layout, including details of gates, fittings and hardware.

1.4 JOB CONDITIONS

- A. If fencing is required around the perimeter of storm water detention/retention basin, the Developer/Contractor shall submit details of fencing proposed and it must be approved by the Township or its Engineer prior to installation.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FABRIC

- A. Zinc-Coated (Galvanized) Steel; ASTM A392. Hot-dip galvanized after weaving. One-piece full height of fabric.
- B. 2" Diamond Mesh; 9 gage (0.148") wire, 1290 lbf minimum breaking strength
- C. Selvages barbed and barbed

2.2 FRAMEWORK

- A. Galvanized Steel Pipe; ASTM A120, Schedule 40. Hot-dip galvanized inside and outside. Provide post caps.
- B. Fence Posts:
 - 1. Corner, Terminal and Pull Posts: 2.875" O.D.
 - 2. Line Posts: 2.375" O.D.
 - 3. Top Rail, Brace Rails: 1.660" O.D.
 - 4. Truss Rods: 0.313" Rod, w/Turnbuckles

C. Gate Posts:

<u>Single Gate</u>	<u>Double Gate</u>	<u>Post Size</u>
Up to 6'	Up to 12'	2.875" O.D.
7' to 12'	13' to 25'	4.000" O.D.
13' to 17'	26' to 35'	6.625" O.D.

2.3 GATES

- A. Framework: 1.660" O.D. galvanized steel pipe, with diagonal truss rods. Provide horizontal center rail on gates over 6' high; vertical center upright on gate leaves over 8' wide.

2.4 GATE HINGES

- A. Non-lift-off Type, offset to permit 180-degree swing.

2.5 FITTINGS

- A. Rail ends, rail sleeves, tension bars, brace ends, post tops and caps, latch forks, lock keepers, and other appurtenances, including gate hinges.
 - 1. Malleable, pressed or cast steel. Hot-dip galvanized after fabrication, ASTM A123.

2.6 TENSION WIRE

- A. #6 gage Galvanized Coil Spring Tension Wire; #9 gage Hog Rings and Tie Wire.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify that final grading in fence location is completed without irregularities which would interfere with fence installation.
- B. Do not commence work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure and layout complete fence line; measure parallel to surface of ground.
- B. Locate and mark position of posts. Locate corner posts at each horizontal angle point; locate line posts at equal distant spacing on not more than 10' nor less than 8' centers, unless otherwise indicated on the Drawings.

3.3 POST INSTALLATION

- A. Encase posts in concrete to minimum 3' depth. Extend concrete at least 6" below bottom of posts.
 - 10" diameter encasement for line posts,
 - 12" diameter encasement for end, corner, pull and gate posts.

Extend concrete 2" above finished grade, crowned to drain water away from the posts.

- B. Provide corner, end, and pull posts with a horizontal brace and tie rod on each side of the posts, extending and connecting to adjacent line posts.
- C. Provide fences higher than 8' with center rail.
- D. On fences under 6' high, attach post caps with setscrews.

3.4 FABRIC INSTALLATION

- A. Remove slack from fabric by means of mechanical fence stretchers before making attachment to posts.
- B. Cut fabric to form one continuous piece between terminal posts.

- C. Hold bottom of fabric 1" to 2" above finished grade.
- D. Attach fabric to terminal posts with vertical tension bands.
- E. Fasten fabric to line posts with #9 gage ties, or by integral fabric lock loops as applicable, at maximum 12" intervals.
- F. Fasten fabric to top rail and intermediate rail with #9 gage ties at maximum 18" intervals.
- G. Fasten fabric to tension wire with hog rings and ties at maximum 18" intervals.

3.5 GATES

- A. Install gates of the size and swing as required and as approved by the Township Engineer.
- B. Fill gate frame with same fabric as fence.
- C. Attach fabric to gate frame vertical end members with tension bars threaded through fabric and held by tension bands spaced maximum 12" intervals; attach to horizontal rails, center upright, and brace rails with #9 gage ties at maximum 12" intervals, top and bottom fabric ties.
- D. Provide latch forks, lock keepers, catches, plungerbars and stop holders. Latches and plungerbars operable from either side of gate. Padlock hasp integral part of latch.
- E. Locate gate stops, set in concrete, so that plungerbar fully engages.
- F. Adjust hardware to provide smooth operation.

3.6 FIELD QUALITY CONTROL

- A. Remove and replace fencing which is improperly located or is not true to line and grade, and posts which are not plumb.
- B. Adjust brace rails and tension rods for rigid installation.
- C. Tighten hardware, fasteners and accessories.
- D. Remove excess and waste materials from the project site.

END OF SECTION

PAVEMENT RESTORATION

TOWNSHIP ROADS						
CLASSIFICATION	BACKFILL	% COMP	TEMP BASE	TEMP SURFACE	FINAL BASE	FINAL SURFACE
*** Township Roads	2A or 2RC	95	N/A	2" Superpave 19mm Binder	8" 3A	1 ½" ID-2 Wearing Course 3" ID-2 Binder Course OR 1 ½" Superpave Wearing Course 3" Superpave Binder Course

DRIVEWAYS							
CLASSIFICATION	BACKFILL	% COMP	TEMP BASE	TEMP SURFACE	FINAL BASE	FINAL SURFACE	STD. DETAIL
Gravel & Unpaved Driveways	Suitable Backfill	95	Suitable Backfill	2" select Granular Material 2RC	----	6" Select Granular Material 2RC	
Bituminous Concrete Driveways	Suitable Backfill	95	Suitable Backfill	2" ID-2* Binder	6" Select Granular Material 2RC	1 ½" ID-2 Wearing Course	
Concrete	Suitable Backfill	95	Suitable Backfill	6" Select Granular Material	4" Select Granular Material	6" Class A Concrete	

* 3P-2 Cold Patch may be used when ID-2 is seasonally not available.

** Where the main sewer lines are in existing unpaved roads, the stone surface shall be 6" deep and 10' wide, being 5' from the centerline of the road each way.

*** Replace in kind if existing roadway cross-section is greater in depths than specified

SECTION 02485 - FINISH GRADING, SEEDING, AND SODDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work Of This Section Includes, but is not limited to:

Placing topsoil
Soil conditioning
Finish grading
Seeding
Sodding
Maintenance

B. The "Seeding Restoration Tables" at the end of this section list specific seeding restoration requirements.

C. Related Work Specified Elsewhere:

Clearing and Grubbing:	Section 02100
Excavation for Structures:	Section 02220
Trenching, Backfilling & Compacting:	Section 02221

1.2 QUALITY ASSURANCE

A. Testing Agency:

Soil and soil supplement testing shall be performed by a Soils Testing Laboratory engaged and paid for by the Developer/Contractor and approved by the Township Engineer. Collect soil samples under the direction of the Township Engineer.

B. Reference Standards:

Pennsylvania Department of Transportation (PENNDOT): Publication 408
Specifications, 1990 as Amended

Pennsylvania Seed Act of 1965, Act 187, as Amended.

Pennsylvania Soil Conditioner and Plant Growth Substance Law, Act of December 1, 1977, P.L. 258, No. 86(3P.S.68.2) as Amended.

Pennsylvania Agricultural Liming Materials Act of 1978, P.L. 15, No. 9(3P.S.132-1) as Amended.

Rules for Testing Seeds of the Association of Official Seed Analysts.

1.3 SUBMITTALS

A. Certificates:

1. Prior to use or placement of material, submit a Statement of Compliance from the materials suppliers, together with supporting data, attesting that the composition of the following products meets specification requirements.
 - a. Topsoil analysis
 - b. Fertilizer
 - c. Lime
 - d. Seed mixture(s)
2. If soil tests are performed to justify decreased liming and fertilizer rates, submit certified soil sample analyses, including laboratory's recommended soil supplement formulation.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Seed:

Deliver seed fully tagged and in separate packages according to species or seed mix. Seed which has become wet, moldy, or otherwise damaged in transit or storage will not be accepted.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Having a pH of between 6.0 and 7.0; containing not less than 2% nor more than 10% organic matter as determined by AASHTO T194.
- B. Fertile friable loam, sand loam, or clay loam which will hold a ball when squeezed with the hand, but which will crumble shortly after being released.
- C. Free of clods, grass, roots, or other debris harmful to plant growth. Free of pests, pest larvae, and matter toxic to plants.

2.2 FERTILIZER

A. Basic Dry Formulation Fertilizer:

Analysis 0-20-20 and as defined by the Pennsylvania Fertilizer Law.

B. Starter Fertilizer:

Analysis 10-5-5 or 12-6-6 and as defined by the Pennsylvania Fertilizer Law.

2.3 LIME

- A. Raw ground limestone conforming to Section 804.2(a) Pub. 408 Specifications.

2.4 SEED

- A. Fresh, clean, dated material from the last available crop and within the date period specified, with a date of test not more than 9 months prior to the date of sowing. Percentage of pure seed present shall represent freedom from inert matter and from other seeds distinguishable by their appearance. All seeds will be subject to analysis and testing.

TABLE 1 - GRASS AND AGRICULTURAL SEEDS

Species	Minimum Guaranteed Purity (Percent)	Maximum Weed Seed (Percent)	Minimum Guaranteed Germination (Percent)
Kentucky Bluegrass (<i>Poa pratensis</i>) Domestic origin min. 21 lb. per bushel	90	0.20	80
Perennial Ryegrass (<i>Lolium perenne</i> , var. Pennfine)	98	0.20	80
Kentucky 31 Fescue (<i>Festuca elatior arundinacea</i>)	98	0.25	85
Crownvetch (<i>Coronilla varia</i> , var. Penngift)	99	0.10	70
Pennlawn Red Fescue (<i>Festuca rubra</i> , var. Pennlawn)	98	0.15	85
Annual Ryegrass (<i>Lolium multiflorum</i>)	95	0.15	90
Timothy (<i>Phleum pratense</i>)	98	0.25	95

2.5 SEED MIXTURES

- A. See "Seeding Restoration Table" at end of this Section.

2.6 INOCULANT

- A. Inoculate leguminous seed before seeding with nitrogen fixing bacteria culture prepared specifically for the species. Do not use inoculant later than the date indicated by the manufacturer.
- B. Protect inoculated seed from prolonged exposure to sunlight prior to sowing. Reinoculate seed not sown within 24 hours following initial inoculation.

2.7 EROSION CONTROL NETTING

- A. Biodegradable netting and paper soil stabilization material.

2.8 MULCHING MATERIALS

- A. Mulches for seeded areas shall be one, or a combination, of the following:

1. Timothy hay or mixed clover and timothy hay, wheat or oat straw; thoroughly threshed.
 - a. Cured to less than 20% moisture content by weight.
 - b. Containing no stems of tobacco, soybeans, or other coarse or woody material, free of mature seed bearing stalks or roots of prohibited or noxious weeds.
2. Wood Cellulose:
 - a. Containing no growth or germination-inhibiting substances.
 - b. Green-dyed and air-dried.
 - c. Packages not exceeding 100 pounds.
 - d. Moisture Content: $12\% \pm 3\%$
 - e. Organic Matter (Dry oven basis): $98.6\% \pm 0.2\%$
 - f. Ash Content: $1.4\% \pm 0.2\%$
 - g. Minimum Water-Holding Capacity: 1,000%

PART 3 - EXECUTION

3.1 TIME OF OPERATIONS

- A. Conduct seeding operations during the times specified in the Seeding Restoration Table.

3.2 PREPARATION OF SUBGRADE

- A. "Hard pan" or heavy shale:
 1. Plow to a minimum depth of 6".
 2. Loosen and grade by harrowing, discing, or dragging.
 3. Handrake subgrade. Remove stones over 2" in diameter and other debris.
- B. Loose loam, sandy loam, or light clay:
 1. Loosen and grade by harrowing, discing, or dragging.
 2. Handrake subgrade. Remove rocks over 2" in diameter and other debris.

3.3 PLACING TOPSOIL

- A. Replace topsoil and spread over the prepared subgrade to obtain the required depth and grade elevation. Final compacted thickness of topsoil not less than 3-1/2"
- B. Handrake topsoil and remove all materials unsuitable or harmful to plant growth.
- C. Do not place topsoil when the subgrade is frozen, excessively wet, or extremely dry. Do not handle topsoil when frozen or muddy.

3.4 TILLAGE

- A. After seed bed areas have been brought to proper compacted elevation, thoroughly loosen to a minimum depth of 5" by discing, harrowing, or other approved methods. Do not work topsoiled areas when frozen or excessively wet.

B. Liming:

Distribute limestone uniformly at the rate indicated on the Seeding Restoration Table. Thoroughly incorporate into the topsoil to a minimum depth of 4" as a part of the tillage operation.

C. Basic Fertilizer:

Distribute basic fertilizer uniformly at the rate indicated on the Seeding Restoration Table. Incorporate into soil to depth of 4" by approved methods as part of tillage operation.

D. Liming and Fertilizer rates may be decreased if lesser rates are indicated by soil tests provided by the Contractor.

3.5 FINISH GRADING

A. Remove unsuitable material larger than 2" in any dimension.

B. Uniformly grade surface to the required contours without the formation of water pockets. Rework areas which puddle by the addition of topsoil and fertilizer. Rerake.

C. Distribute starter fertilizer at the rates indicated on the Seeding Restoration Table. Incorporate starter fertilizer into the upper 1" of soil.

3.6 SEEDING

A. Uniformly sow specified seed mix by use of approved hydraulic seeder, power-drawn drill, power-operated seeder, or hand-operated seeder or by hand. Do not seed when winds are over 15 mph.

B. Upon completion of sowing, cover seed to an average depth of 1/4" by hand raking or approved mechanical methods.

C. Upon completion of seed covering, roll the area with a roller, exerting a maximum force of 65 pounds per foot width of roller.

3.7 MULCHING

A. Mulch within 48 hours of seeding.

B. Place hay and straw mulch in a continuous blanket at a minimum rate of 1,200 pounds per 1,000 square yards.

Anchor hay or straw mulch by use of twine, stakes, wire staples, paper or plastic nets. Emulsified asphalt may be used for anchorage provided it is applied uniformly at a rate not less than 31 gallons per 1,000 square yards.

C. Chemical mulch binders or a light covering of topsoil may be used for anchorage when the size of the area precludes the use of mechanical equipment. Apply approved chemical mulch binders at the manufacturer's recommended rate.

D. Apply wood cellulose fiber hydraulically at a rate of 320 pounds per 1,000 square yards. Incorporate as an integral part of the slurry after seed and soil supplements have been thoroughly mixed.

- E. When mulch is applied to grass areas by blowing equipment, the use of cutters in the equipment will be permitted to the extent that a minimum of 95% of the mulch is 6" or more in length. For cut mulches applied by the blowing method, achieve a loose depth in place of not less than 2".
- F. When mulching by the asphalt mix method, apply the mulch by blowing. Spray the asphalt binder material into the mulch as it leaves the blower. Apply the binder to the mulch in the proportion of 1.5 to 2.0 gallons per 45 pounds of mulch.

Protect structures, pavements, curbs, and walls to prevent asphalt staining. Erect warning signs and barricades at intervals of 50 feet or less along the perimeter of the mulched area.

Do not spray asphalt and chemical mulch binders onto any area within 100 feet of a stream or other body of water.

3.8 MAINTENANCE

- A. Maintenance includes watering, weeding, initial mowing, cleanup, edging, and repair of washouts or gullies.
- B. Keep seeded areas wet, close to the saturation point, to a depth of 3" for a period of 10 days following seeding or sodding.
- C. Those areas which do not show a prompt catch of grass within 10 days of seeding or sodding shall be reseeded or resodded until complete grass catch occurs.
- D. When the grass reaches an average height of 2-1/2", cut to a height of 1-1/2". Irregularities or depressions which show up at this time shall be leveled and reseeded.

SEE ATTACHED SEEDING RESTORATION TABLE

END OF SECTION

SEEDING RESTORATION TABLE

RESTORATION CONDITION	TOPSOIL	LIME	BASIC FERTILIZER	STARTER FERTILIZER	SEED MIX & SOWING RATE (% BY WEIGHT)
Temporary Cover (**)	N/A	N/A	N/A	N/A	100% Annual Ryegrass Sow 9# per 1,000 Sq. Yds. Mar thru May/Aug thru Sept
Roadside, Non-mowed	Yes	100# per 1,000 Sq. Ft.	No	10-5-5@50# per 1,000 Sq.Ft. <u>or</u> 12-6-6@33# per 1,000 Sq. Ft.	80% Kentucky 31 Fescue 20% Pennlawn Red Fescue Sow 21# per 1,000 Sq.Yds. Mar thru May/Aug thru Sept
Roadside, Mowed	Yes	100# per 1,000 Sq. Ft.	No	10-5-5@50# per 1,000 Sq.Ft. <u>or</u> 12-6-6@33# per 1,000 Sq. Ft.	50% Kentucky Bluegrass 30% Pennlawn Red Fescue 20% Perennial Ryegrass Sow 21# per 1,000 Sq.Yds. Mar thru May/Aug thru Sept
Bank Areas, 3:1 and Steeper	Yes	100# per 1,000 Sq. Ft.	No	10-5-5@50# per 1,000 Sq.Ft. <u>or</u> 12-6-6@33# per 1,000 Sq. Ft.	45% Crown vetch 55% Annual Ryegrass Sow 9# per 1,000 Sq. Yds. Any time except Sept. -Oct.
Lawns	Yes	100# per 1,000 Sq. Ft.	0-20-20 50#/1,000 Sq. Ft.	10-5-5@50# per 1,000 Sq.Ft. <u>or</u> 12-6-6@33# per 1,000 Sq. Ft.	50% Kentucky Bluegrass 30% Pennlawn Red Fescue 20% Perennial Ryegrass Sow 21# per 1,000 Sq.Yds. Mar thru May/Aug thru Sept
Fields and Pasture, Non-cultivated	No	No	No	10-5-5@50# per 1,000 Sq.Ft. <u>or</u> 12-6-6@33# per 1,000 Sq. Ft.	100% Timothy Sow 9# per 1,000 Sq. Yds. Mar thru May/Aug thru Sept
Fields, Cultivated	No	No	No	10-5-5@50# per 1,000 Sq.Ft. <u>or</u> 12-6-6@33# per 1,000 Sq. Ft.	100% Annual Ryegrass Sow 9# per 1,000 Sq. Yds. Mar thru May/Aug thru Sept
Woods, Sparse	No	No	No	10-5-5@50# per 1,000 Sq.Ft. <u>or</u> 12-6-6@33# per 1,000 Sq. Ft.	100% Red Fescue Sow 36#/1,000 Sq. Yds. Mar thru May/Aug thru Sept
Woods, Dense	No	No	No	No	Stabilize soil with bio-degradable netting and paper fabric material.

* Unless lesser rate indicated by soils tests

** Unless otherwise specified in the Erosion and Sediment Control Plan

SECTION 02575 - PAVING RESTORATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Work of this section includes, but is not limited to:
 - 1. Temporary Paving
 - 2. Permanent Paving
 - 3. Shoulder Restoration
 - 4. Curb and Sidewalk Restoration
- B. The "Surface Restoration Requirements" Table(s) at the end of this Section lists the specific repaving requirements.
- C. Related Work specified elsewhere:
 - 1. Section 02221 - Trenching, Backfilling and Compacting

1.02 QUALITY ASSURANCE

- A. Use only materials which are furnished by a bulk bituminous concrete producer regularly engaged in production of hot-mix, hot-laid bituminous concrete and is listed in PennDOT Bulletin 41, List of Commercial Producers of Bituminous Mixtures.
 - 1. Pennsylvania Department of Transportation (PennDOT):
 - a. Regulations Governing Occupancy of Highways by Utilities (67 PA Code, Chapter 459)
 - b. Publication 408 Specifications
 - c. Publication 27 - Specification for Bituminous Materials (Bulletin 27)
 - d. Publication 37 - Specification for Bituminous Materials (Bulletin 25)
 - e. Publication 41 - List of Commercial Producers of Bituminous Mixtures (Bulletin 41)
 - f. Publication 213 - Work Zone Traffic Control Guidelines

1.03 SUBMITTALS

- A. Submit a Statement of Compliance, together with supporting data, from bituminous and aggregate suppliers attesting that the materials provided conform to specifications requirements.
- B. Submit batch tickets for each load of bituminous concrete delivered to the project site.

1.04 JOB CONDITIONS

- A. Weather Limitations: In accordance with Section 409.3(b) PennDOT Form 408.
 - 1. Place bituminous concrete when atmospheric temperature is above 40°F, only under dry conditions and when precipitation is not forecast for the following eight (8) hours.

2. Place bituminous concrete only on a dry, non-frozen, base, free of any dew or any moisture.
- B. Employ measures to control traffic to allow safe and expeditious movement of all traffic through the work area.
- C. Implement traffic control measures in accordance with Publication 408, Pennsylvania Department of Transportation Specifications. Also, comply with Publication 213.
- D. Do not allow traffic on repaved areas until authorized by the Township Engineer.
- E. Restore existing paving outside the limits of the work that is damaged by the Contractor's operations to its original condition, at the expense of the Contractor.
- F. Conduct paving and road restoration work during hours as restricted by Township Ordinances.

1.05 TESTING

- A. Take core samples at locations as directed by the Township Engineer.
- B. Bituminous concrete courses deficient more than 1/4" from the specified depth in any one sample, or uniformly more than 1/8" in three or more samples, shall be removed and replaced to the correct depth.
- C. Refill and compact test holes with material acceptable to, and under the direction of, the Township Engineer.
- D. Compaction testing may be required by the Township. Testing, if required, shall be in accordance with Section 409.3 PennDOT Form 408.

1.06 TOWNSHIP ROAD OCCUPANCY PERMIT

- A. Developer/Contractor must obtain a road occupancy permit prior to commencing work.

PART 2 - PRODUCTS

2.01 CONCRETE

- A. See Section 03310 - Concrete Work

2.02 BITUMINOUS PAVING MATERIALS

- A. Pennsylvania Department of Transportation Specifications, Form 408.
- B. Bituminous Tack Coat, Section 460.
- C. Subbase, Section 350.
- D. Bituminous Surface Treatment, Section 480.
- E. Select Granular Material (2RC), Section 703.3.
- F. Superpave Asphalt, Section 309 & 409 PennDOT Form 408.

PART 3 - EXECUTION

3.01 TEMPORARY PAVING

- A. Place temporary paving immediately upon completion of trench backfilling.
- B. Grade and compact subgrade material, then place and compact crushed stone base course to the required thickness.
- C. Place temporary paving material. Compact to required minimum thickness with trench roller having minimum 300 pounds per inch-width of compaction roll.
- D. Continuously maintain temporary paving to the satisfaction of the Township Engineer for a period not to exceed 6 months or as required by permit requirements.
- E. Temporary paving on roads must remain in place for a minimum of 90 days. A shorter period must be approved by Township Engineer.

3.02 PERMANENT PAVING

- A. Commence final repaving work only upon authorization from the Township Engineer; and after approval of crushed stone base course.
- B. Trim existing paving to remove damaged areas; cut straight joint lines and right angle offsets.
- C. Remove temporary paving material.
- D. Apply rubberized joint sealer to cut edges of bituminous paving (ASTM D 1190).
- E. Construct permanent base and surface courses to the required compacted thicknesses shown on the Standard Details, Surface Restoration Requirement Table(s), and in accordance with Township or State requirements.
- F. Maintain permanent paving to the satisfaction of the Township Engineer and in accordance with Township and State requirements throughout the guarantee period.

3.03 BITUMINOUS OVERLAY

- A. Where indicated on the Drawings, Standard Details, or as directed by the Township Engineer, construct an overlay of bituminous wearing course Superpave, Section 309 & 409 PennDOT Form 408.
- B. Broom clean full width of roadway surface and shoulder.
- C. Apply E 1 bituminous tack coat material at 0.05 to 0.07 gallon per square yard, in accordance with Section 460 PennDOT Form 408.
- D. Construct overlay in accordance with Section 409 PennDOT Form 408

3.04 BITUMINOUS SURFACE TREATMENT

- A. Where shown on Drawings, and as directed by the Township Engineer, bituminous surface treatment pavement shall be constructed in accordance with Section 480 PennDOT Form 408.

3.05 SHOULDER RESTORATION

- A. Restore shoulders in accordance with Surface Restoration Table(s).

3.06 DRIVEWAYS

- A. Trim concrete and bituminous driveway surfaces to remove damaged areas.
- B. Saw cut straight joint lines parallel to the centerline of the trench.
- C. Cut offsets at right angles to the trench centerline.
- D. Restore existing concrete driveways trenched through with concrete as specified in Surface Restoration Table, reinforced with 6 x 6 4/4 wire mesh.
- E. Restore driveways in accordance with requirements specified in Surface Restoration Table.
- F. Restore stone or gravel driveways in kind.
- G. Restore brick driveways with like bricks placed on a 4" thick wet sand bed; place bricks in like pattern and spacing.

3.07 BITUMINOUS CONCRETE CURB

- A. Restore bituminous concrete curb in accordance with Section 636 PennDOT Form 408.

3.08 CONCRETE CURB AND SIDEWALK REPAIRS

- A. Replace curbs and sidewalks damaged by construction to match existing.
- B. Reconstruct curbs and sidewalks to the first expansion joint on either side of the damaged portion. Install expansion joint material. Establish 5' minimum length cutting clean joint.
- C. Reconstruct sidewalks in accordance with Section 02580.

REFER TO SURFACE RESTORATION TABLE

END OF SECTION

SECTION 02576 - PAVING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Work Includes, but is not limited to, the following:
1. New Paving
 - a. Bituminous Concrete Paving
 2. New Curbs
- B. Related Work Specified Elsewhere:
- | | |
|------------------------------------------|---------------|
| 1. Site Excavation | Section 02220 |
| 2. Trenching, Backfilling and Compacting | Section 02221 |
| 3. Paving Restoration | Section 02575 |
| 4. Site Drainage | Section 02800 |

1.02 QUALITY ASSURANCE

- A. Use only materials which are furnished by a bulk bituminous concrete producer regularly engaged in production of hot mix, hot laid bituminous concrete. Bituminous paving materials shall be PennDOT approved mixes from certified batching plants.
- B. Referenced Standards:
1. American Society for Testing and Materials (ASTM):
 - a. ASTM D698 - Test Methods for Moisture - Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. (2.49-kg) Rammer and 12-inch (304.8-mm) Drop
 2. Pennsylvania Department of Transportation (PennDOT)
 - a. Publication 408 Specifications.

1.03 SUBMITTALS

- A. Submit materials certificates attesting that each material item complies with or exceeds the specification requirements.

1.04 JOB CONDITIONS

- A. Weather Limitations:
1. Construct bituminous courses only when atmospheric temperature is above 40°F and when base is dry.
 2. Aggregate base courses may be placed when air temperature is above 30°F and rising.
 3. Placement of superpave bituminous mixtures is subject to construction season limitations as set in Section 409.3(b) PennDOT Form 408.

- B. Establish and maintain required lines and grades, including crown and cross-slope, for each course during construction.
- C. Take measures to control traffic to allow safe and expeditious movement of all traffic through the work area.
- D. Employ traffic control measures in accordance with Publication 408, Pennsylvania Department of Transportation Specifications.
- E. Restore existing paving outside the limits of the work, when damaged or in any way rendered defective by Developer/Contractor's operations or his movement of equipment, to its original condition at the expense of the Developer/Contractor.
- F. Roadway width shall be in accordance with the subdivision ordinance or Township Construction Specifications.
- G. Conduct paving and road restoration work during hours approved by the Engineer. No paving shall occur during night time hours unless approved by Township.

1.05 TESTING

A. Thickness Testing:

1. Obtain the number of 6" diameter core samples as directed by the Township Engineer to test the depth of bituminous material courses.
2. Take core samples at locations as directed by the Township Engineer after final compaction rolling.
3. Bituminous concrete courses deficient more than 1/4" from the specified depth in any one sample, or uniformly more than 1/8" in three or more samples, shall be removed and replaced to the correct depth.
4. Refill and compact test holes with material acceptable to, and under the direction of, the Township Engineer.

B. Surface Smoothness:

1. Test finished surface of each bituminous concrete, course for smoothness using 10' straightedge applied parallel with, and at right angles to, centerline of paved area.
2. Surfaces will not be acceptable if exceeding 1/4" tolerance for smoothness, for binder course surfaces and 3/16" tolerance for wearing course surfaces.
3. Check surface areas at intervals as directed by the Township Engineer.
4. Ponding shall be corrected as directed by the Township.

C. Compaction:

1. Compaction testing, at the Contractor's expense, may be required by the Township.
2. Testing, if required, shall be in accordance with Section 409.3 Form 408.

1.06 TOWNSHIP ROAD OCCUPANCY PERMIT

- A. Developer/Contractor must obtain a road occupancy permit prior to commencing work.
- B. Road restoration shall be in accordance with Section 02575.

PART 2 - PRODUCTS

2.01 NEW BITUMINOUS PAVING - RESIDENTIAL

- A. Aggregate Base Course: Shall be 3A modified stone, minimum 8" of depth, in accordance with Section 703.2(c) PennDOT Form 408.
- B. Superpave Bituminous Concrete Base Course: Shall be minimum 3" of depth, in accordance with Section 309 & 409 PennDOT Form 408.
- C. Superpave Bituminous Concrete Binder Course: Shall be minimum 2" of depth, in accordance with Section 309 & 409 PennDOT Form 408.
- D. Binder course shall be placed on the base course directly following the proper cool down period. In no instance shall the base course be exposed for longer than a seven (7) day period.
- E. For new road construction, bituminous concrete base and binder course shall be in place for a minimum of 12 months before placement of final wearing course. Obtain approval from Township Engineer before placing final wearing course.
- F. Binder Courses not covered by a Superpave Bituminous Wearing Course within five (5) years of placement must be sealed with a bituminous seal coat in accordance with Section 470 PennDOT Form 408.
- G. Superpave Bituminous Concrete Wearing Course: shall be minimum 1 1/2" of depth, in accordance with Section 309 & 409 PennDOT Form 408.
- H. Pavement Lines and Markers: Shall be in accordance with Section 962 PennDOT Form 408.

2.02 NEW BITUMINOUS PAVING - INDUSTRIAL

- A. Individual design of industrial specs in accordance with PennDOT, and approval by Township Engineer.

2.03 CONCRETE CURB

- A. Concrete curbs shall be in accordance with Section 02580, and approval by Township Engineer.

2.04 CONCRETE SIDEWALK

- A. Concrete sidewalks shall be in accordance with Section 02580.

2.05 PIPE UNDERDRAIN

- A. Pipe underdrains shall be corrugated polyethylene in accordance with Section 610.2(a)3 PennDOT Form 408.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Excavate, fill and/or backfill, and prepare subgrade as specified in Sections 02220 and 02221.

3.02 FINISH GRADING OF THE SUBGRADE

- A. Grade parallel to the finish surface.
- B. Compact to 95% maximum density determined in accordance with ASTM D698.
- C. Remove all loose material from compacted subgrade surface and satisfactory proof roll in the presence of the Township Engineer immediately before placing base course.

3.03 CONSTRUCTION OF PARKING AREAS AND ROADWAYS

- A. Construct subbase course in accordance with Section 350 PennDOT Form 408; minimum thickness after compaction shall be as shown on Standard Details 5600, 5601, 5602, 5603 and 5604.
- B. Construct superpave bituminous concrete base course in accordance with Section 309 & 409 PennDOT Form 408; minimum compacted thickness as shown on Standard Details 5600, 5601, 5602, 5603 and 5604.
- C. Construct superpave bituminous concrete binder course in accordance with Section 309 & 409 PennDOT Form 408; minimum compacted thickness as shown on Standard Details 5600, 5601, 5602, 5603 and 5604.
- D. Construct superpave bituminous concrete wearing course in accordance with Section 309 & 409 PennDOT Form 408; minimum compacted thickness as shown on Standard Details 5600, 5601, 5602, 5603 and 5604.
- E. Seal paving which meets curbing, inlets and structures with bituminous sealant materials in accordance with Section 470 PennDOT Form 408.
- F. Pavement lines and markers shall be as detailed on the Drawings and in accordance with Section 962 PennDOT Form 408.

3.04 CONSTRUCTION OF CONCRETE CURB

- A. Construct in accordance with Section 02580.

3.05 CONSTRUCTION OF PIPE UNDERDRAIN

- A. Construct pipe underdrain in accordance with Publication 408 and Roadway Standards RC 30 (PennDOT Form 408). Minimum pipe size shall be 6" diameter.

3.06 PROTECTION - GENERAL

- A. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- B. Erect barricades to protect paving from traffic until mixture has cooled and attained its maximum degree of hardness.

3.07 FIELD QUALITY CONTROL

A. General:

- 1. Test the in place bituminous concrete courses for compliance with requirements for thickness, surface smoothness and compaction, if required, as specified in 1.05A, B and C of this Section.
- 2. Repair or remove and replace unacceptable paving sections, as directed by the Township Engineer.

B. Certifications

- 1. Job Mix Formula - Submit job mix formula to the owners engineer five (5) days prior to start of work.
- 2. Provide PennDOT Certification of Compliance (CS-4171) with the first load delivered to the job site each day. Certification must be signed by the plant technician and cross referenced with the job mix formula number which must appear on the delivery ticket.
- 3. Delivery Tickets/Weight Slips - Must be provided with each load delivered to the job site. Weight slips must include, at a minimum, the following:
 - a. Job Mix Formula Number
 - b. Date and Time
 - c. Material Type
 - d. Design ESALS
 - e. For Wearing Course - SRL Designation

END OF SECTION

SECTION 02580 - CURBS AND SIDEWALKS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work Includes, but is not limited to, the following:

1. Concrete Curbs
2. Concrete Sidewalks

B. Related Work Specified Elsewhere:

- | | |
|------------------------------------------|---------------|
| 1. Site Excavation | Section 02220 |
| 2. Trenching, Backfilling and Compacting | Section 02221 |
| 3. Concrete for Utility Construction | Section 03310 |

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. Pennsylvania Department of Transportation (PENNDOT)
 - a. Publication 408 Specifications.
 - b. Standards for Roadway Construction.

1.3 SUBMITTALS

A. Submit materials certificates attesting that each material item complies with or exceeds the specification requirements.

1.4 JOB CONDITIONS

- A. Take measures to control traffic to allow safe and expeditious movement of all traffic through the work area.
- B. Employ traffic control measures in accordance with Publication 408, Pennsylvania Department of Transportation Specifications, all sections of 900 except 901.4. Also comply with Publication 203.
- C. Restore existing concrete curb and sidewalk outside the limits of the work, when damaged or in any way rendered defective by Developer/Contractor's operations or his movement of equipment, to its original condition at the expense of the Developer/Contractor.

PART 2 - PRODUCTS

2.1 CONCRETE CURB

- A. Concrete: Class A - 3,500 psi strength conforming to Publication 408, Section 704 (PENNDOT).
- B. Premolded Expansion Joint Filler: Shall conform to Publication 408, Section 705.1 (PENNDOT).

- C. Provide either a straight vertical curb or slant curb.

2.2 CONCRETE SIDEWALK

- A. Concrete: Class A - 3,500 psi strength conforming to Publication 408, Section 704 (PADOT).
- B. Premolded Expansion Joint Filler: Shall conform to Publication 408, Section 705.1 (PADOT).
- C. Aggregate: Shall conform to Section 350.2 (PENNDOT).
- D. Steel Welded Wire Fabric: Shall conform to Section 709.3 (PENNDOT).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Excavate, fill and/or backfill, and prepare subgrade as specified in Sections 02220 and 02221.

3.2 CONSTRUCTION OF SIDEWALKS

- A. Construct concrete sidewalks in accordance with Section 676.3 (PENNDOT).
- B. Construct pedestrian ramps at all intersections and open space areas in accordance with current American Disability Act requirements.
- C. Construct sidewalks to 4" thickness of concrete, placed on a 4" minimum base of compacted stone crushed aggregate.
- D. Construct sidewalks to 6" thickness of concrete at driveways and pedestrian ramps, reinforced with 6 x 6 W2.1/W2.1 wire mesh, placed on a 4" minimum base of compacted stone crushed aggregate. See Standard Detail 5618.
- E. Provide nonslip-broom finish.
- F. Provide premolded expansion joints at a minimum distance of every 20 feet along sidewalk and separations from curbs, structures, stairs, other pavements, utility poles, hydrants or other permanent structures.
- G. Construct fill banks behind sidewalks on a 3:1 slope.
- H. Construct cut banks behind sidewalks on a 2:1 slope.
- I. All curb ramps must meet the requirements of the 2010 ADA Standards for Accessible Design, or most recent edition.

3.3 CONSTRUCTION OF CONCRETE CURB

- A. Construct cast in place concrete curb in accordance with Publication 408, Section 630 and Standards for Roadway RC-64 (PENNDOT). See 02525-4 CSD Items H and Z.
- B. Contraction joints (10' saw cut)

C. Expansion joints at every 60' and at all existing cur or concrete structures.

3.4 FIELD QUALITY CONTROL

A. General: Repair or remove and replace unacceptable curb and sidewalk as directed by the Township Engineer.

END OF SECTION

SECTION 02601 - MANHOLES

PART 1 - GENERAL

1.01 DESCRIPTION

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

1. Precast Concrete Manholes
2. Concrete Manhole Bases
3. Manhole Steps
4. Manhole Covers and Frames

B. Related Work specified elsewhere:

1. Section 02221 - Trenching, Backfilling & Compacting
2. Section 02610 - Sanitary Sewer Pipe
3. Section 02651 - Sewer and Manhole Testing
4. Section 03310 - Concrete

C. Applicable Standard Details:

1. 5100A Concrete Manhole Base Details
2. 5100B Plans of Manhole Bases
3. 5100G Precast Manhole Base Detail
4. 5106 Standard Shallow Precast Manhole
5. 5107 Standard Deep Precast Manhole
6. 5109 Precast Manholes, Typical all joints
7. 5109A Manhole Cover with Anchor Bolt
8. 5110B Aluminum Manhole Step Details
9. 5112 Ground Water Height Indicator
10. 5115 Heavy Traffic Sanitary Sewer Manhole Frame and Cover
11. 5116 Bolted Waterproof Manhole Frame and Cover, Type I
12. 5119A Type A Drop Manhole Details, PVC Pipe
13. 5119C Type A Drop Manhole Details, DI Mechanical Joint Pipe
14. 5120A Type B Drop Manhole Details, PVC Pipe
15. 5120C Type B Drop Manhole Details, DI Mechanical Joint Pipe
16. 5121 Special Fitting for Drop Manholes

1.02 REFERENCES

A. Pennsylvania Department of Transportation (PENNDOT):

1. Publication 408 Specifications, as Amended.

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

1. A48 Specification for Gray Iron Castings
2. C32 Specification for Sewer and Manhole Brick
3. C270 Specifications for Mortar for Unit Masonry
4. C478 Specifications for Precast Reinforced Concrete Manhole Sections
5. C923 Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes

1.03 SUBMITTALS

A. Submit certification from material suppliers attesting that materials meet or exceed specification requirements.

B. Manufacturer's Information:

1. Submit details of manhole sections, and precast bases if used.
2. Submit details of manhole frames and covers.
3. Submit details of manhole steps.
4. Submit manufacturers' descriptive literature and installation instructions for the resilient pipe-to-manhole connection and for the joint sealant compound.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Crushed Stone Subbase: AASHTO 57 and AASHTO No. 8, Type C, Section 702.3, Publication 408 Specifications
- B. Manhole Brick: ASTM C32, Grade MS, Solid
- C. Masonry Mortar: ASTM C270, Type S
- D. Cement Concrete: Section 03310

2.02 MANHOLES

A. Precast Concrete Manhole Sections:

1. Conforming to ASTM C478, with 5.5% 1% air entrained cement concrete. +
2. Provide eccentric cone or flat slab top sections as indicated on Drawings.
3. Provide 24" minimum access opening.
4. Precast riser sections of length to suit.
5. Precast bases of a design similar to the precast riser sections.
6. Where manholes are subject to adverse conditions, special concrete protection to be provided as directed by the Township Engineer.

B. Manhole Steps:

B. Manhole Steps:

1. Aluminum: ASTM B247, Alloy 6061-T6
2. Steel reinforced fiberglass steps
3. Steel reinforced copolymer polypropylene plastic steps

C. Manhole Frames and Covers:

1. All casting shall be made in accordance with the "Steel Products Procurement Act of Pennsylvania".
2. All Manufacturers must be approved by the Pennsylvania Department of Transportation and Dover Township.
3. Cast iron castings: ASTM A48, Class 30 or better AASHTO M306-04; free of bubbles, sand and air holes, and other imperfections.
4. Contact surfaces machined and matched.
5. Casting shall have a factory applied water base bituminous coating.
6. Cast the following inscription on the cover: "Dover Township Sanitary Sewer."
7. Standard manhole castings shall be East Jordan Iron Works model 1045Z2 frame & 1045A cover, or approved equal.

D. Watertight Frames and Covers:

1. Model shall be East Jordan Iron Works model 1045ZPT bolted and o-ring gasketed or approved equal.
2. Cast the following inscription on the cover: "Dover Township Sanitary Sewer".
3. No crack-drilled units allowed.

E. Manhole Inserts:

1. High Density Polyethylene as manufactured by Parson Environmental Products, Inc.

F. Joint Sealant Compound: ASTM D1850, cold applied.

G. Manhole Flexible Connector System: Shall be PSX: Positive Seal as manufactured by Press-Seal Gasket Corporation, Fort Wayne, Indiana. Must meet or exceed ASTM C- 923.

H. Manhole Cover Adjustment Rings

1. Precast cement concrete adjustment rings shall be cast from 4000 psi concrete (28-day compressive strength). Circumferential reinforcement shall be in conformance with ASTM C478. Split concrete rings are not permitted.
2. Plastic or High Density Polyethylene (HDPE) rings are not permitted.
3. Steel adjustment rings are not permitted.
4. Poured in place concrete adjustments shall conform to Standard Detail 5117.

PART 3 - EXECUTION

3.01 EXCAVATION

- A. Perform excavation to the line and grade indicated on the Drawings and as specified in Section 02221 - Trenching, Backfilling and Compacting.

3.02 CONSTRUCTION

- A. Construct watertight manholes of precast concrete sections of the type indicated on the Drawings.
- B. Construct 4' diameter manholes unless otherwise indicated.
- C. Construct drop connections of the required type as indicated on the Drawings and in accordance with Standard Details 5119 and 5120. Encase drop connection in concrete.
 - 1. All piping within the drop connection and one pipe length upstream of the wye or tee/ wye combination shall be ductile iron.
 - 2. Drop connection shall be concrete encased.
 - 3. Upon approval of the Township/ Authority Engineer, inside drop connections may be utilized when a 5' inside diameter manhole is provided. All braces, supports and connectors shall be stainless steel.
 - 4. Upon approval of the Township/ Authority Engineer, inside drop connections may be made utilizing an "Intraflow - Low Profile Inside Drop" as manufactured by Royal Environmental Systems, Inc.
- D. Provide cast-in-place concrete or precast concrete bases.
 - 1. Construct cast-in-place bases as indicated on Standard Detail 5100A.
 - a. Install a minimum of 4" of crushed stone subbase for cast-in-place concrete bases.
 - b. Provide concrete to support the full length of the pipe section cast into the base as shown on the Standard Detail.
 - c. Cast-in-place bases may be constructed with a special form for a joint to match the manhole cylinder sections.
 - 2. Install precast bases as shown on Standard Detail 5100G.
 - a. Set the precast base on 6" crushed stone subbase.
 - b. Provide a sealed, flexible resilient connection between pipe and precast base section. "PSX" gasket or equal, approved by the Township Engineer.
- E. Flow Channels:
 - 1. Form flow channels in manhole bases as indicated on the Standard Details.
 - 2. Slope channels uniformly from influent invert to effluent invert; minimum 1" drop.
 - 3. Construct bends of the largest possible radius. Form channel sides and invert smooth and uniform; free of cracks, holes or protrusions.
- F. Do not permit pipe to project more than 2" into the manhole.
- G. Joint Sealant:
 - 1. Seal joints between precast concrete manhole sections with joint sealant compound as indicated on Standard Detail 5109.
 - 2. Apply joint sealant compound in accordance with instructions of the manufacturer.
 - 3. Place compound on the interior and exterior sides of the joint to be squeezed out by the weight of the upper section.
 - 4. Trowel sealant compound smooth with manhole interior.

5. Do not apply rigid mortar to the joints between manhole sections.
6. Joint sealant to be Rub-R-Nek or approved equal.

H. Install manhole sections with steps in proper vertical alignment.

I. Manhole Frame Adjustment:

1. Use precast concrete or HDPE manhole rings or cast-in-place concrete to achieve elevation indicated for frame and cover.
2. Do not adjust elevation more than 6 inches with precast rings, maximum 2 rings.
3. Seal joints between precast rings with joint sealant compound.
4. With cast-in-place concrete, maximum adjustment is 24" from top step to top of frame.

J. Install manhole frames and covers:

1. Set top of frames at binder grade elevation or other elevation indicated on the Drawings.
2. Bolted watertight manhole covers installed as indicated on Standard Detail 5116. Heavy traffic manhole covers installed as indicated on Standard Detail 5115.
3. Anchor manhole covers installed in unpaved areas as indicated on Standard Detail 5109A.
4. Seal joint between manhole frame and manhole with joint sealant compound.
5. Install watertight manhole covers in drainage swales, along streams, gutter areas in roadways where flooding can occur and within flood plain areas.
6. Top rim of manholes, within the floodplain or adjacent to a stream, shall be set 12" above finished grade and marked with a yellow steel fence post.

K. New Manholes:

1. Where new manholes are to be constructed on existing pipelines, carefully excavate around existing pipeline for placement of the new manhole base. Take all measures necessary to control flow through the existing pipeline and to prevent leakage into the new base. After completion of the manhole, carefully remove the top portion of the existing pipeline.
2. Where new manholes are to be constructed an existing pipelines, carefully excavate around existing pipeline for placement of the new manhole base. Take all measures necessary to control flow through the existing pipeline and to prevent leakage into the new base.
 - a. Cut existing pipeline on either side of manhole, slide new pipe into manhole, lineup with existing pipe and connect lines with an approved coupling.

3.03 CONNECTIONS TO EXISTING MANHOLES

- A. Connections to existing manholes shall be made carefully; excavating down on the outside of the manhole without causing damage to the manhole. Core drill an opening into the manhole, insert a sealed, flexible resilient connection ("PSX" gasket) for the new pipe entering the manhole; once the connection is complete, perform a vacuum test as specified in Section 02651 on the existing manhole and provide by pass pumping if required to do the testing. If the vacuum test fails, do necessary repairs and retest. Backfill around manhole in accordance with Section 02221 Trenching, Backfilling and Compaction.

3.04 BACKFILLING

- A. Backfill only after examination of the manhole by the Township's Engineer or representative.

- B. Test manhole as specified in Section 02651.
- C. Perform backfilling as specified in Section 02221 - Trenching, Backfilling and Compacting.
- D. Place backfill in approximately equal lifts on opposite sides of manhole to equalize opposing horizontal pressures.

END OF SECTION

SECTION 02602

STORM INLETS, CATCH BASINS, ENDWALLS

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Storm drainage inlets
2. Storm drainage catch basins
3. Storm drainage pipe endwalls
4. Pipe culvert end sections

B. Related work specified elsewhere:

- | | |
|----------------------------------------------|---------------|
| 1. Trenching, backfilling and compacting: | Section 02221 |
| 2. Soil erosion and sedimentation control: | Section 02270 |
| 3. Finish grading, seeding and sodding: | Section 02485 |
| 4. Bituminous paving and surfacing: | Section 02500 |
| 5. Manholes: | Section 02601 |
| 6. Storm drain pipe: | Section 02618 |
| 7. Plain and reinforced cement concrete: | Section 03000 |
| 8. Cement concrete for utility construction: | Section 03050 |

C. Definitions: NONE

D. Applicable Standard Details:

02602-1- Inlet/Storm Pipe Installation Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

Publication 408, Specifications
Publication 72M, Standards for Roadway Construction

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

A36	Specification for Carbon Structural Steel
A47	Specification for Ferrite Malleable Iron Castings
A48	Specification for Gray Iron Castings
A185	Specification for Steel Welded Wire Fabric for Concrete Reinforcement
A536	Specification for Ductile Iron Castings
A615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
C32	Specification for Sewer and Manhole Brick (made from clay or shale)
C270	Specification for Mortar for Unit Masonry

3. Pennsylvania Code

Title 67, Transportation, Chapter 459, Occupancy of Highway by Utilities.

1.03 SUBMITTALS

A. Certificates:

1. Submit certification from material suppliers attesting that materials provided meet or exceed specification requirements.

B. Shop Drawings:

1. Submit detailed Shop Drawings, including reinforcing steel details.

C. Submit concrete mix designs, certified results of compressive strength tests, certified field tests and copies of batch slips for all cast-in-place inlets, catch basins or endwalls.

1.04 JOB CONDITIONS: Section not utilized.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Precast Concrete Units:

1. After fabrication and curing, transport the units to the job site. Protect until required for installation.
2. Handle to avoid damage to surfaces, edges and corners and to avoid creation of stresses within the units.

B. Inspections

1. Inspection by the ENGINEER will, at a minimum, be made of materials upon delivery to the job site; of the subgrade, prior to construction or placement; and of the completed structure, prior to backfill.
2. Precast cement concrete products shall be subject to rejection for failure to conform with these specifications or if any one of the following conditions is noted:
 - a. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
 - b. Defects that indicate incorrect proportioning, mixing, and molding.
 - c. Surface defects larger than ½" diameter indicating honey-combed or open texture.
 - d. Damaged or cracked ends, where such damage would prevent making a satisfactory joint.

3. Concrete Testing (For Cast-In-Place Work): Section 03310, Paragraph 3.3.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed Stone Subbase:

1. AASHTO No. 8 or 57, Type C, Section 703.2, Publication 408 Specifications. Do not use slag or cinders.

B. Brick: ASTM C32 Grade SS, solid.

- C. Masonry Mortar: ASTM C270, Type S.
- D. Malleable Iron Castings: ASTM A47, Grade 35018, Domestic.
- E. Ductile Iron Castings: ASTM A536, Grade 60-40-18, Domestic.
- F. Structural Grade Carbon Steel: ASTM A36.
- G. Cast-in-Place Cement Concrete: Section 03050.
- H. Cast Gray Iron Castings: ASTM A48.

2.02 FABRICATIONS

A. Precast Cement Concrete Units:

1. Comply with the requirements of Section 714, Publication 408 Specifications. Concrete shall be Class AA, unless otherwise specified.
2. All reinforcing shall comply with the requirements of Publication 72M.
3. 6' inlets shall be similar in all respects to standard inlets except that the longitudinal dimension shall be increased by 24".
4. Modified boxes (PennDOT Type 1, 2 or 3, Modified Type I or Modified Type II) shall have reinforced cover adjustment slabs in accordance with Details in Publication 72M.

B. Pipe Culvert End Sections:

1. Concrete or Metal - Comply with the requirements of, Publication 72M, RC-33.
2. Polyethylene end sections shall have smooth interior and be anchored at the flared end.

C. Inlet Grates:

1. Comply with the requirements of Publication 72M, RC-34 PennDOT approved diagonal or bicycle safe grates only as specified in Section VIII - Technical Provisions (Detailed).
2. 6' inlet grates shall be similar in all respects to standard inlet grates except that the longitudinal dimension shall be increased by 24".
3. Inlet grates in traffic areas shall be capable of handling HS-25 loading.
4. Welded structural steel grates and frames shall be coated with bituminous paint. All iron castings shall be furnished unpainted.

D. Adjustments

1. Precast cement concrete grade adjustment risers: Shall be cast from 4000 psi concrete (28-day compressive strength), shall be a maximum of 2" thick, and shall be reinforced in accordance with ASTM A478.
2. Brick adjustments are not permitted.

3. Infra-Riser adjustment rubber rings manufactured by East Jordan Iron Works, East Jordan Michigan or approved equal, may be substituted for concrete rings if approved by the ENGINEER.

E. Outlet Structures

1. Precast concrete or cast-in-place concrete in accordance with Paragraph A.
2. Construct outlet structures to dimensions shown on Contract Drawings.

PART 3 EXECUTION

3.01 EXCAVATION

- A. Excavate as specified in Section 02221, Paragraph 3.04.
- B. Excavate at location marked in the field.
- C. Excavate to the required depth and grade for the bottom of the unit plus that excavation necessary for placement of base material.

3.02 CONSTRUCTION

- A. Construct inlets and catch basins of either precast cement concrete sections or of cast-in-place cement concrete, and of the type indicated on the Contract Drawings.
 1. Place precast units on a minimum 4" compacted crushed aggregate base.
 2. Construct cast-in-place units on a minimum 4" compacted crushed aggregate base.
 3. Pour channels in inlet boxes to channel the flow of water to the outlet pipe and to prevent water from standing in box.
 4. Unless units are cast-in-place, use precast cement concrete grade adjustment risers or Infra Risers to adjust to grade. Mortar concrete risers in place.
 5. Place bicycle safe grates in all paved (present or future) areas.
- B. Construct endwalls to the dimensions and design indicated on Standard Drawing RC-31, Publication 72M, and of the type shown on the Contract Drawings. Construct endwalls of monolithically cast reinforced concrete.
- C. Do not permit pipes to project more than 3" into inlets. Do not expose end of pipe through faces of endwalls.
- D. Where indicated on the Contract Drawings, provide pipe culvert end sections of the design and dimensions of Standard Drawing RC-33, Publication 72M.
- E. Install polyethylene end sections in accordance with manufacturer's instructions, bedded and anchored as required.
- F. Construct basin outlet structures with inverts, grates and openings at the required elevations shown on the Contract Drawings. Connect to new or existing outlet pipes, relaying or adding pipe as needed to meet the structure.
- G. At junction of different sized pipes, the pipe crowns should match.

3.03 BACKFILLING

- A. Backfill structures only after inspection by the ENGINEER.
- B. Perform backfilling and compaction as specified in Section 02221, Paragraph 3.11.

3.04 DISPOSAL OF EXCAVATED MATERIAL: Section 02221, Paragraph 3.12.

3.05 RESTORATION OF SURFACE AREAS

- A. Restore paved areas in accordance with Section 02575.
- B. Restore unpaved surfaces as specified in Section 02221, Paragraph 3.14.

END OF SECTION

SECTION 02610 - SANITARY SEWER PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Work of This Section Includes, but is not limited to: Sanitary sewer

gravity pipelines

Sanitary sewer pressure pipelines

Laterals/service connections

B. Related Work Specified Elsewhere:

Trenching, Backfilling & Compacting: Section 02221

Manholes: Section 02601

Sewer and Manhole Testing: Section 02651

C. Applicable Standard Details:

- 5177 - Pipe Bedding Details, Type I and Type II
- 5178A - Pipe Trench Detail
- 5179 - Concrete Cradles and Encasement Details
- 5180 - Vertical Water Main Clearance
- 5180A - Sanitary Sewer Stream Crossing
- 5187 - Lateral Detail
- 5187A - Sloped Riser Lateral Detail
- 5187B - Vertical Riser Lateral Detail
- 5197 - House Connection Cleanout

1.02 QUALITY ASSURANCE

A. Reference Standards:

American National Standards Institute (ANSI):

A21.4 Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings

A21.11 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

A21.51 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for water or other liquids

American Society for Testing and Materials (ASTM):

- A53 Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless A74 Cast Iron Soil Pipe and Fittings
- C564 Rubber Gaskets for Cast Iron Soil Pipe and Fittings
- D1785 Poly(Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120 D2241 Poly(Vinyl Chloride)(PVC) Plastic Pipe (SDR-PR)
- D2466 Poly(Vinyl Chloride)(PVC) Plastic Pipe Fittings, Schedule 40
- D2564 Solvent Cements for Poly(Vinyl Chloride)(PVC) Pipe and Fittings
- D3033 Type PSP Poly(Vinyl Chloride)(PVC) Sewer Pipe and Fittings
- D3034 Type PMS Poly(Vinyl Chloride)(PVC) Sewer Pipe and Fittings
- D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- F679 Poly(Vinyl Chloride)(PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

Federal Specifications:

- FS HH-P-117 Packing, Jute, Twisted
- FS QQ-C-40(2) Caulking, Lead Wool and Lead Pig American Water

Works Association (AWWA):

- C600 Installation of Gray and Ductile Cast-Iron Pipe and Appurtenances
- C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4" thru 12", for Water

- B. Materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, or acid solder will be rejected.

1.03 SUBMITTALS

A. Certificates:

Submit each manufacturer's certification attesting that the pipe, pipe fittings, joints, joint gaskets and lubricants meet or exceed specification requirements.

B. Pipe and Pipe Bedding Classes:

Submit a system map or list of pipe sections indicating the material and class of pipe and the pipe bedding type to be used for each manhole run or force main.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling:

Do not place materials on private property without written permission of the property owner.

During loading, transporting and unloading, exercise care to prevent damage to materials.

Do not drop pipe or fittings. Avoid shock or damage at all times.

Take measures to prevent damage to the exterior surface or internal lining of the pipe.

B. Storage:

Do not stack pipe higher than recommended by the pipe manufacturer.

Store gaskets for mechanical and push-on joints in a cool, dry location out of direct sunlight and not in contact with petroleum products.

PART 2 - PRODUCTS

2.01 DUCTILE-IRON PIPE

A. Pipe:

ANSI A21.51, 350 psi. Standard cement-mortar lining, ANSI A21.4

B. Fittings:

Ductile-iron or gray-iron, ANSI A21.10. Provide with standard lining as for ductile-iron pipe.

C. Joints: ANSI A21.11

Where not specifically indicated on the Drawings, joints may be either mechanical joint or push-on joint.

D. Rubber gaskets, Lubricants, Glands, Bolts and nuts: ANSI A21.11

E. All pressure sewer pipe over 4" in diameter shall be ductile-iron as specified above.

2.02 POLYVINYL CHLORIDE (PVC) SEWER PIPE

A. Gravity Sewer Pipe and Fittings:

1. 15" nominal pipe size and smaller: ASTM D3034, SDR-35; or ASTM F789, Type PS-45
2. 18" to 27" nominal pipe size: ASTM F679 or ASTM F789, Type PS-45
3. Flexible Elastomeric Seals: ASTM D3212 Seal Material: ASTM F477

B. Pressure Sewer Pipe and Fittings: 4" nominal pipe size and smaller

1. ASTM D2241, SDR-21 (200 psi)
2. Flexible Elastomeric Seals: ASTM D3139 Seal Material: ASTM F477
3. Fittings: ASTM D2466, Socket Type, Schedule 40, Schedule 80 for fittings with threaded end connections. Solvent Cement: ASTM D2564.

C. Pressure Sewer Pipe and Fittings C-900 pressure class and dimension ratio as indicated on the Drawings.

1. Joints: Push-in: ASTM D3139
2. Fittings: Cast or ductile iron fittings for PVC pressure pipe: AWWA C110

2.03 STEEL CASING PIPE

- A. Pipe: ASTM A53; 35,000 psi minimum yield strength, asphalt coated. Wall thickness as indicated on the Drawings.
- B. Joints: Electric resistance welded.

2.04 RIP RAP STONE

- A. Field stone or rough hewn quarry stone of approximate rectangular shape; hard and angular and of such quality that it will not disintegrate on exposure to water or weathering.
- B. 9" minimum thickness, measured perpendicular to face, with no face dimension less than the thickness of the stone.
- C. Not less than 70% of the individual pieces weighing minimum of 150 lbs; not more than 10% of the individual pieces weighing less than 100 lbs.
- D. To be sized based on velocity of 25-year storm.

2.05 SERVICE SADDLES AND WYE BRANCHES SANITARY TEES

- A. Contractor shall provide manufacturer's information on wye branches sanitary tees for approval by Township Engineer.
- B. Service saddles shall be manufactured by Sealtite, Type E, Model H, or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Perform trench excavation to the line and grade indicated on the Contract Drawings and as specified in Section 02221.
- B. Unless otherwise indicated on the Drawings, provide for a minimum cover of 4 feet above the top of piping laid in trenches in non-traffic areas, and 5 feet in traffic areas, unless otherwise approved by Township Engineer.
- C. Provide Type IV pipe bedding as specified in Section 02221 for all pipe. Place aggregate in a manner to avoid segregation, and compact to the maximum practical density so that the pipe can be laid to the required tolerances.

3.02 LAYING PIPE IN TRENCHES

- A. Give 48-hours notice to the Township's Engineer in advance of pipe laying operations.
- B. Use laser alignment instruments.
- C. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to pipe. Do not drop pipe.
- D. Lay pipe proceeding upgrade with the bell or groove pointing upstream.
- E. Lay pipe to a true uniform line with the barrel of the pipe resting solidly in pipe bedding material throughout its length. Excavate recesses in pipe bedding material to accommodate joints, fittings and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- F. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow line. Minimize the number of joints between wye branches.
- G. Clean and inspect each section of pipe before joining. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. Use lubricant recommended by the pipe or fitting manufacturer for making joints. If unusual joining resistance is encountered or if the pipe cannot be fully inserted into the bell, disassemble joint, inspect for damage, reclean joint components, and reassemble joint.
- H. Assemble joints in accordance with recommendations of the manufacturer.

Push-on Joints:

Clean the inside of the bell and the outside of the spigot. Insert rubber gasket into the bell recess.

Apply a thin film of gasket lubricant to either the inside of the gasket or the spigot end of the pipe, or both.

Insert the spigot end of the pipe into the socket using care to keep the joint from contacting the ground. Complete the joint by forcing the plain end to the bottom of the socket. Mark pipe that is not furnished with a depth mark before assembly to assure that the spigot is fully inserted.

Mechanical Joints:

Wash the socket and plain end. Apply a thin film of soapy water. Slip the gland and gasket over the plain end of the pipe. Apply soapy water to gasket.

Insert the plain end of the pipe into the socket and seat the gasket evenly in the socket.

Slide the gland into position, insert bolts, and finger-tighten nuts.

Bring bolts to uniform tightness. Tighten bolts 180 degrees apart alternately.

Solvent Cemented Joints:

Chamfer and deburr pipe. Clean socket and plain end. Measure and mark the socket depth on the outside of the pipe.

Apply primer to inside socket surface using a scrubbing motion to ensure penetration. Repeated applications may be necessary. Soften surface of male end of pipe to depth of fitting socket by applying a liberal brush coat of primer. Do not pour primer on. Assure entire surface is well softened.

Repeat application of primer to inside socket surface, then apply cement to pipe while surfaces are still wet with primer. Apply cement uniformly taking care to keep excess cement out of socket.

Immediately after applying the last coat of cement to the pipe, and while both the inside socket surface and outside pipe surface are soft and wet, forcefully seat the pipe into the socket. Turn the pipe 1/4 turn during assembly to distribute cement evenly. Assembly should be completed within 20 seconds after the last application of cement. Insert pipe with a steady, even motion. Do not use hammer blows.

Hold joint in place until cement has set. Wipe excess cement from the pipe.

Coupled Joints:

Assemble in accordance with the manufacturer's recommendations.

- I. Disassemble and remake improperly assembled joints using a new gasket.
- J. Check each pipe installed as to line and grade in place. Correct deviation from grade immediately. A deviation from the designed grade as shown on the Contract Drawings, or deflection of pipe joints, will be cause for rejection.
- K. Place sufficient bedding material on each section of pipe, as it is laid, to hold firmly in place.
- L. Clean interior of the pipe as work progresses. Where cleaning after laying is difficult because of small pipe size, use a suitable swab or drag in the pipe and pull forward past each joint immediately after the jointing has been completed.
- M. Keep trenches and excavations free of water during construction.
- N. When the work is not in progress, and at the end of each work day, securely plug open ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.

O. Deflection:

When it is necessary to deflect pressure sewer mains from a straight alignment horizontally or vertically, do not exceed the following limits:

Ductile-Iron Pipe: Per AWWA C600

3.03 WYE BRANCHES

- A. Install wye branches at locations indicated on the Contract Drawings concurrently with pipe laying operations. Use standard fittings of the same material and joint type as the pipeline into which they are installed.
- B. For taps into an existing pipeline, use a saddle wye or tee with stainless steel clamps. Mount saddles with solvent cement or gasketed tee and secure with metal bands. Layout holes with a template and cut holes with a mechanical hole cutter.

3.04 LATERALS

- A. Construct laterals from the wye branch to one foot beyond the right-of-way or property line or as designated on the Drawings and in accordance with Standard Detail 5187. Laterals should be constructed of full pipe lengths whenever possible. No couplings are permitted. Laterals shall be constructed perpendicular (90°) to the sewer main. A maximum 5° variation is allowable. Deviations must be approved by the Township Engineer.
- B. Install an approved watertight plug, braced to withstand pipeline test pressure thrust, at the termination of the lateral. Install a temporary 2" x 4" marker stake extending from the end of the lateral to minimum 1 foot above finished grade.
- C. Cleanouts shall be fitted with a panella type cap with a brass plug.
- D. Laterals shall not be located in driveways or access drives.
- E. Laterals located in paved areas require a frame and cover as manufactured by Neenah Model R-1976.

3.05 CAST-IN-PLACE CONCRETE CONSTRUCTION

- A. Conform to the applicable requirements of Section 03310.

3.06 CRADLES AND ENCASEMENT

- A. Provide concrete cradles and encasement for pipeline where indicated on the Drawings, or as directed by the Township's Engineer, and in accordance with Standard Detail 5179.

3.07 THRUST RESTRAINT

- A. Provide pipeline with restrained joints or concrete thrust blocking at all bends, tees, and changes in direction. Construct concrete thrust blocking in accordance with Standard Details 5195 and 5196 or details shown on the Drawings.

If restrained joints are utilized, submit design calculations showing determination of restrained lengths and submit joint restraint details. The calculations shall follow the latest Ductile Iron Pipe Research Association (DIPRA) guidelines.

Method of joint restraint shall utilize devices specifically designed for the application for which manufacturer's data is available in regards to design load capabilities and installation procedures.

- B. Furnish and install, tie rods, clamps, set screw retainer glands, or restrained joints as indicated on the Drawings.
- C. Protect metal restrained joint components against corrosion by applying a bituminous coating, encasing the entire assembly with an 8 mil thick polyethylene wrap in accordance with AWWA C105, or by concrete mortar encasement of metal area.
- D. Other methods of joint restraint may be used after approval by Township Engineer.

3.08 CARRIER PIPE IN CASINGS

- A. Applicable to casing pipe installed in open cut trenches. For installation by boring, jacking, or tunneling consult with the Township's Engineer.
- B. Provisions regarding pipe laying specified above also apply to carrier pipe installed in casings.
- C. Excavate trench to the additional depth and width necessary to accommodate the casing pipe and to maintain the line and grade of the carrier as indicated on the Drawings.
- D. Minimum inside diameter of the casing pipe: 4" greater than the largest outside diameter of the carrier pipe joints.
- E. Support pipeline within casing so that no external loads are transmitted to the carrier pipe. Attach HDPE spacers to barrel of carrier pipe; do not rest carrier pipe on pipe joint bells.
- F. Fill annular space between carrier pipe and casing pipe with packed sand or flowable fill. Close ends of casing with brick and at downstream end install a 2" diameter stainless steel weep hole.

3.09 STREAM CROSSINGS

- A. Construct sanitary sewer pipeline stream crossings in accordance with Standard Detail 5180A.
- B. Provide a minimum of 3'-0" of cover from top of pipe to stream bed elevation at stream crossing.
- C. Provide concrete encased mechanical joint ductile-iron pipe backfilled with minimum 3" size stone to the level of the stream bed, between the limits of the stream crossing. Ductile-iron pipe shall run the entire length of the manhole run.
- D. Do not backfill until concrete has achieved its initial set and concrete work is examined by the Township's Engineer.

3.010 BACKFILLING TRENCHES

- A. Backfill trenches as specified in Section 02221.

3.011 DETECTABLE WARNING TAPE

- A. Detectable warning tape shall consist of a minimum thickness of 0.5 mils solid aluminum foil core running the full length and width encased in a protective, high visibility, green color coded inert plastic jacket that is impervious to all known alkalis, acids, chemical reagents and solvents found in the soil. Foil to be visible on unprinted side. Minimum overall thickness shall be 5.5 mils. Minimum tensile strength shall be 5000 psi. Minimum weight of 2 ½ pounds per 1" x 100' unit. Tape width shall be a minimum of 6 inches and have the words "Caution Buried Sewer Line Below" imprinted on the color side. Tape shall meet Office of Pipeline Safety regulations, U.S. Department of Transportation, USAS Code B31.8.

END OF SECTION

SECTION 02615 - WATER MAINS

PART 1 - GENERAL

1.1 DESCRIPTION

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

1. Water Transmission Lines and Fittings
2. Water Distribution Lines and Fittings

B. Related Work specified elsewhere:

1. Section 02221 - Trenching, Backfilling & Compacting
2. Section 02640 - Valves and Fire Hydrants
3. Section 02642 - Water Service Connections
4. Section 02653 - Testing & Disinfecting Water Mains
5. Section 03310 - Concrete for Utility Construction

C. Applicable Standard Details:

1. 5177 Pipe Bedding Details
2. 5180A Stream Crossing Detail
3. 5301 Air Release Valve, Water Main
4. 5302 Water Main Crossing Storm Drain or Sanitary Sewer
5. 5304 Curvature of Ductile Iron Pipelines
6. 5308 Cap and Blow-off

1.2 REFERENCES

A. American National Standards Institute (ANSI): American Water Works Association (AWWA):

1. ANSI/AWWA C104/A21.4 - Cement Mortar Lining for Ductile Iron and Gray Iron Fittings for Water
2. ANSI/AWWA C105/A21.5 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
3. ANSI/AWWA C110/A21.10 - Ductile Iron and Gray Iron Fittings, 3" Through 48", for Water and Other Liquids
4. ANSI/AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
5. ANSI/AWWA C115/A21.15 - Flanged Ductile Iron and Gray Iron Pipe with Threaded Flanges
6. ANSI/AWWA C150/A21.50 - Thickness Design of Ductile Iron Pipe
7. ANSI/AWWA C151/A21.51 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
8. ANSI/AWWA C600 - Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances

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

1. ASTM A120 - Black Steel Pipe and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless for Ordinary Uses
2. ASTM B43 - Seamless Red Brass Pipe, Standard Sizes
3. ASTM D1785 - Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, 120

1.3 SUBMITTALS

- A. Submit manufacturers' catalog information for each type of pipe, fittings, couplings, adapters, gaskets and assembly of joints. Include manufacturers' recommendations for deflection in pipe joints.
- B. Submit a Statement of Compliance, together with supporting data, from the materials suppliers of each type of pipe, fitting, gasket, lubricant or other joint materials attesting that each of the products provided meets or exceeds specifications requirements.
- C. Submit proposed joint restraint system to Township Engineer for review and approval.
- D. Review locations for placement of valves with Township Engineer and obtain approval prior to installation.
- E. Maintenance of Service: Submit plan to the Township Engineer for review and approval outlining procedures for maintaining service to existing customers during installation.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Do not place materials on private property without written permission from the property Owner.
- B. During loading, transporting and unloading, exercise care to prevent damage to materials.
- C. Do not drop pipe or fitting.
- D. Avoid shock or damage at all times.
- E. Use padded slings, hooks and tongs to prevent damage to the exterior surface or internal lining of the pipe.
- F. Pipe may be stockpiled along alignment where approved by the Township Engineer.
- G. Do not stack higher than Maximum Stacking Heights shown in AWWA C600 or as recommended by the pipe manufacturer.
- H. Keep interior of pipe and fittings free from dirt or other foreign matter.
- I. Store gaskets for mechanical and push-on joints in cool location out of direct sunlight and not in contact with petroleum products.

PART 2 - PRODUCTS

2.1 PIPE, FITTINGS AND JOINTS

A. Ductile Iron:

1. Ductile Iron Pipe: Class, as specified on the contract drawings, minimum Class 52 ANSI/AWWA

C151/A21.51, standard cement mortar lined in accordance with ANSI/AWWA C104/A21.4 and as specified.

2. Ductile Iron Fittings: ANSI/AWWA C110/A21.10; standard cement mortar lined in accordance with ANSI/AWWA C104/A21.4, 250 psi pressure rating.
3. Joints:
 - a. Mechanical or Push-on Joints conforming with ANSI/AWWA C111/A21.11.
 - b. Flanged Joints conforming with ANSI/AWWA C110/A21.10.
4. Ductile Iron Pipe and Fittings: Cement mortar liner in accordance with ANSI/AWWA C104/A21.4 and the following:
 - a. For pipe 3" thru 12" - 1/8" minimum lining thickness.
 - b. For pipe 14" thru 24" - 3/16" minimum lining thickness.
5. Restrained Joints:
 - a. As specified in paragraph 3.6 of this Section.
 - b. Manufacturer: Lok-Type U.S. Pipe, Super Lock Clow, Lok-Fast, American Pipe, Locked Mechanical Joint, Atlantic State and Griffin, or other systems after Township Engineer approval.

B. Curb Stops (3/4" and 1", Others Approved by Engineer):

1. Brass or red brass alloy body conforming to ASTM B62.
2. Plug type valve.
3. Positive pressure sealing.
4. Manufacturer: Mueller Oriseal III, H-1504-2
Ford Model, B44-333-Q

C. Curb Boxes and Covers (1/2" through 2" Curb Valves):

1. Cast iron body, extension type, with stationary shutoff rod (stem extension).
2. Extension Range 48" to 60".
3. Arch pattern base.
4. One piece lid with inscription "WATER".
5. Box and Cover, Bituminous Coated.
6. Manufacturer: Mueller H-10314 or equal.
7. Curb box located in concrete shall utilize curb box sleeve, Mueller H-10342.

2.2 TAPPING ACCESSORIES

A. Tapping Valves and Sleeves:

1. Refer to 2.03, Section 02640.

2.3 RIP RAP STONE

- A. Field stone or rough hewn quarry stone of approximate rectangular shape, hard and angular, and of such quality that it will not disintegrate on exposure to water or weathering. Rip rap must be sized to withstand the velocity from a 25 year storm.
- B. 9" minimum thickness, measured perpendicular to face, with no face dimension less than the thickness of the stone.
- C. Not less than 70% of the individual pieces weighing minimum of 150 lbs; not more than 10% of the individual

pieces weighing less than 100 lbs.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Maintain service to existing customers during installation of water mains. Notify customers in writing 48 hours in advance of disruption of water service. Provide temporary lines if required to maintain customer service.
- B. Excavate trenches as specified in Section 02221 - Trenching, Backfilling and Compacting.
- C. Provide at least 4'0" of cover from the top of the pipe to the finished grade elevation except at stream crossings.
- D. Provide a minimum of 3'-0" of cover from the top of pipe to stream bed elevation at stream crossings. In rock, provide a minimum of 1 foot of cover.

3.2 PIPE BEDDING

- A. Provide Type IV pipe bedding for ductile iron pipelines as specified in Section 02221 - Trenching, Backfilling and Compacting.
- B. Shape recesses for the joints or bell of the pipe by hand.
- C. Assure that the pipe is supported on the lower quadrant for the entire length of the barrel.

3.3 PIPE LAYING

- A. Clean and inspect each length of pipe or fitting before lowering into the trench.
- B. Do not lower pipe into the trench except that which is to be immediately installed.
- C. Lay pipe to a uniform line with the barrel of the pipe resting solidly in pipe bedding material throughout its length.
- D. Excavate recesses in pipe bedding material to accommodate joints, fittings, and appurtenances.
- E. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- F. Lay each section of pipe in such a manner as to form a close concentric joint with adjoining section and to avoid offsets.
- G. Lubricate pipe and gaskets as recommended by the manufacturer; assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. All lubricants are to be non-petroleum based products and are to be compatible with potable water.
- H. Grade Check:
 - 1. Check each pipe installed as to line and grade in place.
 - 2. Correct deviations immediately.

3. Deflection of pipe joints in excess of maximum recommended by manufacturer will be cause for rejections.

- I. Install fittings and valves as pipe laying progresses; do not support weight of fittings and valves from pipe. Install valves at locations shown on construct drawings. Provide valve at both ends of all stream crossings.
- J. When the work is not in progress, and at the end of each workday, securely plug the ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.
- K. Backfill concurrently with pipe laying to hold installed pipe in place.
- L. When pipe laying is terminated for any reason, provide at least 24" of backfill over all pipe except the last piece laid.

M. Push-on Joints:

- 1. Clean the inside of the bell and the outside of the spigot.
- 2. Insert rubber gasket into the bell recess.
- 3. Apply a thin film of gasket lubricant to either the inside of the gasket or the spigot end of the pipe, or both.
- 4. Insert the spigot end of the pipe into the socket using care to keep the joint from contacting the ground.
- 5. Complete the joint by forcing the plain end to the bottom of the socket.
- 6. Mark pipe that is not furnished with a depth mark before assembly to assure that the spigot is fully inserted.

N. Mechanical Joints:

- 1. Wash the socket and plain end.
- 2. Apply a thin film of lubricant.
- 3. Slip the gland and gasket over the plain end of the pipe.
- 4. Apply lubricant to gasket.
- 5. Insert the plain end of the pipe into the socket and seat the gasket evenly in the socket.
- 6. Slide the gland into position, insert bolts, and finger-tighten nuts.
- 7. Tighten bolts, 180 degrees apart alternately, to uniform tightness.
- 8. Coat all bolts and nuts with bitumastic paint after installation.

O. Coupled Joints: Assemble in accordance with manufacturer's recommendations.

P. Install service connections as specified in Section 02642.

3.4 CUTTING PIPE

- A. Cut pipe without damaging pipe or lining.
- B. Grind cut ends and rough edges smooth.
- C. Bevel end for push-on joints.

3.5 DEFLECTION

- A. When it is necessary to deflect water mains from a straight alignment horizontally or vertically, do not exceed limits as follows:

1. Ductile Iron Pipe: 50% of maximum limits specified in AWWA C600.

3.6 THRUST RESTRAINT

- A. Provide pipeline with restrained joints or concrete thrust blocking at all bends, tees, and changes in direction. Construct concrete thrust blocking in accordance with Standard Details 5195 and 5196 or details shown on the Drawings.

If restrained joints are utilized, submit design calculations showing determination of restrained lengths and submit joint restraint details. The calculations shall follow the latest Ductile Iron Pipe Research Association (DIPRA) guidelines.

Method of joint restraint shall utilize devices specifically designed for the application for which manufacturer's data is available in regards to design load capabilities and installation procedures.

- B. Furnish and install, tie rods, clamps, set screw retainer glands, or restrained joints as indicated on the Drawings.
- C. Protect metal restrained joint components against corrosion by applying a bituminous coating, encasing the entire assembly with an 8-mil thick polyethylene wrap in accordance with AWWA C105, or by concrete mortar encasement of metal area.

3.7 BLOWOFFS

- A. Install a hydrant on the dead ends of all water mains where shown on the Drawings.
- B. Construct blowoffs as shown on Standard Detail 5308.

3.8 AIR RELEASE VALVES

- A. Install air release valves at the high points of water mains where shown on the Drawings.
- B. Construct air release valves including valve vault as shown on Standard Detail 5301.
- C. Float operated to automatically release air from system while system is operating.
- D. Body and Cover: Cast iron, ASTM A48, Class 35.
- E. Seat: Viton, renewable.
- F. Internal Parts and Float: Stainless steel capable of withstanding a 750 psig test pressure.
- G. Valve shall be designed for 300 psig test pressure and 200 psig operating pressure.

3.9 COMBINATION AIR VALVE

- A. General: Float operated, and vacuum and air release performed by a combination valve housed in a single body.
- B. Body and Cover: Cast iron, ASTM A48, Class 35, withstand 450 psig test pressure and 300 psig operating pressure.

- C. Float: Stainless steel, withstand test pressure 750 psig.
- D. Seat: Buna-N.
- E. Internal Trim Parts: Stainless Steel.

3.10 SPECIAL CONDITIONS

A. Connections:

1. Wherever an existing water main is to be cut and closed, or extended or connected to the proposed new lines, construct connections as shown on the Drawings.
2. For connecting pipe of different materials, use transition fittings as recommended by the manufacturer and approved by the Township Engineer.

B. Stream Crossings:

1. Install water mains crossing streams as shown on Standard Detail 5180A.
2. Provide valves, valve vaults, and sampling tap on each side of the stream as shown on the Contract Drawings.

C. Highway Crossings:

1. Install water mains crossing highways as shown on Drawings.
2. Comply with Pennsylvania Department of Transportation, and Township permit requirements.
3. When casing pipe is indicated, consult with the Township Engineer for installation.

D. Wall Sleeves:

1. Provide pipes passing through concrete or masonry construction with sleeve or wall pipe fittings (and mechanical) of type and size indicated.
2. Provide sleeves two pipe sizes larger than the water mains, unless otherwise specified or shown.

- E. Isolation Distance: Minimum horizontal distance of 5' between water mains and telephone, gas, electric and cable TV utilities, and 10' between sanitary sewer mains, shall be maintained, unless approved by Township Engineer.

3.11 TESTING AND DISINFECTING

- A. Test and disinfect water mains as specified in Section 02653 - Testing and Disinfecting Water Mains.

END OF SECTION

SECTION 02618 - STORM DRAIN PIPE

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Storm sewer pipelines

B. Related work specified elsewhere:

- | | |
|----------------------------------------------|---------------|
| 1. Trenching, backfilling and compacting: | Section 02221 |
| 2. Finish grading, seeding and sodding: | Section 02485 |
| 3. Trench paving and restoration: | Section 02575 |
| 4. Manholes: | Section 02601 |
| 5. Storm inlets, catch basins, endwalls: | Section 02602 |
| 6. Cement concrete for utility construction: | Section 03310 |

C. Definitions:

1. Polyethylene pipe Type C - full circular cross-section with corrugated surface both inside and outside.
2. Polyethylene pipe Type S - full circular cross-section with outer corrugated pipe wall and smooth inner wall.

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

Publication 408, Specifications
Publication 72M, Standards for Roadway Construction

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

C76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C507 Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
D2241 Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR series)
D2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
F405 Specification for Corrugated Polyethylene (PE) Tubing and Fittings
F667 Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings

3. American Association of State Highway Transportation Officials (AASHTO):

M36 Metallic (zinc or aluminum) coated corrugated steel culverts and underdrains
M246 Precoated galvanized steel sheet for culverts and underdrains
M252 Corrugated Polyethylene Drainage Tubing
M278 Class PS50 Polyvinyl Chloride (PVC) Pipe
M294 and MP6-95 Corrugated Polyethylene Pipe, 12" to 36" Diameter

1.03 SUBMITTALS

A. Certificates:

1. Submit two copies of manufacturer's certification attesting that the pipe, fittings, and joints meet or exceed specification requirements.

B. Manufacturer's Literature:

1. Submit two copies of the manufacturer's recommendations on installation, handling, and storage of materials.

1.04 JOB CONDITIONS: Section not utilized.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. During loading, transporting, and unloading, exercise care to prevent damage to materials.
- B. Do not drop pipe or fittings. Avoid shock or damage at all times.
- C. Do not place materials on private property without permission from the property owner.

PART 2 PRODUCTS

2.01 REINFORCED CONCRETE PIPE

A. Pipe and Fittings:

1. ASTM C76, Minimum Class II

B. Joints:

1. Tongue and groove or bell and spigot.

2.02 ELLIPTICAL REINFORCED CONCRETE PIPE

A. Pipe:

1. ASTM C507, Minimum Class HE-A or VE-II.

2.03 CORRUGATED POLYETHYLENE PIPE

A. Tubing and Fittings - 3" to 6"

1. AASHTO M252
2. ASTM F405

B. Pipe and Fittings - 12" to 48"

1. Integrally formed smooth interior.
2. AASHTO M294 and MP6-95
3. ASTM F667

C. Pavement Base Drains - 4", 6"

1. AASHTO M304

2.04 POLY (VINYL CHLORIDE) PIPE 3" TO 6"

A. Pipe and Fittings

1. AASHTO M278
2. ASTM D3034

PART 3 EXECUTION

3.01 PREPARATION

- A. Perform trench excavation and associated work as specified in Section 02221.
- B. Provide pipe bedding (Type III or IV) as specified in Section 02221, Paragraph 3.08. Place aggregate so that the pipe can be laid to the required tolerances.

3.02 LAYING PIPE IN TRENCHES

- A. Give ample notice to the ENGINEER in advance of pipe laying operations, minimum twenty-four hours.
- B. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to pipe. Do not drop pipe.
- C. Lay pipe proceeding upgrade with the bell or groove pointing upstream.
- D. Lay pipe to a true uniform grade with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- E. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.
- F. Clean and inspect each pipe and fitting before joining. Align pipe with previously laid sections. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. Assemble joints in accordance with the pipe manufacturer's instructions.
- G. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. A deviation from the designed line or grade as shown on the Contract Drawings will be cause for rejection.
- H. Place and compact sufficient backfill to hold each section of pipe firmly in place as the pipe is laid.

3.03 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of pipe by the ENGINEER.
- B. Backfill and compact trenches as specified in Section 02221, Paragraph 3.11.

3.04 PAVEMENT BASE DRAINS AND PIPE UNDERDRAINS

- A. Construct drains of the size and type indicated on the Contract Drawings in accordance with the requirements set forth in Section 610, Publication 408 Specifications and as shown on Standard Drawing RC-30, Publication 72M.

3.05 SURFACE RESTORATION

- A. Restore unpaved areas in accordance with Section 02221, Paragraph 3.14.
- B. Restore other areas in accordance with Section 02575.

END OF SECTION

SECTION 02640 - VALVES AND FIRE HYDRANTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work of this section includes, but is not limited to:
 - 1. Water Main and Service Valves
 - 2. Fire Hydrants
- B. Related Work specified elsewhere:
 - 1. Section 02615 - Water Main Pipe
 - 2. Section 02642 - Water Service Connections
- C. Applicable Standard Details:
 - 1. 5303A Fire Hydrant Setting Using Tie-Rods
 - 2. 5308 Cap and Blowoff

1.2 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. American National Standards Institute (ANSI); American Water Works Association (AWWA):
 - a. ANSI/AWWA C500 Gate Valves, 3" through 48" NPS, for Water and Sewage Systems
 - b. ANSI/AWWA C502 Dry-Barrel Fire Hydrants
 - c. ANSI/AWWA C504 Rubber-Seated Butterfly Valves

1.3 SUBMITTALS

- A. Certificates: Submit a Statement of Compliance, together with supporting data, from the materials suppliers attesting that valves, hydrants, and accessories provided meet or exceed ANSI/AWWA Standards and specification requirements.
- B. Product Data: Submit manufacturer's latest published literature including illustrations, installation instructions, maintenance instructions and parts lists.
- C. Submit details of precast vaults with supporting layouts showing piping bypass valves, gear operation and vault access for valves 14" and larger. Obtain Township Engineer's review and approval prior to installation.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Prepare valves, hydrants and accessories for shipment according to AWWA Standards and seal valve, hydrant and meter ends to prevent entry of foreign matter into product body.

- B. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces.

PART 2 - PRODUCTS

2.1 GATE VALVES

- A. Iron body, bronze trim conforming to AWWA-C509.
 - 1. Resilient wedge seated gate valve.
 - 2. Non-rising stem; O-ring stem seals.
 - 3. Valve design to permit seal plate "O-ring" replacement with valve under pressure and in full open positions.
 - 4. 2" square operating nut; open counterclockwise unless otherwise indicated.
 - 5. Flanged, mechanical joint or bell end connections.
 - 6. Provide valves 14" and larger with bypass valves and gear operators.
 - 7. Provide valves 16" and larger with gear operators.
 - 8. Manufacturer: Mueller

2.2 BUTTERFLY VALVES

- A. ANSI/AWWA C504, Class 150B; iron body, stainless steel shaft, nylon bearings; flanged, wafer, or mechanical joint ends.
 - 1. Sizes 2" thru 20": 200 psi rated.
 - 2. Sizes 24" thru 48": 150 psi rated.
 - 3. Manufacturer: Mueller
- B. Worm gear manual actuators, sealed and permanently lubricated, position indicator; vertical, right angle, or buried type; hand wheel, crank handle, or square nut as indicated.
 - 1. Stem extension and valve box for buried valves.
 - 2. Open counterclockwise unless otherwise indicated.
 - 3. Manufacturer: Mueller

2.3 TAPPING VALVES AND SLEEVES

- A. Tapping Sleeves:
 - 1. Mechanical Joint, or as indicated on Drawings.
 - 2. 200 psi working pressure.
 - 3. Outlet Flange: ANSI B16.1, Class 125.
 - 4. Manufacturer: Mueller
- B. Tapping Valves:
 - 1. ANSI/AWWA C500
 - 2. Inlet Flange, Class 125.
 - 3. Manufacturer: Mueller

2.4 VALVE BOXES

- A. 12" Valves and Smaller: Domestic cast iron, two-piece, screw type.
- B. Valves Larger than 12": Domestic cast iron, three-piece, screw type; round base.
- C. Cast iron lid. "Water" cast on top surface.

2.5 FIRE HYDRANTS

- A. Dry-barrel break-away type conforming to AWWA C502.
 - 1. Bury Depth: 4'-6", or as indicated on the Drawings.
 - 2. Inlet Connection: 6".
 - 3. Valve Opening: 5-1/4".
 - 4. Mechanical Joint or Bell End.
 - 5. Corrosion resistant bolts and nuts.
 - 6. Opening direction cast on hydrant head.
 - 7. Direction of Opening: Counterclockwise.
 - 8. Painted at the factory, primer and top coat yellow.
 - 9. York-type thread
- B. One pumper, two hose nozzles. (90° apart)
 - 1. Obtain thread type and size from the Township Engineer.
 - 2. Attach nozzle caps by separate chains.
- C. Type: Mueller Super Centurion 250
- D. Manufacturer: Mueller

2.6 AIR RELEASE VALVES

- A. Cast iron body and cover; stainless steel float, orifice seat, linkage mechanism, mountings and trim. Buna-N orifice valve designed for maximum venting capacity under normal main pressure.
- B. 150 psi minimum rated working pressure; hydrostatically tested to 2 times rated working pressure.
- C. Type: Val-matic.
- D. Manufacturer: APCO, GA Industries, or equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Determine the exact location and size of valves and hydrants from the Drawings; the Standard Details represent typical details only; obtain all necessary clarification and directions from the Township Engineer prior to the execution of work. Provide valves at both ends of stream crossings.

- B. Perform trench excavation, backfilling and compaction in accordance with Section 02221.
- C. Install pipe and tubing in accordance with Sections 02615 and 02642 and the applicable Standard Details.

3.2 GATE AND BUTTERFLY VALVES

- A. Install valves in conjunction with pipe laying; set valves plumb.
- B. Provide buried valves with valve boxes installed flush with finished grade.
- C. Provide precast vault for valves with bypass valves or gear operators.

3.3 FIRE HYDRANTS

- A. Install fire hydrants as shown on Standard Detail 5303A; provide support blocking and drainage gravel as shown; do not block drain hole.
- B. Hydrant Placement (behind curb):
 - 1. Set hydrant with pumper or hose nozzles no less than 12" nor more than 18" from gutter face of curb.
- C. Hydrant Placement (lawn space between curb and sidewalk):
 - 1. Set hydrant with nozzle caps drain portion of hydrant no less than 12" from sidewalk.
- D. Set hydrants plumb with pumper nozzle facing the roadway; each nozzle 45° facing curb line set hydrants with centerline of pumper nozzle at least 18" above finished grade and the safety flange not more than 6" nor less than 2" above grade.
- E. Paint hydrants with one prime and two finish coats in accordance with color scheme and paint requirements provided by the Township Engineer. Hydrants shall be painted yellow.
- F. After hydrostatic testing, flush hydrants and check for proper drainage.

3.4 AIR RELEASE VALVES

- A. Install air release valves in precast valve vault with cast iron frame seal cover. Provide clamp where needed. Set air release valves plumb.

END OF SECTION

SECTION 02642 - WATER SERVICE CONNECTIONS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Work of this section includes, but is not limited to:
1. Tapping water mains by installation of corporation stops or other suitable fittings or couplings.
 2. Installation of service pipe and fittings, curb stops and meter boxes.
 3. Installation of meter setting equipment, including cast iron meter box.
- B. Related Work specified elsewhere:
1. Section 02221 - Trenching, Backfilling & Compacting
 2. Section 02615 - Water Mains
 3. Section 02745 - Valve Vaults and Meter Boxes
- C. Applicable Standard Details:
1. 5318 Standard Installation 3/4" Metered Domestic Water Service - Single Setting
 2. 5320 Standard Installation 1" Metered Domestic Water Service

1.02 QUALITY ASSURANCE

- A. Referenced Standards:
1. American National Standards Institute (ANSI):
 - a. B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800
 - b. B16.3 Malleable Iron Screwed Fittings, 150 and 300 lb.
 2. American Society for Testing and Materials (ASTM):
 - a. A536 Ductile Iron Castings
 - b. B62 Specification for composition Bronze or Ounce Metal Castings
 - c. B88 Specification for Seamless Copper Water Tube
 3. American National Standards Institute (ANSI)/American Water Works Association (AWWA):
 - a. ANSI/AWWA C500 Gate Valves, 3 through 48 inch NPS, for Water and Sewage Systems
 - b. AWWA C700 Cold Water Meters, Displacement Type
 - c. ANSI/AWWA C701 Cold Water Meters, Turbine Type for Customer Service
 - d. ANSI/AWWA C800 Underground Service Line Valves and Fittings
 4. All meters and fittings shall be made of lead free components.

1.03 SUBMITTALS

- A. Manufacturer's Literature: Submit manufacturer's literature for each size and type of Corporation Stop, Curb Stop, Curb Box, Meter Setting and pipe, fitting or coupling.
- B. Drawings and Samples: Submit drawings, and samples as directed, of all products to be assembled by the Developer/Contractor at site for prior approval by the Township Engineer.

- C. Certificates: Submit a Statement of Compliance, together with supporting data, from the materials suppliers attesting that products and materials provided meet or exceed specification requirements.
- D. Maintenance of Service: Submit plan to the Township Engineer for review and approval outlining procedures for maintaining service to existing customers during construction.

1.04 JOB CONDITIONS

- A. For water services to homes 100 feet or less from curb stop, no couplings will be allowed in the service line and the water meter will be provided in the house with a remote radio readout.
- B. For water services to homes over 100 feet from curb stop, a meter pit will be provided for the meter with remote radio readout.
- C. Mobile Homes - All mobile homes requiring a meter shall have a meter pit installed.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Product Delivery: During loading, transporting and unloading of all materials and products, exercise care to prevent any damage.
- B. Storage: Store all products and materials off the ground and under protective coverings and custody, away from walls and in a manner to keep these clean and in good condition until used.

PART 2 - PRODUCTS

2.01 PIPE OR TUBING AND FITTINGS

- A. Copper Water Tubing:
 - 1. ASTM B88, Type K, Seamless
 - 2. Matching Fittings of Compression Type

2.02 TAPPING ACCESSORIES

- A. Tapping Valves and Sleeves:
 - 1. Refer to 2.03, Section 02640.

2.03 CORPORATION STOP ASSEMBLY

- A. Corporation Stops:
 - 1. Brass or Red Brass alloy body conforming to ASTM B62.
 - 2. Inlet end threaded for tapping according to ANSI/AWWA C800.
 - 3. Outlet end suitable for service pipe specified.
 - 4. Manufacturer: Mueller or Ford Model FB1000-3-Q-NL
- B. Service Saddles:
 - 1. A double strap type, designed to hold pressures in excess of the working pressure of the pipe.

2. Provide for connection to existing water main.
3. Only provide on new water main if water main thickness is not enough to accommodate tap size.

2.04 CURB STOP ASSEMBLY

A. Curb Stops (3/4" and 1", Others Approved by Engineer):

1. Brass or red brass alloy body conforming to ASTM B62.
2. Plug type valve.
3. Positive pressure sealing.
4. Manufacturer: Mueller Oriseal III, H-1504-2 or Ford Model B44-333-Q-NL.

B. Curb Boxes and Covers (1/2" through 2" Curb Valves):

1. Cast iron body, extension type, with stationary shutoff rod (stem extension).
2. Extension Range 48" to 60".
3. Arch pattern base.
4. One piece lid with inscription "WATER".
5. Box and Cover, Bituminous Coated.
6. Manufacturer: Mueller H-10314.
7. Curb box located in concrete shall utilize curb box sleeve, Mueller H-10342.

2.05 METER SETTING EQUIPMENT

A. Outside Meter Setting:

1. Meter Yokes; Copper or Iron, riser type assembly with bronze inlet inverted key angle valve expansion type outlet connection and ell fitting; flared copper tubing connections both ends.
2. Meter Yokes; Copper or Iron, inlet and outlet horizontal/vertical setting with matching couplings, fittings and stops.

B. Inside Meter Setting:

1. Meter Yokes; Copper or Iron, to suit installation conditions.
2. Inlet and Outlet Horizontal/Vertical setting with matching couplings, fittings and stops.

C. Cast Iron Meter Boxes: Comprising a base, a vertically adjustable 2-piece body and a separate lid; domestic cast iron, ASTM A48, Class 30 or better. Provide cast iron meter boxes for meters Size 5/8" to 3/4". Adjust meter box covers to finished grade.

D. Covers, Lids and Frames: Domestic cast iron, ASTM A48, Class 30 or better with contact surfaces machined and matched; lid shall be cast iron, minimum 10" opening, words "water meter" cast into the lid; bronze worm lock with standard waterworks pentagon bolt head; lid to have a recess to engage a lug on the key permitting the key to become a handle for lifting the lid.

2.06 WATER METERS

- A. All water meters will be provided by the Township at the property owner's cost. Meters shall include remote radio readout.

2.07 BACKFLOW PREVENTER

- A. Reduced pressure principle type to protect against back-pressure backflow and back-siphonage; size as indicated on the Drawings, Watts Model #7.
- B. Bronze body construction, stainless steel internal parts and flange bolts, tight seating rubber check valve assemblies; provide complete with inlet Y-strainer and non-rising stem gate valves before and after the device.
- C. NSF approved; certified to meet or exceed the requirements of ASSE Standard 1013, AWWA C506, and USC Foundation for Cross-Connection Control Research.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Establish location of curb stops and meter boxes for each service connection within 5' of outside right-of-way line. Service lines and curb stops shall not be located in driveways or access drives.
- B. Curb stops located in paved areas require a frame and cover as manufactured by Neenah Model R-1976.
- C. Excavate trench to the line and grade shown on the Drawings and as specified; jack or bore service lines 4" diameter and under underneath paved highways and driveways.
- D. Maintain service to existing customers during installation of service connections. Notify customer in writing 48 hours in advance of service disruption. Provide temporary lines if required to maintain customer service.
- E. All mobile homes requiring a meter shall have a meter pit installed.

3.02 CONNECTIONS

- A. General: Provide pipe joints and coupling materials suitable in size, design and material of pipe and service fittings with which it is used.
- B. Screwed Joints: Use sharp cut threads of standard gauge and length; after threading, ream all pipe ends to the size of bore and clean out all chips; sufficient quantity of select pipe dope of graphite and oil shall be used for lubrication of assembly.

3.03 TAPPING WATER MAINS

- A. Each connection for different kind of water mains shall be tapped using suitable materials, equipment and methods approved by the Township Engineer. Tapping shall occur under full pipe pressure. No dry taps are permitted.
- B. Provide service clamps for all mains other than those of cast or ductile iron.
- C. Screw Corporation Stops directly into a tapped and threaded iron main at 10 and 2 o'clock positions on the main's circumference; locate corporation stops at least 12" apart longitudinally and staggered.
- D. Use proper seals or other devices to ensure that no leaks are left in the water mains at the points of tapping; do not backfill and cover the service connection until approved by the Township Engineer.

3.04 SERVICE LINE AND FITTINGS

- A. Use bends to connect the service pipe or tubing to the tapping fitting or corporation stops to provide flexibility to counteract the effects of settlement or expansion/contraction in the line.
- B. Lay each section of the service line in a manner to form a tight joint with the adjoining section; avoid offsets, kinks or awkward bends to ensure a smooth flow line. Copper service lines shall be continuous from the main to the curb stops. No joints will be allowed.
- C. Clean and inspect each pipe and part of the fitting before installing and assemble to provide a flexible joint; use joints or lubricants recommended by the manufacturers and as specified by the Township Engineer.
- D. Install service fittings and appurtenances on suitable brick or concrete supports as shown on the Drawings and Standard Details; do not use earth, rocks, wood or other organic materials as supports. Curb stop shall be no more than 48" nor less than 42" from top of stop to finished grade.
- E. Prevent displacement of pipes and fittings at the time of placing concrete for thrust blocks or for any structures and until initial setting of concrete is assured.
- F. Operate each corporation and curb stop before and after installation.
- G. When the work is not in progress and at the end of each work day, securely plug the ends of pipe and fittings to prevent any dirt or foreign substances from entering the lines.
- H. Provide concrete thrust blocking or restrained joints at all bends, tees and changes in direction.
- I. Provide all pipes passing through concrete or masonry construction with Wall Sleeves of the type and size indicated.
- J. Provide non limestone based stone dust or sand bedding to a minimum of 6 inches around all copper services.
- K. Provide compacted crushed stone subbase, AASHTO M43, Size 57, for meter boxes.
- L. Meter vault covers and frames shall be adjusted to finish grade elevation.
- M. Test and disinfect mains and service lines as specified in Section 02653.

3.05 BACKFLOW PREVENTER

- A. Install backflow preventer where indicated on the Drawings and in accordance with manufacturer's instructions.
- B. Comply with Dover Township requirements and plumbing codes in regards to testing and installation requirements.

END OF SECTION

SECTION 02651 - SEWER AND MANHOLE TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

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

1. Vacuum Testing Sewer Manholes
2. Testing Gravity Sewer Pipelines:
 - a. Low-pressure Air Test
 - b. Infiltration Test
3. Hydrostatic Testing Pressure Pipelines
4. Deflection Testing Plastic Pipelines

B. Related Work specified elsewhere:

1. Section 02601 - Manholes
2. Section 02610 - Sanitary Sewer Pipe

1.2 QUALITY ASSURANCE

A. Test Acceptance:

1. No test will be accepted until the results are below the specified maximum limits.
2. The Developer/Contractor shall determine and correct the causes of test failure and retest until successful test results are achieved.

B. Final Acceptance:

1. See paragraph 2.08.A, Section 01010 - General Requirements.

1.3 SUBMITTALS

A. Submit the following prior to start of testing:

1. Testing procedures
2. List of test equipment
3. Testing sequence schedule
4. Provisions for disposal of flushing and test water
5. Certification of test gauge calibration
6. Deflection mandrel drawings and calculations

1.4 JOB CONDITIONS

A. Do not allow personnel in manholes during vacuum or pressure testing.

- B. Provide relief valves set at 10 psig to avoid accidentally overpressurizing gravity sewer line during low-pressure air testing.

PART 2 - PRODUCTS

2.1 VACUUM TESTING EQUIPMENT

- A. Vacuum pump
- B. Vacuum line
- C. Vacuum tester base with compression band seal and outlet port
- D. Shut-off valve
- E. Stop watch
- F. Plugs
- G. Vacuum gauge, calibrated to 0.1" Hg

2.2 AIR TEST EQUIPMENT

- A. Air compressor
- B. Air supply line
- C. Shut-off valves
- D. Pressure regulator
- E. Pressure relief valve
- F. Stop watch
- G. Plugs
- H. Pressure gauge, calibrated to 0.1 psi

2.3 INFILTRATION TEST EQUIPMENT

- A. Weirs

2.4 HYDROSTATIC TEST EQUIPMENT

- A. Hydro pump
- B. Pressure hose

- C. Water meter
- D. Test connections
- E. Pressure relief valve
- F. Pressure gauge, calibrated to 0.1 psi

2.5 DEFLECTION TEST EQUIPMENT

- A. Go, No-Go mandrels
- B. Pull/retrieval ropes

PART 3 - EXECUTION

3.1 TESTING MANHOLES

- A. General: Testing using either air or water shall be done whenever possible prior to backfilling to assist in locating leaks. Retesting of all manholes shall occur following final paving. Joint repairs by parging are to be done on both outside and inside of the joint to ensure a permanent seal.
- B. Vacuum Test:
 - 1. Plug all pipe openings; take care to securely brace the plugs and pipe.
 - 2. Inflate the compression band to effect a seal between the vacuum base and the structure; connect the vacuum pump to the outlet port with the valve open; draw a vacuum to 10" of Hg; close the valve; start the test.
 - 3. Test:
 - a. Determine the test duration for the manhole from the following table:

VACUUM TEST TABLE

Depth of Manhole (ft.)	TIME (sec.)		
	Diameter of Manhole (in.)		
	48"	60"	72"
up to 10	30	30	30
12	30	30	34
14	30	32	40
16	30	37	45
18	32	41	51
20	35	46	57
22	39	51	62
24	42	55	68
26	46	60	74
28	49	64	80
30	53	69	85

- b. Record the vacuum drop during the test period; if the vacuum drop is greater than 1.0" of Hg during the test period, the manhole shall be repaired and retested; if a vacuum drop of 1" of Hg does not occur during the test period, the test shall be discontinued and the manhole will be accepted.
- c. If the manhole fails the initial test, the Contractor shall locate the leak and make proper repairs. Leaks and lift holes shall be filled with approved non- shrink grout.

3.2 PIPELINE PREPARATION

- A. Backfill trenches in accordance with Section 02221.
- B. Provide pressure pipeline with concrete reaction support blocking.
- C. Flush pipeline to remove debris; collect and dispose of flushing water and debris.
- D. Clean pipelines by propelling a snug fitting rubber ball through the pipeline with water from the upstream manhole to the downstream manhole.
- E. Lines will be televised prior to acceptance. Contractor must make arrangements with Township for review.
- F. Plug outlets, wye branches and laterals; brace plugs to offset thrust.

3.3 TESTING GRAVITY SEWER PIPELINES

- A. Low-pressure Air Test:
 1. Test each newly installed section of gravity sewer line between manholes.
 2. Slowly introduce air pressure to approximately 4.0 psig.
 - a. If ground water is present, determine its elevation above the springline of the pipe by means of a ground water height indicator; for every foot of ground water above the springline of the pipe, increase the starting air test pressure reading by 0.43 psig; do not increase pressure above 10 psig.
 3. Allow pressure to stabilize for at least five minutes. Adjust pressure to 3.5 psig or the increased test pressure as determined above if ground water is present. Start the test.
 4. Test:
 - a. Determine the test duration for a sewer section with a single pipe size from the following table. No allowance will be made for laterals.

AIR TEST TABLE

Minimum Test Time for Various Pipe Sizes

Nominal Pipe Size, inches	T (time), min/100ft	Nominal Pipe Size, inches	T (time), min/100ft
3	0.2	21	3.0
4	0.3	24	3.6
6	0.7	27	4.2
8	1.2	30	4.8
10	1.5	33	5.4
12	1.8	36	6.0
15	2.1		
18	2.4		

- b. Record the drop in pressure during the test period; if the air pressure has dropped more than 1.0 psig during the test period, the line is presumed to have failed; if the 1.0 psig air pressure drop has not occurred during the test period, the test shall be discontinued and the line will be accepted.
- c. If the line fails, determine the source of the air leakage, make corrections and retest; the Developer/Contractor has the option to test the section in incremental stages until the leaks are isolated; after the leaks are repaired, retest the entire section between manholes.
- d. All laterals installed into manholes shall be air tested. Regardless of pipe length, the minimum test times for 4" dia., 6" dia., and 8" dia. Pipes are 2 ½, 4 and 5 minutes respectively.

B. Testing Pipe Over 36" Diameter: Pipe larger than 36" diameter shall be subjected to a visual interior inspection.

C. Infiltration Test:

- 1. Use only when gravity pipeline is submerged in ground water a minimum of 4 feet above the crown of the pipe for the entire length being tested; obtain prior approval of the Township Engineer.
- 2. Maximum Allowable Infiltration: 50 gallons per inch of pipe diameter per mile per day for any one section under test, including the allowances for leakage from manholes.

3.4 TESTING PRESSURE SEWER PIPELINES

A. Hydrostatic Leakage Test:

- 1. Test each newly laid pressure pipeline, including any valved section thereof, hydrostatically at 1.5 times the working pressure of the pipeline based on the elevation of the lowest point in the pipeline corrected to the elevation of the test gauge; obtain test pressure from the Township Engineer.
- 2. Slowly fill the section to be tested with water, expelling air from the pipeline at the high points. Install corporation cocks at high points if necessary. After all air is expelled, close air vents and corporation cocks and raise the pressure to the specified test pressure.
- 3. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings, and valves

- showing visible leakage. Retest.
4. After visible deficiencies are corrected, continue testing at the same test pressure for an additional two hours to determine the leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as the quantity of water supplied to the pipeline necessary to maintain test pressure during the period of the test.
 5. Compute the maximum allowable leakage by the following formula:

$$L = \frac{ND(P)^{1/2}}{7400}$$

Where: L is the allowable leakage in gallons/hour
N is the number of joints in the section tested
D is the nominal diameter of the pipe in inches
P is the average test pressure in psig

If the line under test contains sections of various diameters, the allowable leakage shall be the sum of the computed leakage for each size.

6. If the test of the pipe indicates leakage greater than that allowed, locate the source of the leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of the amount of leakage.

3.5 DEFLECTION TESTING OF PLASTIC SEWER PIPE

- A. Perform vertical ring deflection testing on all portions of PVC and ABS sewer piping, in the presence of the Township Engineer, after backfilling has been in place for at least 30 days but not longer than 12 months.
- B. The maximum allowable deflection for installed plastic sewer pipe shall be limited to 5.0% of the original vertical internal diameter.
- C. Perform deflection testing with a deflectometer, calibrated television, or a properly sized 'Go, No-Go' mandrel; the mandrel(s) shall be provided at the Developer/Contractor's expense and subject to the approval of the Township Engineer.
- D. Pipe exceeding the allowable deflection shall be located, excavated, replaced, and retested.
- E. During the 12th month of the warranty period, perform a second vertical ring deflection test on all portions of PVC sewer piping, in the presence of the Engineer, including preparation in accordance with previous sections.

END OF SECTION

SECTION 02653 - TESTING AND DISINFECTING WATER MAINS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work Of This Section Includes, but is not limited to:

1. Testing water pipeline:
 - a. Hydrostatic pressure testing
 - b. Leakage testing
2. Disinfecting:
 - a. Preliminary flushing
 - b. Chlorine application methods
 - c. Final flushing
 - d. Bacteriological testing

B. Related Work Specified Elsewhere:

1. Section 02615 - Water Mains
2. Section 02640 - Valves and Fire Hydrants
3. Section 02642 - Water Service Connections

1.2 QUALITY ASSURANCE

A. Testing Agency: Bacteriological testing shall be performed by a testing laboratory approved by DEP, engaged and paid for by the Developer/Contractor; and approved by the Township's Engineer. Samples are to be collected by the testing agency, and results submitted to the Township.

B. Referenced Standards:

1. American National Standards Institute (ANSI); American Water Works Association (AWWA):
 - a. ANSI/AWWA B300 Standard for Hypochlorites
 - b. ANSI/AWWA B301 Standard for Liquid Chlorine
 - c. ANSI/AWWA C600 Standard for Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances, Section 4, Hydrostatic Testing
 - d. AWWA C651 Standard for Disinfecting Water Mains

C. Test Acceptance:

1. No test will be accepted until the results are below the specified maximum limits.
2. The Developer/Contractor shall, at his own expense, determine and correct the sources of leakage and retest until successful test results are achieved.

D. Final Test Acceptance:

1. See paragraph 2.08.A, Section 01010 - General Requirements.

1.3 SUBMITTALS

- A. Test Procedures: Submit a testing sequence schedule including a list of testing equipment to be used.
- B. Certificates:
 - 1. Submit a Statement of Compliance, together with supporting data, from the materials suppliers attesting that the chlorine form composition provided meets specification requirements.
 - 2. Submit, prior to starting testing, certification attesting that the pressure gauges to be used have been calibrated and are accurate to the degree specified in Part 2, Products.
- C. Test Reports: Submit two copies of the testing laboratory certified test reports of each bacteriological test to the Township.

PART 2 - PRODUCTS

2.1 HYDROSTATIC TEST EQUIPMENT

- A. Hydro pump
- B. Pressure hose
- C. Test connections
- D. Water meter
- E. Pressure gauge, calibrated to 0.1 lb./sq.in.
- F. Pressure relief valve

2.2 DISINFECTING CHEMICALS

- A. Liquid chlorine, calcium hypochlorite, or sodium hypochlorite conforming to ANSI/AWWA Standards B300 and B301.

2.3 ADHESIVE

- A. Food - grade adhesive such as Permatex Form-A - Gasket No. 2 and Permatex Clear RTV Silicone Adhesive Sealant manufactured by Loctite Corporation, Kansas City, KS or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Backfill trenches in accordance with Section 02221.
- B. Provide the water line under test with reaction thrust blocking; hydrostatic testing shall not begin until the concrete thrust blocking has set; allow 2000 psi 28-day strength concrete to set (cure) for a minimum of 7 days prior to testing; if High Early Strength 3,000 psi 3-day strength concrete is used, hydrostatic testing may not begin until the concrete has set a minimum of 2 days.

- C. Provide pumps, piping, tanks, connections, polyurethane pigs, and appurtenances at no additional expense to the Owner. Owner will provide the necessary water for testing. Water for retests that result from failure of the initial test will be at the expense of the Contractor.
- D. Provide 48 hours advance notification to the Township Engineer of scheduled pressure and leakage testing. No testing is to be performed unless air temperature is 35°F or higher.

3.2 TESTING WATER LINES

- A. Hydrostatic Testing: Test each newly installed section of water line by hydrostatic test procedure in accordance with the recommended practice established by AWWA, Standard C600, Section 4, hydrostatic testing, as modified herein below.

- 1. Pressure Test:

- a. Conduct pressure tests for a period of not less than 2 hours at 150 psig or at a pressure of not less than 1.25 times the working pressure based upon the elevation of the lowest point in line under test corrected to the elevation of the test gauge, but shall not exceed 150 psi.

- B. Observe joints, fittings and valves under test; remove and renew cracked pipe, joints, fittings, and valves showing visible leakage; retest.

- 1. Leakage Testing:

- a. Conduct the leakage test concurrently with the pressure test for the 2-hour period at the specified test pressure.
 - b. Water pipe installation is deemed to have failed the leakage test if the leakage obtained is greater than that determined by the formula or the leakage exceeds 10 gal per inch pipe diameter in 24 hours.

$$L = ND(P)^{0.5}/7400$$

Where: L is allowable leakage in gallons/hour
N is number of joints in the section tested
D is nominal diameter of pipe in inches
P is average test pressure in pounds per square inch gauge

- c. If the line under test contains sections of various diameters, the allowable leakage shall be the sum of the computed leakage for each size.
 - d. If test results indicate that the pipe has leakage greater than specified, locate and repair the defective joints, fittings, pipe or valves and retest until leakage is within allowable limits; repair visible leaks regardless of the amount of leakage.

3.3 DISINFECTION

- A. General:

- 1. After completion of satisfactory pressure and leakage testing, disinfect the water lines in accordance with the recommended practice established in AWWA Standard C651; conduct water line disinfection in the following steps:
 - a. Preliminary flushing
 - b. Chlorine application
 - c. Final flushing
 - d. Bacteriological tests

- B. During construction, place calcium hypochlorite granules at the upstream end of the first section of pipe, at the upstream end of each branch main and at 500-ft. intervals. (Refer to Table 1 at the end of this section for quantity of granules to be used.)
1. **CAUTION:** This procedure must not be used on solvent welded plastic or on screwed joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.
- C. Preliminary Flushing - Use one of the following two methods:
1. Prior to disinfection, except when the tablet method is used, flush the line with pipe cleaning plugs or "pigs"; these "pigs" shall be polyurethane blown elastomer foam bullets hydraulically propelled; the "pig" shall have the ability to negotiate fabricated mitered bends and short radius elbows and pass through tees, crosses, and multi-dimensional sizes of pipe and valves; the "pigs" shall be approved for use in potable water systems by governing regulatory agency; dispose of flushing water used with "pigs".
 2. Prior to disinfection, except when the tablet method is used, the main shall be filled to eliminate air pockets and shall be flushed to remove particulates; the flushing velocity in the main shall be not less than 2.5 fps unless the Township Engineer determines that conditions do not permit the required flow to be discharged to waste; (Refer to Table 3 at the end of this section for the rates of flow to produce a velocity of 2.5 fps in pipes of various sizes.) Flushing water shall be safely disposed of in a manner acceptable to the governing regulatory agency.
- D. Chlorine Form: The chlorine form to be applied to the system shall be either liquid chlorine, calcium hypochlorite or sodium hypochlorite; the Township Engineer's written approval of the chlorine form to be used is required.
- E. Chlorine Application:
1. Tablet Method:
 - a. **CAUTION:** The tablet method cannot be used unless the main is kept clean and dry during construction because the preliminary flushing step must be eliminated; do not use the tablet method in mains having diameters over 24 in.
 - b. During construction, place 5g calcium hypochlorite tablets in each section of pipe and place one such tablet in each hydrant, hydrant branch and other appurtenances to achieve the required dose of 25 mg/l available chlorine; (Refer to Table 2 at the end of this section for the proper number of 5g calcium hypochlorite tablets needed.) attach all the tablets inside and at the top of the main with an adhesive; there shall be no adhesive on the tablet except on the broad side attached to the surface of the pipe; attach the tablets before the pipe section is placed in the trench and mark their position on the section so it can be readily determined that the pipe is installed with the tablets at the top.
 - c. When pipeline installation is completed, fill the main with water at a rate such that water within the main will flow at a velocity not greater than 1 fps; retain the water in the pipe for 24 hours; if the water temperature is less than 41°F, retain the water in the pipe for at least 48 hours; position valves so that the strong chlorine solution in the main being treated will not flow into water mains in active service.
 2. Continuous Feed Method:
 - a. The continuous feed method consists of placing calcium hypochlorite granules in the main during construction (at the option of the Township Engineer), completely filling the main to remove all air pockets, flushing the completed main to remove particulates and filling the main with potable water chlorinated so that after a 24-hour holding period in the main there will be a free chlorine residual of not less than 10 mg/l.
 - b. At a point not more than 10 feet downstream from the beginning of the new main, water entering the

new main shall receive a dose of chlorine fed at a constant rate such that the water entering the new main will not have less than 25 mg/l free chlorine; assure this concentration is provided by measuring chlorine concentration; **Township Engineer shall approve of the method before proceeding with disinfection.**

- c. During the application of chlorine, position valves so that the strong chlorine solution in the main being treated will not flow into water mains in active service.
- d. Retain the chlorinated water in the main for a 24-hour period. During the 24-hour treatment, operate valves, curb stops and hydrants in order to disinfect appurtenances and pipe branches; at the end of this 24-hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/l of free chlorine, as determined by a certified testing laboratory.

F. Final Flushing:

1. Flush the heavily chlorinated water from the system under treatment until the chlorine concentration in the water leaving the system is no higher than that generally prevailing in the system or is acceptable for domestic use.
2. Comply with Federal, State and local laws when discharging the flushed chlorine solution.

G. Bacteriological Testing:

1. After final flushing is completed and before the water main is placed in service, test the line for bacteriological quality.
2. Collect a minimum of one sample at the end of each new main for each test, and one sample of the incoming water from the existing water system for comparison.
3. Collect samples in sterile bottles treated with sodium thiosulfate.
4. Sampling tap shall consist of corporation stop installed in the main with copper tube gooseneck assembly through which a portion of the chlorinated water has been allowed to flow; sterilize the tap, valves and pipe in a manner similar to the sterilization of the main; do not use hose or fire hydrant to collect samples.
5. Provide bacteriological test reports to the Township Engineer; failure to meet State health standard requirements will be cause for the Developer/Contractor to rechlorinate and retest the system.
6. If trench water has entered the main, or if, in the opinion of the Township Engineer, excessive quantities of dirt or debris have entered the main, take bacteriological samples at intervals of approximately 200 ft. from the water that has stood in the main for at least 16 hours after final flushing has been completed.

SEE ATTACHED TABLES

END OF SECTION

TABLE 1
Ounces of Calcium Hypochlorite Granules to be Placed at
Beginning of Main and at each 500-ft Interval

Pipe Diameter (in.)	Calcium Hypochlorite Granules (Oz)
4	0.5
6	1.0
8	2.0
12	4.0
16 or larger	8.0

TABLE 2
Number of 5g Hypochlorite Tablets Required for Dose of 25mg/l*

Pipe Diameter (inches)	Length of Pipe Section (feet)				
	13 or less	18	20	30	40
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13

* Based on 3.25g available chlorine per tablet, any portion of tablet rounded to next higher number.

TABLE 3
Required Flow and Openings to Flush Pipelines*
(40 psi Residual Pressure in Water Main)

Pipe Diameter (inches)	Flow Required to Produce 2.5fps Velocity in Main (gpm)	Size of Tap on Main** (inches)	Hydrant Outlets	
			Number	Size (inches)
4	100	15/16	1	2-1/2
6	220	1-3/8	1	2-1/2
8	390	1-7/8	1	2-1/2
10	610	2-5/16	1	2-1/2
12	880	2-13/16	1	2-1/2
16	1565	3-5/8	2	2-1/2

* With a 40 psi pressure in the main with the hydrant flowing to atmosphere, a 2-1/2" hydrant outlet will discharge approximately 1000 gpm; a 4-1/2" hydrant nozzle will discharge approximately 2500 gpm.

** Size of tap on main, with no significant length of discharge piping.

TABLE 4
Chlorine Required to Produce 25 mg/l Concentration in 100 Ft. of Pipe

Pipe Diameter (inches)	100% Chlorine (lb.)	1% Chlorine Solution (Gal.)
4	0.013	0.16
6	0.030	0.36
8	0.054	0.65
10	0.085	1.02
12	0.120	1.44
16	0.217	2.60

END OF SECTION

SECTION 02722 - LOW-PRESSURE SEWER SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

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

1. Sanitary sewer low-pressure pipelines
2. Service connections
3. In-line cleanouts
4. Terminal cleanouts

B. Related Work Specified Elsewhere:

1. Section 02221 - Trenching, Backfilling & Compacting
2. Section 02610 - Sanitary Sewer Pipe
3. Section 02651 - Sewer and Manhole Testing

C. Applicable Standard Details:

1. 5220 Typical Service Connection Plan
2. 5222 Pressure Sewer Trench and Bedding Detail
3. 5223 Service Valve Detail
4. 5224 Valve Box Detail
5. 5225 In-Line Cleanout Detail
6. 5226 Terminal Cleanout Detail
7. 5180 Vertical Water Main Clearance
8. 5195 Thrust Block for Vertical Bends
9. 5196 Thrust Block for Bends, Tees and Caps

1.2 REFERENCES

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

1. ASTM D1784 - Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (vinyl Chloride) (CPVC) Compounds
2. ASTM D2241 - Poly(Vinyl Chloride)(PVC) Plastic Pipe (SDR-PR)
3. ASTM D2466 - Poly(Vinyl Chloride)(PVC) Plastic Pipe Fittings, Schedule 40
4. ASTM D2564 - Solvent Cements for Poly(Vinyl Chloride)(PVC) Plastic Pipe and Fittings
5. ASTM D3139 - Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
6. ASTM D1785 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120
7. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe
8. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fitting for Polyethylene (PE) Pipe and Tubing

9. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
10. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
11. ASTM 1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing

1.3 SUBMITTALS

A. Shop Drawings and Product Data:

1. Submit manufacturer's catalog data, literature, illustrations and specifications.
2. Submit shop drawings of valves and valve operators including dimensions, net assembled weight of each size valve furnished, construction details, and materials of components.
3. Submit manufacturer's installation instructions.
4. Submit manufacturer's maintenance instructions and complete parts lists.

B. Certificates:

1. Submit a Certificate of Compliance, together with supporting data, from the materials supplier(s) attesting that valves, accessories, and specialties meet or exceed specification requirements.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. During loading, transporting and unloading, and storage on site, exercise care to prevent damage to materials.
- B. Do not drop pipe or fittings.

PART 2 - PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) SEWER PIPE

A. Pressure Sewer Pipe and Fittings:

1. Pipe: ASTM D2241, SDR21.
2. Flexible Elastomeric Seals: ASTM D3139.
3. Seal Material: ASTM F477.
4. Fittings: ASTM D2466, Socket type, Schedule 40.
5. Solvent Cement: ASTM D2564.

2.2 HIGH DENSITY POLYETHYLENE PIPE

A. Pressure Sewer Force Main:

1. High Density Polyethylene (HDPE), 160 psi rated, SDR 11, Iron Pipe Size (IPS) pipe, size as indicated on the plans.
2. The outside pipe diameter (OD) and minimum wall thickness (MWT) shall be as follows:

<u>IPS (Inches)</u>	<u>OD (Inches)</u>	<u>MWT (Inches)</u>
2	2.375	0.216
3	3.500	0.318
4	4.500	0.409
6	6.625	0.602

3. Materials used shall have a PPI/ASTM standard thermoplastic material designation code of PE3408 and a material classification conforming to Grade P34 for ASTM D-3350.
4. Pressure sewer force mains when installed in public right-of-ways shall have all pipe data heat indented in a "Green" stripe on the wall of the pipe.
5. Pipe shall be supplied in the maximum length available to avoid joints.
6. Field splices shall be in accordance with ASTM D3261 (Butt heat fusion) or by approved electrofusion fittings manufactured in accordance with ASTM F1055 and rated at a minimum operating pressure of that of the pipe.
7. Fittings and adapters to valves and other equipment shall be in the strict accordance with the recommendations of the pipe manufacturer.

B. Pressure Sewer Service Laterals:

1. Shall be 1-1/4" High Density Polyethylene (HDPE), 160 psi rated, SDR 11, Iron Pipe Size (IPS) pipe with an outside diameter of 1.660 inches with a minimum wall thickness of 0.151 inches.
2. Materials used shall have a PPI/ASTM standard thermoplastic material designation code of PE3408 and a material classification conforming to Grade P34 for ASTM D-3350.
3. Pressure sewer service lateral shall be solid "Green" in color.
4. Pipe shall be supplied in minimum lengths of 500 feet to avoid joints.
5. Field splices shall be in accordance with ASTM D3261 (butt heat fusion) or by approved electrofusion fittings manufactured in accordance with ASTM F1055 and rated at a minimum operating pressure of that of the pipe.

2.3 UTILITY MARKING TAPE

- A. Tape shall consist of minimum 5-mil (0.005") overall thickness, with no less than a 35 gauge (0.00035") solid aluminum foil core. The foil must be visible from BOTH sides. The layers shall be laminated together with the extrusion lamination process, not adhesives. Further, there shall be NO inks or printing extending to the edges of the tape. The adhesive will NOT contain any dilutants, pigments or contaminants and is specially formulated to resist degradation by elements normally encountered in the soil. All printing shall be encased to avoid ink rub-off.

B. Test Data:

<u>Property</u>	<u>Method</u>	<u>Value</u>
Thickness	ASTM D2103	5.0 mils
Tensile strength	ASTM D 882	25 lbs./inch (5500 psi)
Elongation	ASTM D 882-88	<50% at break
Printability	ASTM D2578	>50 dynes/cm ²
Flexibility	ASTM D 671-81	Pliable hand
Inks	Mfg. Specs.	Heat set Myles
Message repeat	Mfg. Specs.	Every 20"
Foil	Mfg. Specs.	Dead soft/annealed
Top Layer	Mfg. Specs.	Virgin PET
Bottom Layer	Mfg. Specs.	Virgin LDPE
Adhesives	Mfg. Specs.	>30%, solid 1.5#/R
Bond strength	Boiling H ₂ O @ 100°C	5 hours w/o peel
Colors	APWA code	See below

C. Color Code shall be as follows:

1. Safety Red: Electric power, distribution and transmission and municipal electric systems.
2. High Visibility Safety Yellow: Gas and oil distribution and transmission, dangerous materials, product and steam.
3. Safety Alert Orange: Telephone and telegraph systems, police and fire communications, and cable television.
4. Safety Precaution Blue: Water systems and slurry pipelines.
5. Safety Green: Sanitary and storm sewer systems.
6. Safety Brown: Force mains, reclaimed water lines and effluent reuse lines.
7. Alert Purple: Reclaimed non-potable water lines.

2.4 VALVES

A. Ball Valves

1. Bronze body, solid bronze tee head, ASTM B62. Compression type union inlet and outlet. Double Buna-N O-rings in stem, spherical ball, molded Buna-N rubber seats. Size as indicated on the Contract Drawings.

B. PVC Check Valves

1. Gravity-operated, ball-type providing full-ported passageway when open.
2. 150 psi working pressure.
3. Flowmatic 208C, or equal

2.5 ADJUSTABLE VALVE BOXES

- A. Plastic; PVC, ABS, or reinforced olefin polymers.
- B. Plastic top tube, belled bottom; bell arched and flanged; slide friction adjustment.
- C. Cast iron top collar and lid; lid cast with 'Sewer'.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform trench excavation to the line and grade indicated on the Drawings and as specified in Section 02221 - Trenching, Backfilling and Compacting..
- B. Unless otherwise indicated on the Drawings, provide for a minimum cover of 4'-0" above the top of piping laid in trenches.
- C. Provide Type IV bedding as indicated on Standard Detail 5222; place aggregate in a manner to avoid segregation, and compact to the maximum practical density so that the pipe can be laid to the required tolerances.

3.2 LAYING PIPE IN TRENCHES

- A. Give ample notice to the Engineer in advance of pipe laying operations.
- B. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to the pipe. Do not drop pipe.
- C. Lay pipe proceeding upgrade with the bell or groove pointing upstream.
- D. Excavate recesses in bedding material to accommodate joints, fittings and appurtenances. Do not subject pipe to a blow or shock to achieve solid bedding or grade.
- E. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.
- F. Clean and inspect each pipe and fitting before joining. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction and ground movement. Use lubricant recommended by the pipe or fitting manufacturer for maing joints. If unusual joining resistance is encountered or if the pipe cannot be fully inserted into the joint, disassemble joint, inspect for damage, re-clean joint components, and re-assemble joint.
- G. Do not deflect joints in pressure piping more than the maximum recommended by the pipe manufacturer.
- H. Place sufficient backfill on each section of pipe, as it is laid, to hold pipe firmly in place.
- I. Clean the interior of the pipe as the work progresses.
- J. Keep trenches and excavations free of water during construction.

- K. When the work is not in progress, and at the end of each workday, securely plug ends of pipe and fittings to prevent trench water, earth or other substances from entering the pipe or fittings.

3.3 THRUST RESTRAINT

- A. Provide pressure pipeline with restrained joints or concrete thrust blocking at all bends, tees, and changes in direction; construct concrete thrust blocking in accordance with Standard Details 5195 and 5196. If restrained joints are utilized, submit design calculations showing determination of restrained lengths and submit joint restraint details. Method of joint restraint shall utilize devices specifically designed for the application for which manufacturer's data is available for the application. Submit manufacturer's literature for approval.

3.4 SERVICE VALVES AND CLEANOUTS

- A. Provide service valves, in-line cleanouts, and terminal cleanouts where indicated on the Drawings.
- B. Construct as indicated on Standard Details 5223 thru 5226.

3.5 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after elimination of pipe laying by the Township Engineer.
- B. Install detectable utility marking tape above all sanitary sewer pressure pipeline, 12" to 18" below final grade.
- C. Backfill pipeline trenches in accordance with Section 02221.

3.6 HYDROSTATIC LEAKAGE TEST

- A. Hydrostatically test each newly laid pressure pipeline, including any valved section thereof, in accordance with Section 02651.

END OF SECTION

SECTION 02745 - VALVE VAULTS AND METER BOXES (CONCRETE)

PART 1 - GENERAL

1.1 DESCRIPTION

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

1. Valve and Meter Vaults
2. Meter Boxes

B. Related Work specified elsewhere:

1. Section 02221 - Trenching, Backfilling & Compacting
2. Section 02615 - Water Mains
3. Section 02640 - Valves and Fire Hydrants
4. Section 02642 - Water Service Connections
5. Section 03310 - Cast-in-Place Concrete

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. Pennsylvania Department of Transportation (PENNDOT): Publication 408
2. American Society for Testing and Materials (ASTM):
 - a. ASTM A48 - Specification for Gray Iron Castings
 - b. ASTM C890- Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
 - c. ASTM C891- Practice for Installation of Underground Precast Concrete Utility Structures
 - d. ASTM C913- Specification for Precast Concrete Water and Wastewater Structures

1.3 SUBMITTALS

- A. Drawings and Product Data: Submit as requested, detailed drawings and manufacturer's latest published literature for meter boxes, vaults, and frames and covers.
- B. Certificates: Submit manufacturer's certification for all products attesting materials meet or exceed specification requirements.

1.4 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Exercise care in handling precast concrete products to avoid chipping, cracking and breakage.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS

- A. Preformed Plastic Joint Sealant Compound: Self-adhering, cold-applied sealant conforming to Federal Specification SS-S-00210.
- B. Cast Iron: ASTM A48, Class 30 or better; free of bubbles, sand and air holes and other imperfections.

2.2 PRODUCTS

- A. Concrete Vaults and Meter Boxes for Use in Traffic Areas:
 - 1. Precast Reinforced Concrete Vault: Watertight precast reinforced concrete designed to ASTM C890 A16 (HS 25) live loading and manufactured to conform to ASTM C913.
 - 2. Cast-in-Place Concrete Vault: Concrete shall be Class AA, Structures and Miscellaneous, in conformance with Section 704 and Table A of Publication 408 Specifications; reinforcing shall meet ASTM A615, Grade 40.
 - 3. Either precast concrete or cast-in-place concrete is acceptable.
 - 4. Concrete vaults shall be complete with inlet and outlet pipe openings, access covers, vents and steps as required.
 - 5. Inlet and outlet pipe openings shall be provided with cast iron wall sleeves.
 - 6. Size of vaults will be per Township Engineer's recommendation.
- B. Valve and Meter Vault Frames and Covers: Domestic cast iron. Contact surfaces machined and matched. Word "Water" cast into the cover.
- C. PVC Meter Box: (Use in sidewalks, lawns and other non-vehicle areas.)
 - 1. Use for 5/8" diameter to 1" diameter water meter.
 - 2. Rigid - 300 minimum wall PVC material.
 - 3. Separate cast iron cover and lid.
 - 4. Type and model to be approved by Township Engineer.
- D. Meter Box Covers and Lids:
 - 1. Cast iron lid, minimum 12" opening
 - 2. Words "Water Meter" cast into the lid
 - 3. Bronze worm lock with standard waterworks pentagon bolt head.
 - 4. Lid with a recess to engage a lug on the key permitting the key to become a handle for lifting the lid.
- E. Access Hatches:
 - 1. Aluminum, flush, channel frame type; single or double leaf as indicated on the Drawings.
 - 2. Provide 1/4" extruded aluminum channel frame with anchoring flange, alloy 6063-T6. 1-1/2" channel drain.
 - 3. Provide minimum 1/4" thick diamond checkered aluminum plate covers, alloy 6061-T6, designed for live load minimum 300 lbs./sq.ft.; heavy-duty aluminum hinges, stainless steel hinge pins, stainless steel tension spring-operated lifting mechanism, automatic hold-open arm with release handle.
 - 4. Stainless steel inside snap lock, removable key-wrench lifting handle. Steel guard chains.
 - 5. Finish: Standard mill finish.

6. Shop coat portions of the frame which may contact or be embedded in concrete with a heavy coat of bituminous paint.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavate to the line and grade as specified in Section 02221.
- B. Location and depth of vaults and meter boxes as shown on the drawings.

3.2 FOUNDATION

- A. Provide compacted crushed stone subbase foundation for precast concrete structures; crushed stone shall meet AASHTO M43, Size 57.
- B. Construct subbase foundations for cast-in-place concrete and unit masonry structures on undisturbed earth.

3.3 CONSTRUCTION

- A. Meter Boxes: Provide precast concrete meter boxes; adjust meter box covers to finished grade.
- B. Vaults:
 1. Construct valve and meter vaults of precast or cast-in-place reinforced concrete.
 2. Seal vault joints watertight with preformed plastic joint sealant compound. Apply asphalt waterproofing to exterior walls.
 3. Seal annular space between pipe and wall sleeves with mechanical seal consisting of interlocking synthetic rubber links shaped to fill the space and assembled with bolts and a pressure plate under each bolt head and nut.
 4. Install cast iron vault covers and frames; adjust to finished grade elevation.

3.4 BACKFILLING

- A. Backfill only after Township Engineer's inspection of the vault or meter box.
- B. Backfill as specified in Section 02221.

END OF SECTION

SECTION 02800 - SITE DRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work of this section includes, but is not limited to:
 - 1. Storm Drainage Piping
 - 2. Inlets and Catch Basins
 - 3. Headwalls and Endwalls
 - 4. Manholes
 - 5. Rip Rap

- B. Related Work Specified Elsewhere:
 - 1. Section 02100 - Clearing and Grubbing
 - 2. Section 02221 - Trenching, Backfilling and Compacting
 - 3. Section 02222 - Site Excavation
 - 4. Section 02485 - Finish Grading, Seeding, Sodding and Ballfield Mixes
 - 5. Section 02575 - Paving Restoration
 - 6. Section 02576 - Paving

1.2 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. Pennsylvania Department of Transportation(PENNDOT) Publication 408 Specifications.

1.3 SUBMITTALS

- A. Submit a Certificate of Compliance attesting that each material meets or exceeds specification requirements.

- B. Submit drawings and manufacturer's descriptive literature for the following:
 - 1. Drainage Piping
 - 2. Inlets and Catch Basins
 - 3. Headwalls and Endwalls
 - 4. Manholes
 - 5. Basin Frames and Grates

PART 2 - PRODUCTS

2.1 STORM DRAIN PIPE

- A. Type of storm drain pipe shall be in accordance with PENNDOT Design Manual Part 2, Highway Design, Publication 13.

- B. Reinforced cement concrete pipe (RCCP), conforming to AASHTO M-170 and Section 601 (PENNDOT).

- C. Smooth lined corrugated polyethylene pipe, conforming to AASHTO M-294, Type S.
- D. Other materials may be used upon approval of Township Engineer.

2.2 INLETS AND CATCH BASINS

- A. Precast concrete, conforming to Section 605 (PENNDOT), PENNDOT Standard Drawing RC-34, Publication No. 72 and Standard Details.
 - 1. Opening Reinforcement: Reinforcement bars conforming to ASTM A615.
 - 2. Wall and Bottom Reinforcement: Welded wire fabric conforming to ASTM A185.
- B. Inlet Grates and Frames: Structural steel, grey malleable iron, or ductile iron conforming to Section 605 (PENNDOT) and PENNDOT Standard Drawings. Grates to be bicycle safe.
 - 1. Coat structural frames with bituminous paint.

2.3 HEADWALLS AND ENDWALLS

- A. Conform to Section 605 (PENNDOT) and PENNDOT Standard Drawing RC-31, Publication No. 72.

2.4 MANHOLES

- A. Refer to Section 02601.
- B. PENNDOT RC Drawings and Section 605 of PENNDOT 408.

2.5 RIP RAP STONE

- A. Field stone or rough unhewn quarry stone of approximate rectangular shape; hard and angular and of such quality that it will not disintegrate on exposure to water or weathering.
- B. 9" minimum thickness, measured perpendicular to face, with no face dimension less than the thickness of the stone.

Not less than 70% of the individual pieces weighing minimum of 150 lbs.; not more than 10% of the individual pieces weighing less than 100 lbs.

- C. Rip rap shall conform to Section 850 of PENNDOT 408. Size Rip Rap based on 25-year storm velocities

PART 3 - EXECUTION

3.1 INSTALLATION OF STORM DRAIN PIPE

- A. Provide bedding material under the haunching of the pipe to provide adequate support. Provide Type IV bedding material as described in Section 02221.
- B. Provide backfill and compact as described in Section 02221.

3.2 INLETS AND CATCH BASINS

- A. Locate inlets as indicated on the Drawings.
- B. Perform excavation as specified in Section 02221.
- C. Construct inlets and basins in accordance with Section 605 (PENNDOT) and PENNDOT Standard Drawings RC-34 and Standard Details.
 - 1. Place precast units on a 6" compacted crushed stone subbase.
 - 2. Use precast concrete rings to adjust existing inlets to grade; mortar in place.
- D. Form channels in inlets so that no ponding water remains in the structure.
- E. Construct swales to the lines and grades and cross-sections indicated on the Drawings.
- F. Where new pipes enter existing manholes and inlets, provide non-shrink grout between the pipe and the wall of the structure. Apply grout on inside and outside of the basin.

3.3 HEADWALLS AND ENDWALLS

- A. Locate inlets as indicated on Drawings.
- B. Perform excavation as specified in Section 02221.
- C. Construct headwalls and endwalls in accordance with Section 605 (PENNDOT), PENNDOT Standard Drawing RC-31 and Standard Details.

3.4 MANHOLES

- A. Locate manholes as indicated on the Drawings.
- B. Perform excavation as specified in Section 02221.
- C. Construct in accordance with Section 02601.

3.5 PLACEMENT OF RIP RAP

- A. Place rip rap as indicated on the Drawings, and in accordance with the Standard Details.

END OF SECTION

SECTION 03310 - CONCRETE FOR UTILITY CONSTRUCTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work Of This Section Includes, but is not limited to: Cast-in-place

Cement Concrete Construction
Reaction and Support Blocking
Cradles and Encasement

B. Related Work Specified Elsewhere:

Trenching, Backfilling & Compacting:	Section 02221
Paving Restoration:	Section 02575
Manholes:	Section 02601

C. Applicable Standard Details:

5100A	Manhole Base Details
5119	Type A Drop Manhole Detail
5119A	Type A Drop Manhole Detail, PVC Pipe
5119C	Type A Drop Manhole Detail, DI Mechanical Joint Pipe
5120	Type B Drop Manhole Detail
5120A	Type B Drop Manhole Detail, PVC Pipe
5120C	Type B Drop Manhole Detail, DI Mechanical Joint Pipe
5179	Concrete Cradle and Encasement Details
5179A	Concrete Arch Encasement, Type II, Details
5187A	Sloped Riser Lateral Detail
5187B	Vertical Riser Lateral Detail
5195	Thrust Block for Vertical Bends
5196	Thrust Block for Bends, Tees, Caps

1.2 QUALITY ASSURANCE

A. Reference Standards:

Pennsylvania Department of Transportation (PENNDOT): Publication 408 Specifications, 1990 as Amended

American Society for Testing and Materials (ASTM):

C31	Making and Curing Concrete Test Specimens in the Field
C39	Test for Compressive Strength of Cylindrical Concrete Specimens
C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C172	Sampling Fresh Concrete

1.3 SUBMITTALS

A. Certificates:

Submit certification from the concrete producer attesting that the cement concrete conforms to the State

Specifications for the class of concrete being used.

Submit certified results of compressive strength tests performed by an independent testing laboratory.

B. Shop Drawings:

Submit detailed drawings of reinforcing steel.

PART 2 - PRODUCTS

2.1 CEMENT CONCRETE

A. Ready-mixed, conforming to Section 704, Pub. 408 Specifications.

Requirements for State approved batch plants, design computations and plant inspection shall not apply. The acceptability of concrete will be based on conformance with the Cement Concrete Criteria specified below and the results of the specified tests.

B. Cement Concrete Criteria:

Class A:

28-day compressive strength: 3500 psi Slump: 1 to 3 inches

High Early Strength:

3-day compressive strength: 3000 psi Slump: 1 to 3 inches

Cement Factor and Maximum Water-Cement Ratio conforming to Table A, Section 704.1(b), Pub. 408 Specifications.

2.2 REINFORCEMENT STEEL

A. Reinforcement Bars:

New billet-steel conforming to Section 709.1, Pub. 408 Specifications. Deformed, Grade 40.

B. Steel Wire Fabric:

Conforming to Section 709.3, Pub. 408 Specifications.

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with Sections 676 and 1001, Pub. 408 Specifications, for construction requirements including formwork, curing, protection and finishing of cement concrete.

B. Excavate and shape trench bottoms and sides to accommodate thrust block forms, encasement, manhole bases, inlets and vaults.

C. Support pipe, valves and fittings at the required elevation with brick or concrete block. Do not use earth, rock,

wood, or organic material as supports.

3.2 CONSTRUCTION

- A. All cast-in-place Class A concrete. Class A concrete shall be central-plant-mixed.
- B. Construct manhole bases, reaction and support blocking, cradles, encasements, and miscellaneous mass concrete of Class C concrete. Class C concrete may be from a mobile cement concrete plant or truck-mixed.
- C. Construct reinforced and plain cement concrete roadway pavements and base courses of High Early Strength concrete. High Early Strength Concrete shall be central-plant-mixed.
- D. Provide spacers, chairs, bolsters, ties and other devices for properly placing, spacing, supporting and fastening reinforcement in place.
- E. Place concrete utilizing all possible care to prevent displacement of pipe or fittings. Return displaced pipe or fittings to line and grade immediately.
- F. Insure tie rods, nuts, bolts and flanges are free and clear of concrete.
- G. Do not backfill structures until concrete has achieved its initial set, forms are removed, and concrete work is inspected by the Township Engineer.
- H. Perform backfilling and compaction as specified in Section 02221.

3.3 FIELD TESTS OF CONCRETE DURING CONSTRUCTION

- A. Perform compressive strength tests, slump tests, and air content tests for each 50 cubic yards of each class of concrete placed, or fraction thereof. Retain an independent testing laboratory to test cylinders.

Keep a slump cone and an airmeter in close proximity to all concrete placements. Sample concrete in accordance with ASTM C172.

Determine slump in accordance with ASTM C143.

Determine air content in accordance with ASTM C231 or ASTM C173 as applicable.

- B. Cast at least 5 cylindrical test specimens for each batch. Test two cylinders at 7 days; test two cylinders at 28 days. Hold the remaining cylinder in reserve for testing in the event that any of the other cylinders are damaged prior to testing.

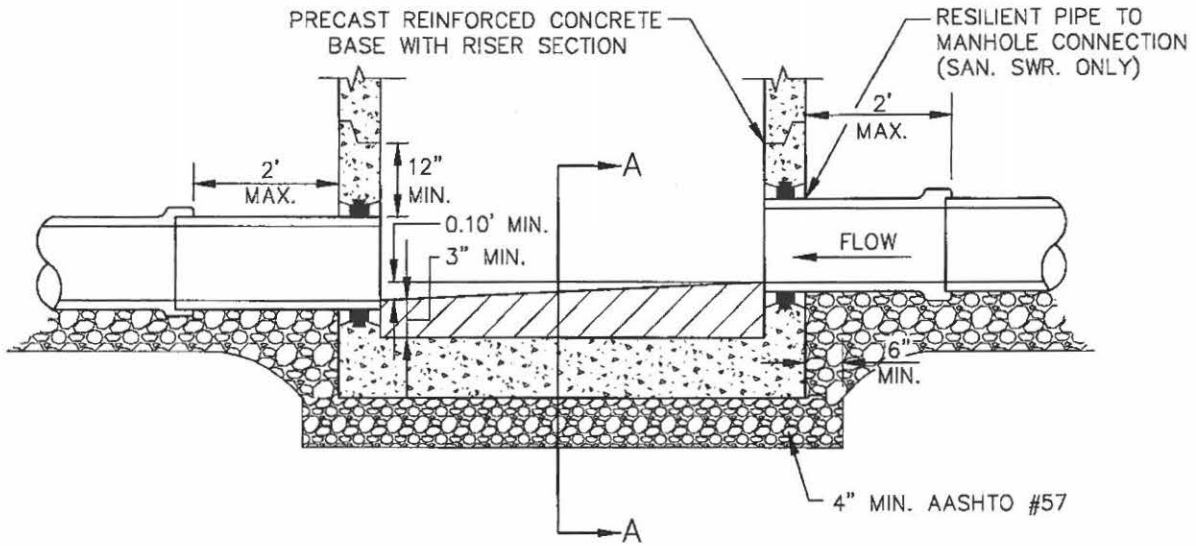
Prepare and cure test cylinders in accordance with ASTM C31.

Determine concrete compressive strength in accordance with ASTM C39. Compute and evaluate in accordance with ASTM C94.

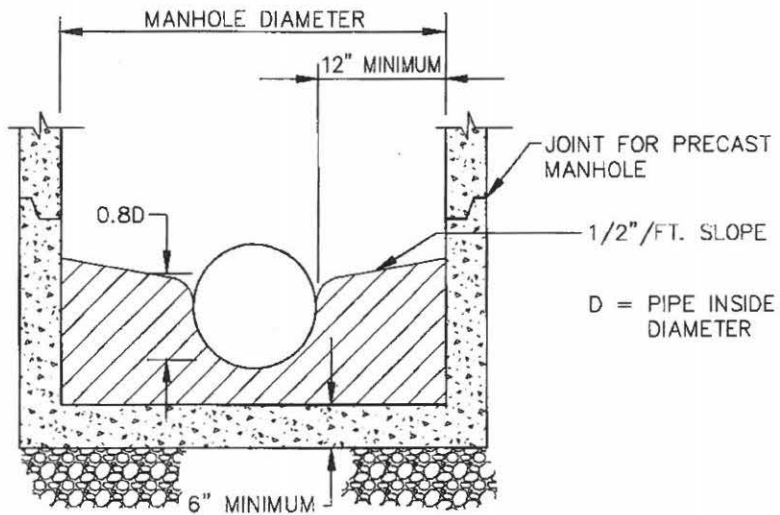
- C. If test cylinders fail to meet compressive strength requirements, the Township Engineer may require additional core tests in accordance with ASTM C42 at the expense of the Developer/Contractor.

END OF SECTION

K:\161990400\dwg\5100A (PRECAST MANHOLE BASE DETAIL).dwg, 12/9/2004 9:06:12 PM



ELEVATION



SECTION A-A

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



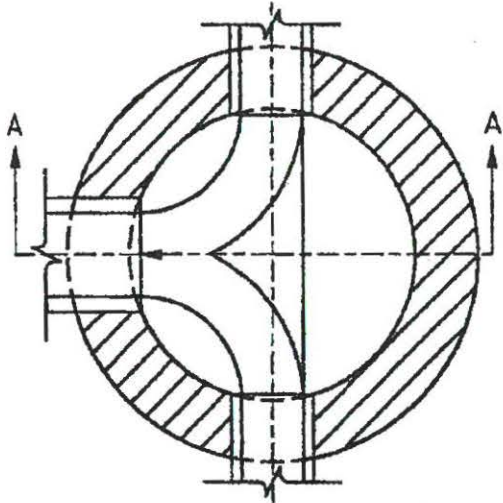
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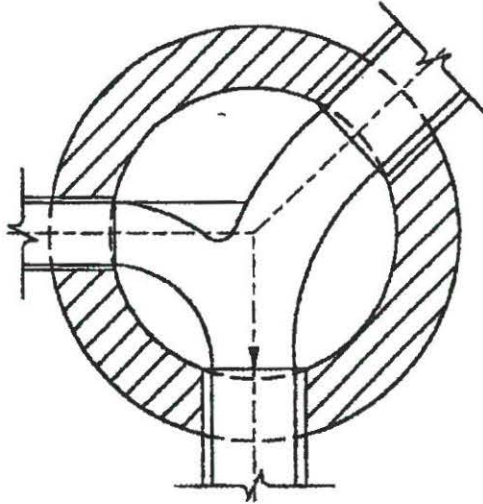
**PRECAST MANHOLE
BASE DETAIL**

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5100A

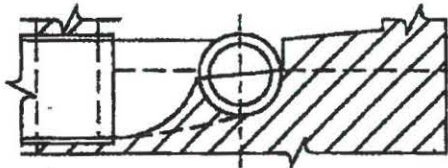
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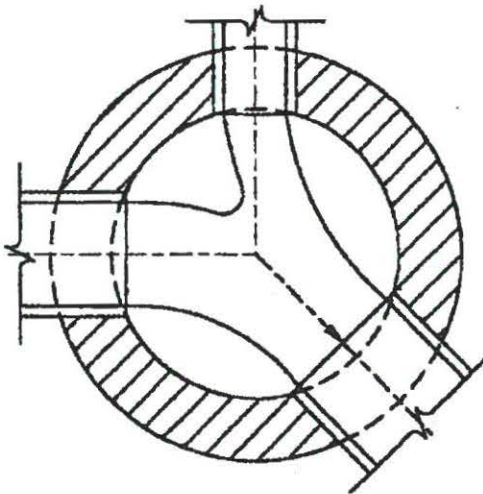
PLAN



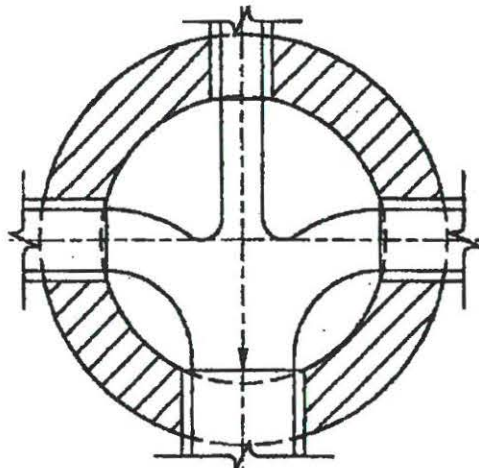
PLAN



SECTION A - A



PLAN



PLAN

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

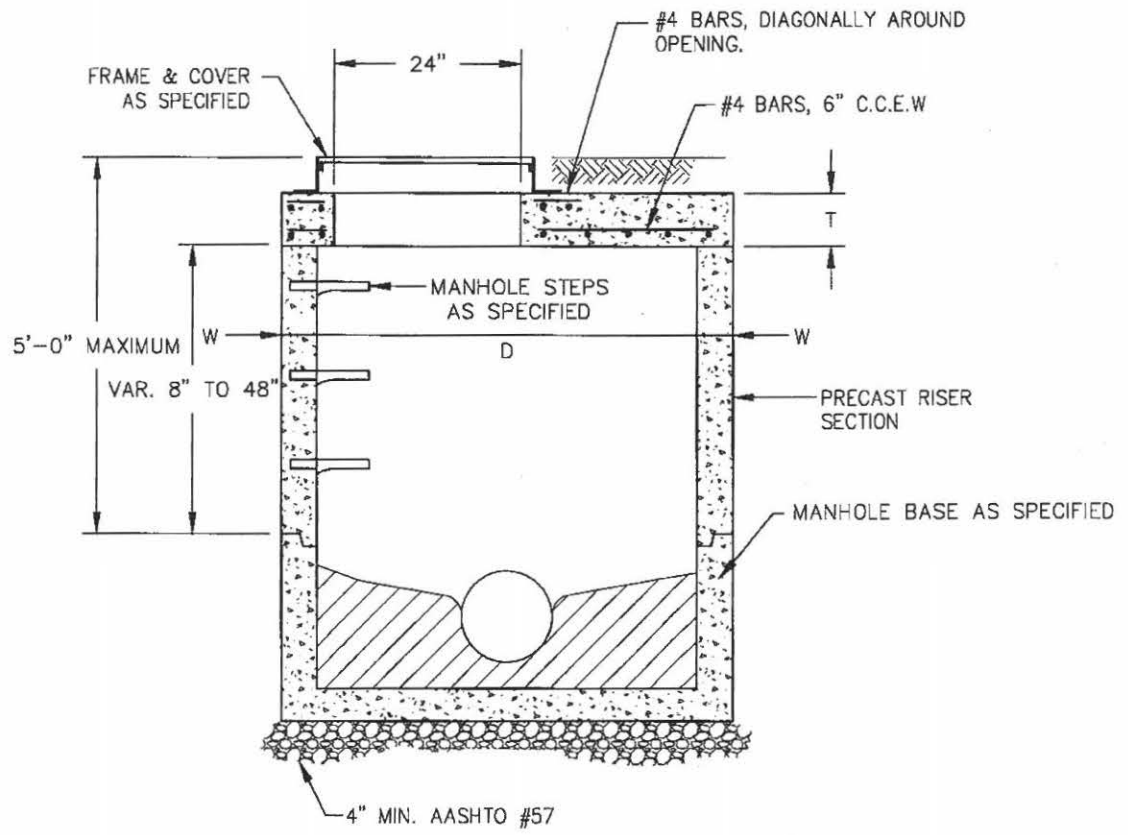


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PLANS OF
MANHOLE BASE

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5100B

K:\161990400\dwg\5106 (STANDARD SHALLOW MANHOLE DETAIL).dwg, 12/9/2015 9:08:51 PM



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

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



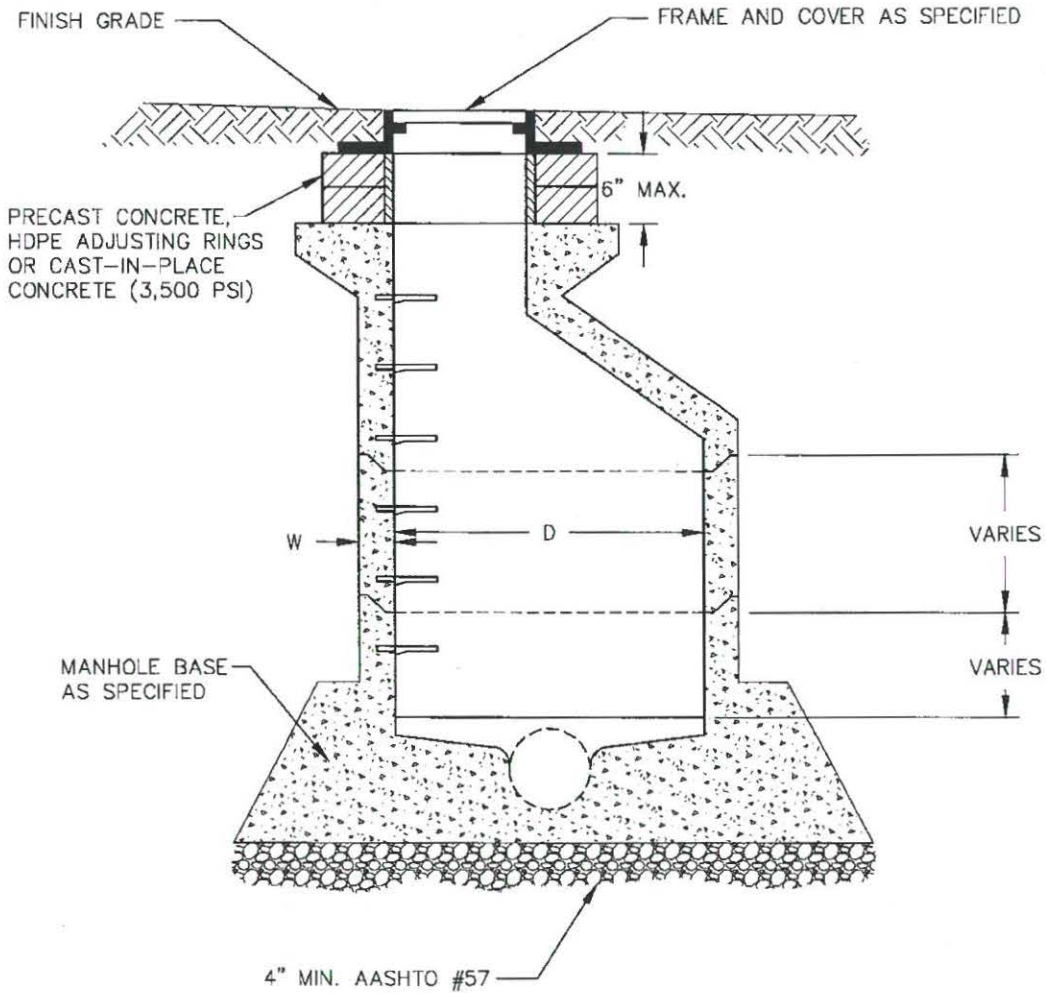
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STANDARD SHALLOW
MANHOLE DETAIL

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5106

K:\161990400\dwg\5107 (STANDARD MANHOLE DETAIL).dwg, 12/9/2015 9:14:12 PM



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

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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STANDARD MANHOLE
 DETAIL

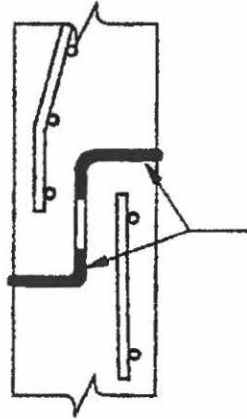
DATE: 1/26/2005

DRAWN BY: ARB

CHK. BY:

NO. 5107

K:\161990400\dwg\5109 (PRECAST MANHOLES TYPICAL ALL JOINTS).dwg. 12/9/2015 9:15:36 PM



JOINT SHALL BE SEALED
WATERTIGHT BY APPLICATION
OF PREFORMED JOINT SEALING
COMPOUND. JOINT SEALANT
COMPOUND SHALL "SQUEEZE-OUT"
ON BOTH SIDES OF JOINT. JOINT
SEALANT SHALL BE "RUB
'R-NEK" OR EQUAL.

NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



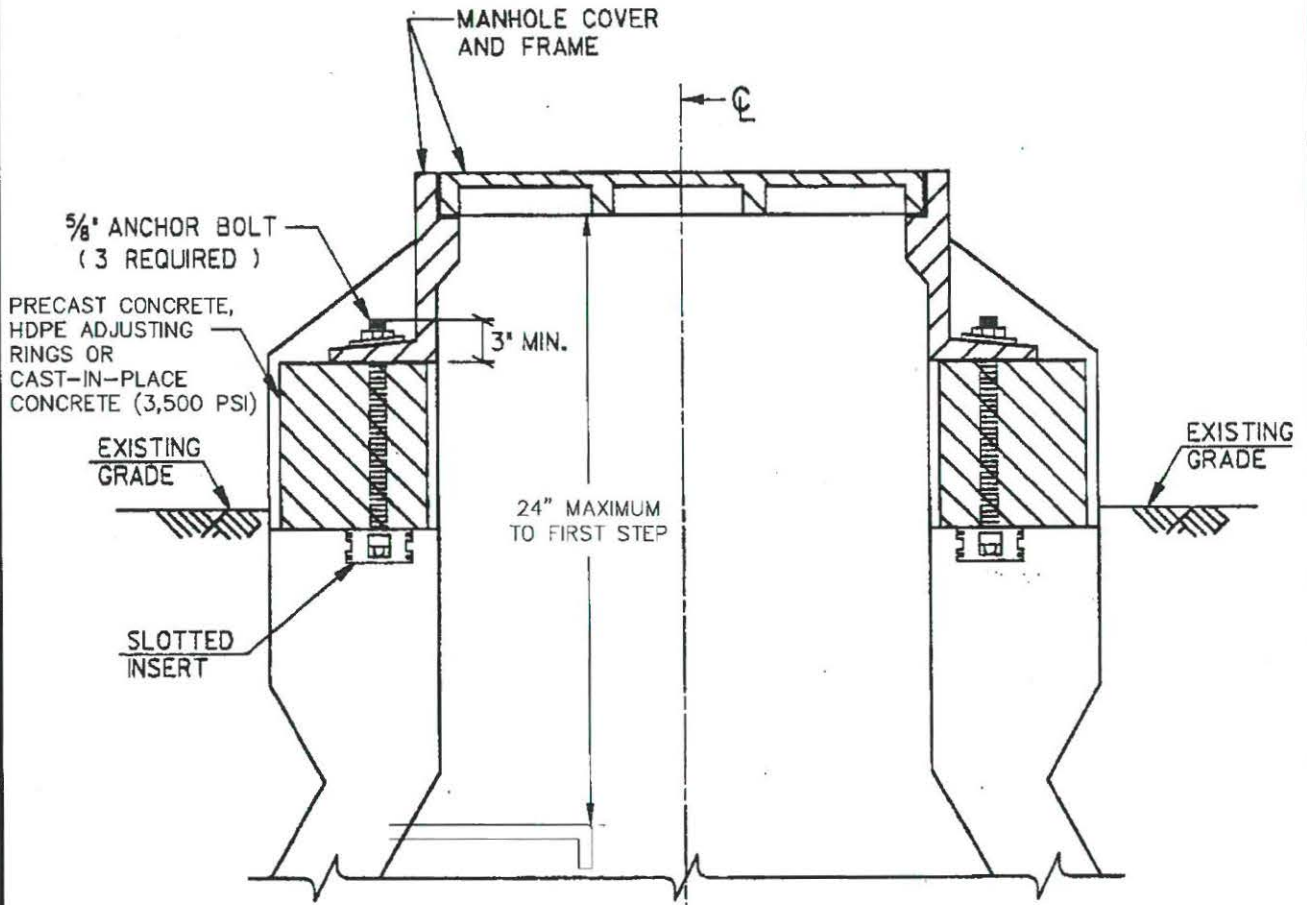
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PRECAST MANHOLES TYPICAL ALL JOINTS

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5109

K:\161990400\dwg\5109A (MANHOLE COVER ANCHOR BOLT).dwg, 12/9/2015 9:16:39 PM



MANHOLE COVER WITH ANCHOR BOLT

NO SCALE

REV. 12/11/2006
NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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**MANHOLE COVER
ANCHOR BOLT**

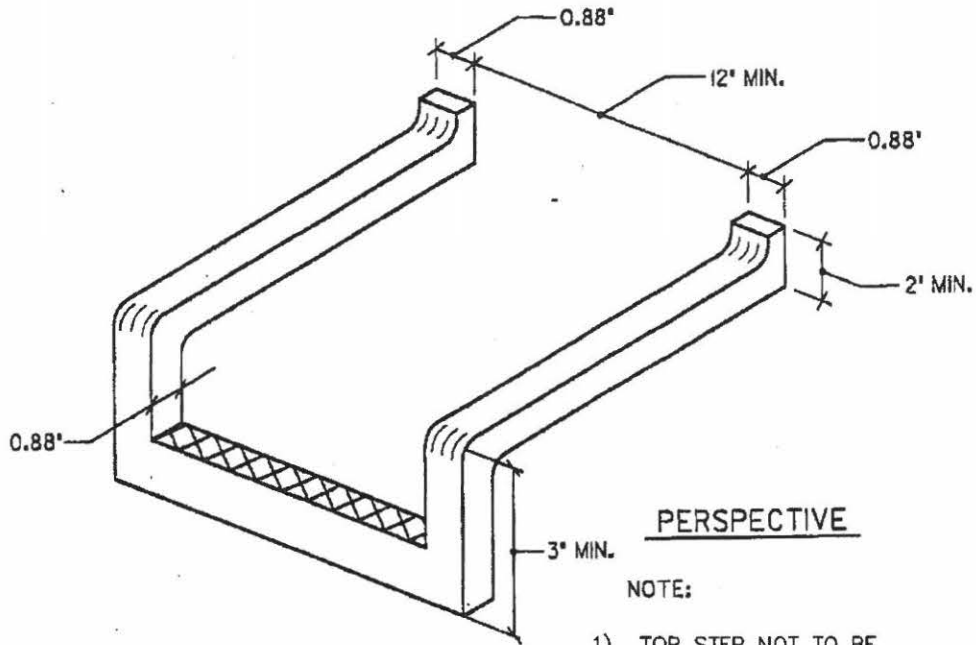
DATE: 1/26/2005

DRAWN BY: ARB

CHK. BY:

NO. 5109A

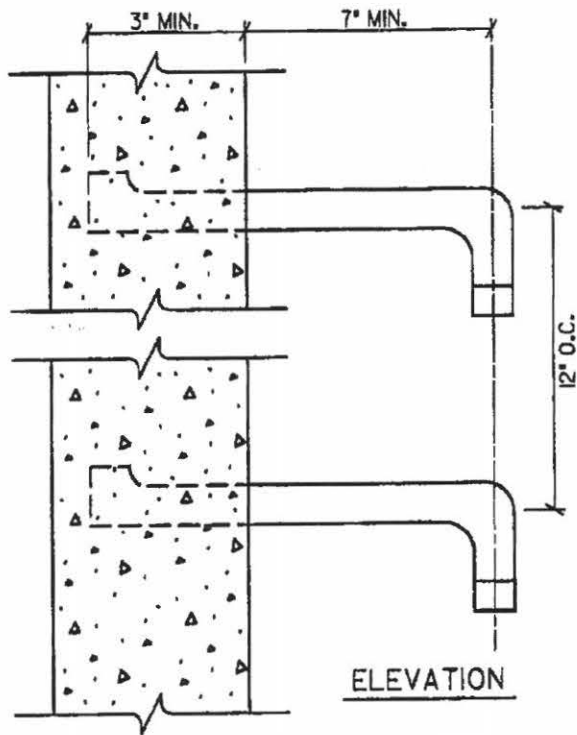
K:\161990400\dwg\5110A (ALUMINUM MANHOLE STEP DETAIL).dwg, 12/9/2015 9:24:08 PM



PERSPECTIVE

NOTE:

- 1) TOP STEP NOT TO BE GREATER THAN 2'-0" FROM TOP OF MANHOLE.
- 2) LANDING TO BOTTOM STEP NOT TO BE GREATER THAN 2'-0".
- 3) STEPS SHALL BE ONE OF THE FOLLOWING MATERIALS:
 - a) ALUMINUM ASTM B247 ALLOY 6061-76.
 - b) STEEL REINFORCED FIBERGLASS.
 - c) STEEL REINFORCED COPOLYMER POLYPROPYLENE PLASTIC.



ELEVATION

MANHOLE STEP DETAIL

NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



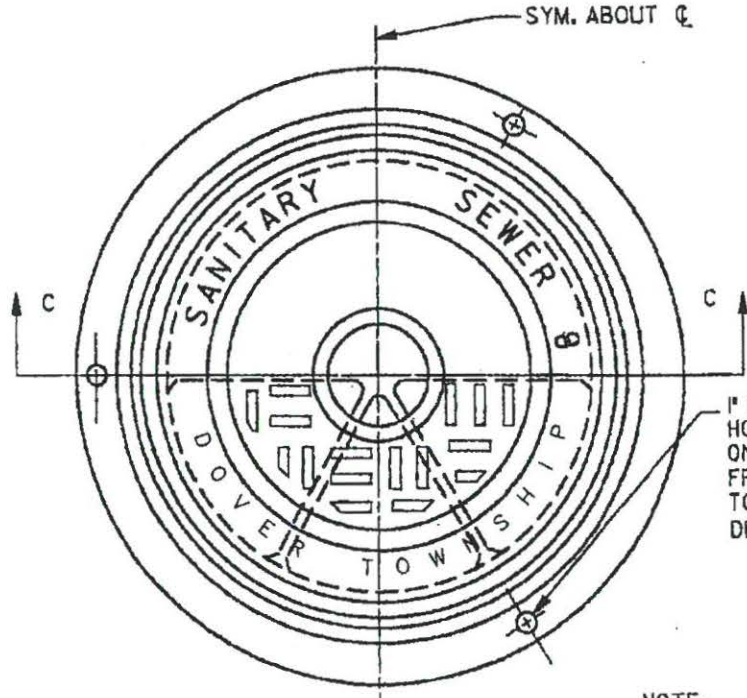
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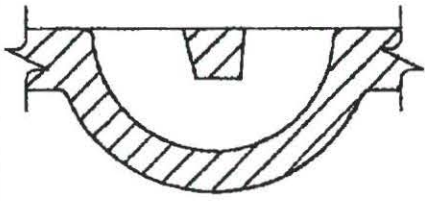
**ALUMINUM MANHOLE
STEP DETAIL**

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5110A

K:\101990400\dwg\5115 (HEAVY TRAFFIC SANITARY SEWER MANHOLE FRAME & COVER).dwg, 12/9/2015 9:25:14 PM



1" DIA. BOLT HOLES 3 REQUIRED ONLY WHEN FRAME IS ANCHORED TO MANHOLE. SEE DETAIL

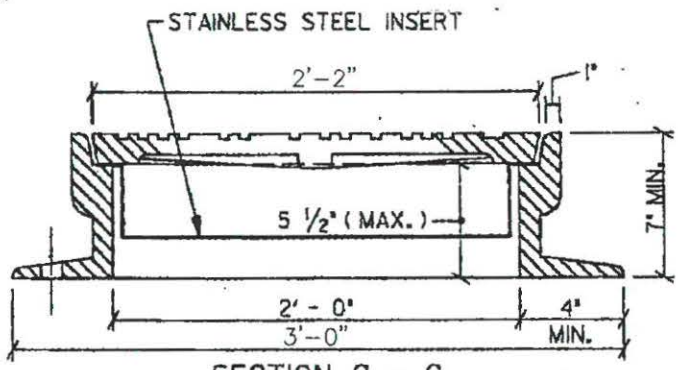


PICK HOLE CROSS SECTION

PLAN

NOTE:

1. MINIMUM FRAME AND COVER TOTAL WEIGHT 400 LBS. (MINIMUM).
2. PROVIDE STAINLESS STEEL INSERT ON ALL MANHOLES THAT ARE NOT BOLTED WATER-PROOF MANHOLES.



SECTION C - C

NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



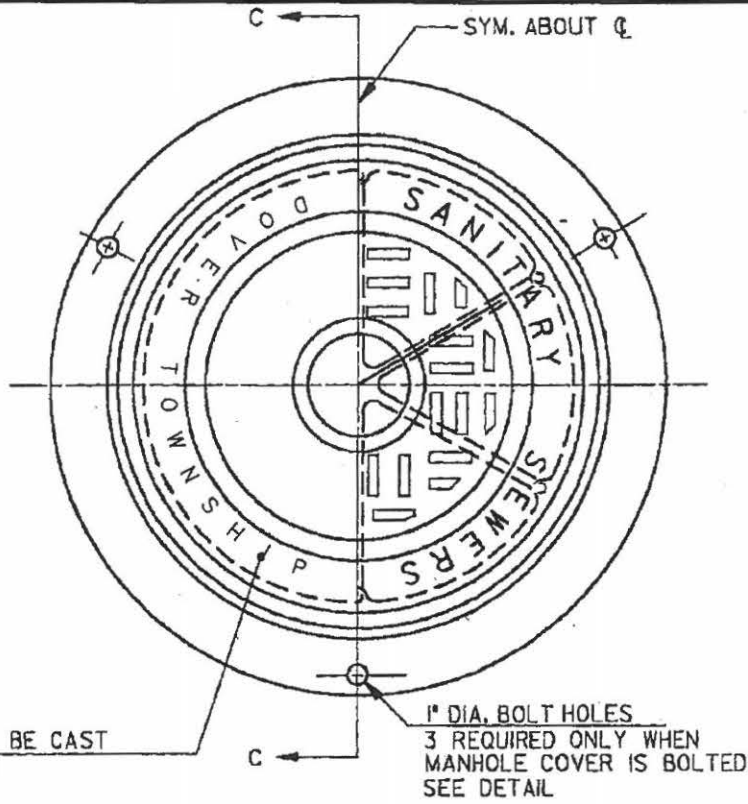
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HEAVY TRAFFIC
 SANITARY SEWER
 MANHOLE FRAME &
 COVER

DATE:	1/26/2005
DRAWN BY:	ARB
CHK. BY:	
NO.	5115

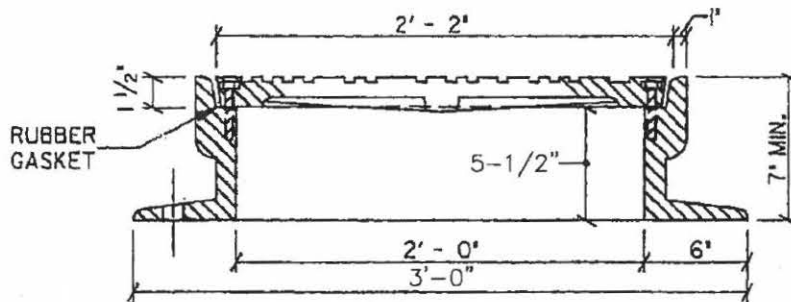
K:\161990400\dwg\5116 (BOLTED WATERPROOF MANHOLE FRAME & COVER TYPE 1).dwg, 12/9/2015 9:26:24 PM



OWNERS NAME TO BE CAST
IN COVER AS PER
SPECIFICATIONS

1" DIA. BOLT HOLES
3 REQUIRED ONLY WHEN
MANHOLE COVER IS BOLTED
SEE DETAIL

PLAN



SECTION C - C

NOTES:

1. FURNISH LID WITH CONCEALED PICK - HOLE.
2. WATERPROOF FRAME, SHALL BE FURNISHED COMPLETE WITH RUBBER GASKET.
3. HEX HEAD BOLTS WILL BE BRONZE, COUNTERSUNK.
4. MINIMUM FRAME AND COVER TOTAL WEIGHT 400 LBS.
5. RUBBER GASKET

NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



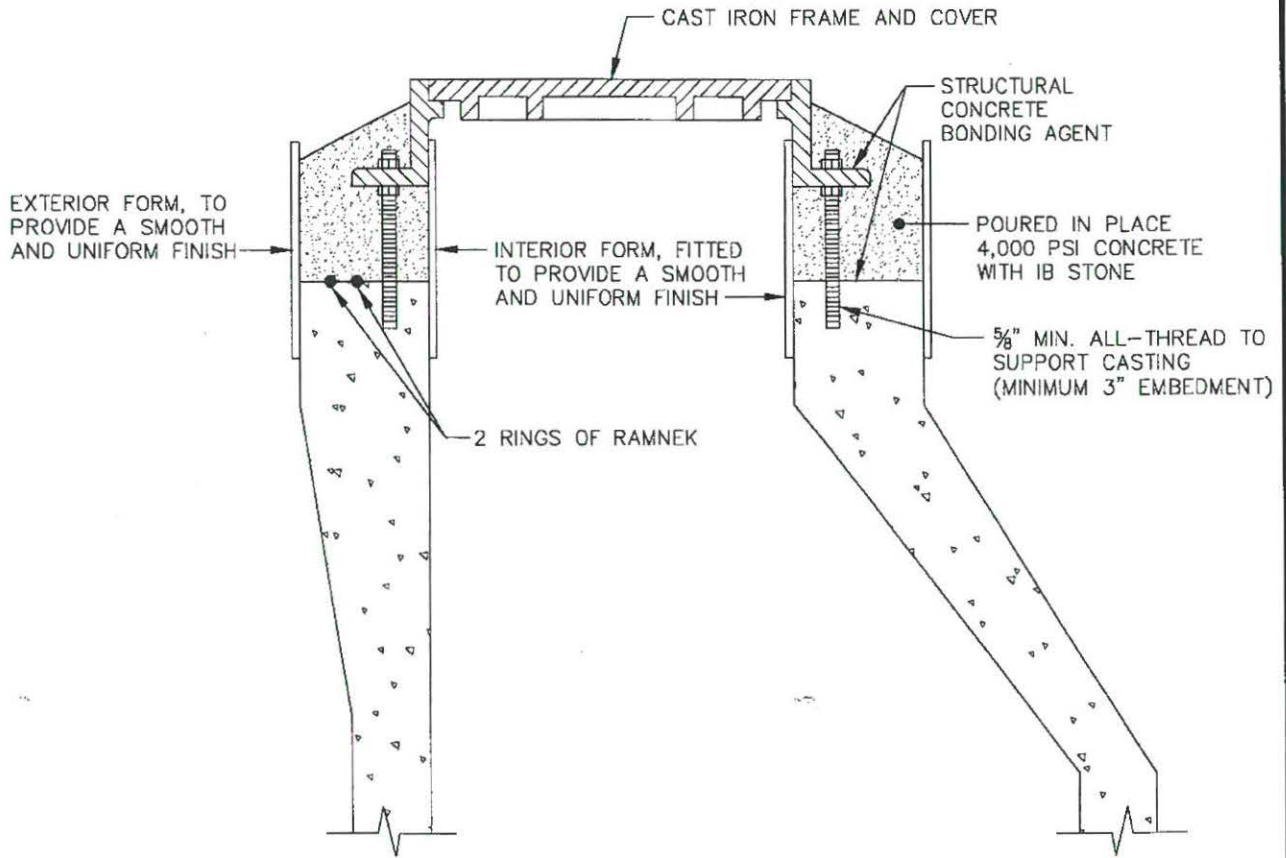
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BOLTED WATERPROOF
MANHOLE FRAME &
COVER TYPE 1

DATE:	1/26/2005
DRAWN BY:	ARB
CHK. BY:	
NO.	5116

K:\161990400\dwg\5117 (POURED IN PLACE CONCRETE ADJUSTMENT).dwg, 12/9/2015 9:27:37 PM



NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



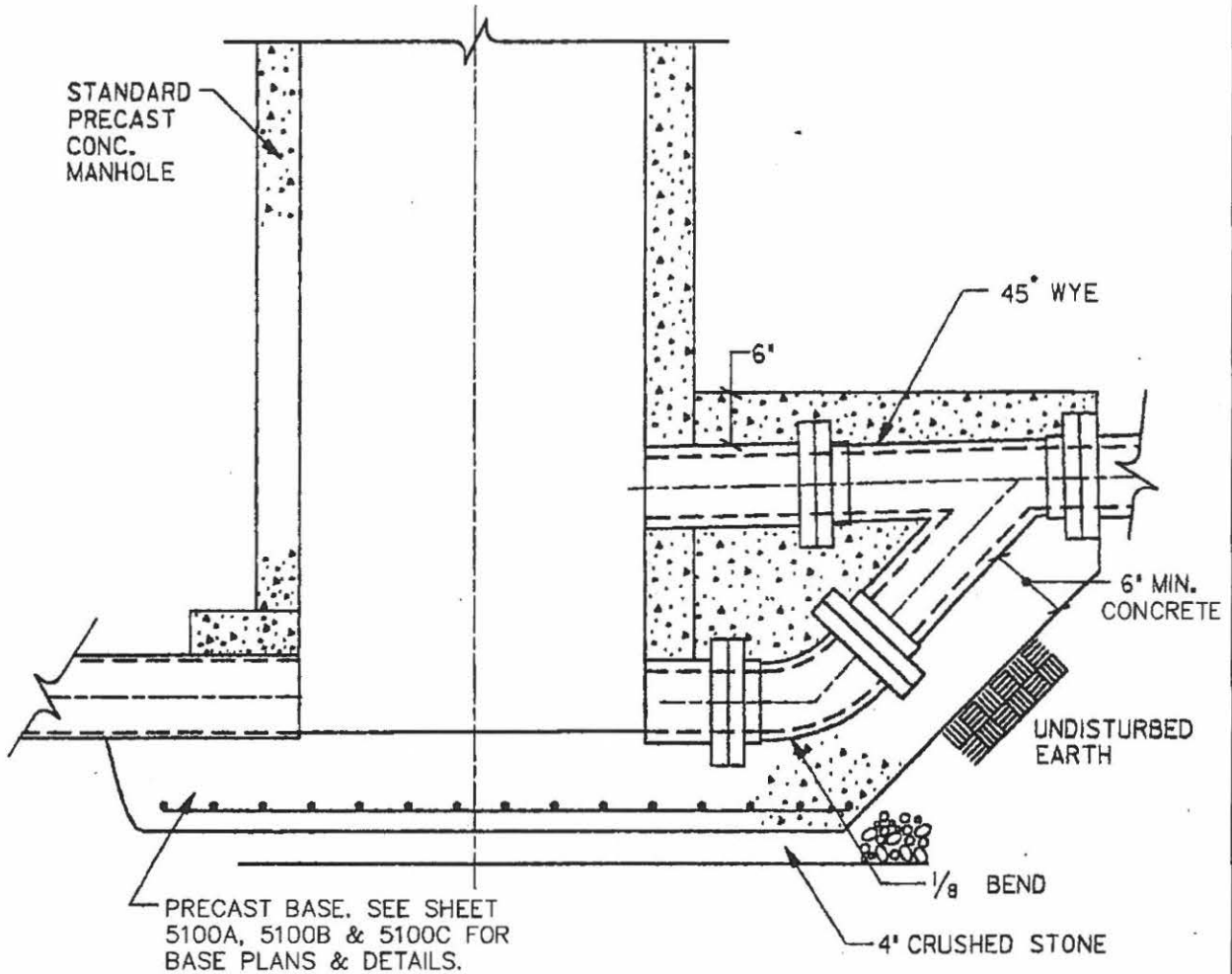
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POURED IN PLACE
 CONCRETE ADJUSTMENT
 DETAIL

DATE:	8/20/2015
DRAWN BY:	BAM
CHK. BY:	
NO.	5117

K:\161990400\dwg\51119C (DIP MECHANICAL JOINT TYPE A DROP MANHOLE DETAIL).dwg, 12/9/2015 9:39:03 PM



PRECAST BASE. SEE SHEET 5100A, 5100B & 5100C FOR BASE PLANS & DETAILS.

ELEVATION

TYPE A DROP MANHOLE DETAILS

<u>SIZE OF SEWER</u>	<u>MIN. DROP</u>	<u>MAX. DROP</u>
8"	1' - 10"	4' - 2"
10"	2' - 1"	4' - 8"
12"	2' - 5"	5' - 2"
14"	2' - 6"	5' - 7"
16"	2' - 9"	6' - 0"

NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



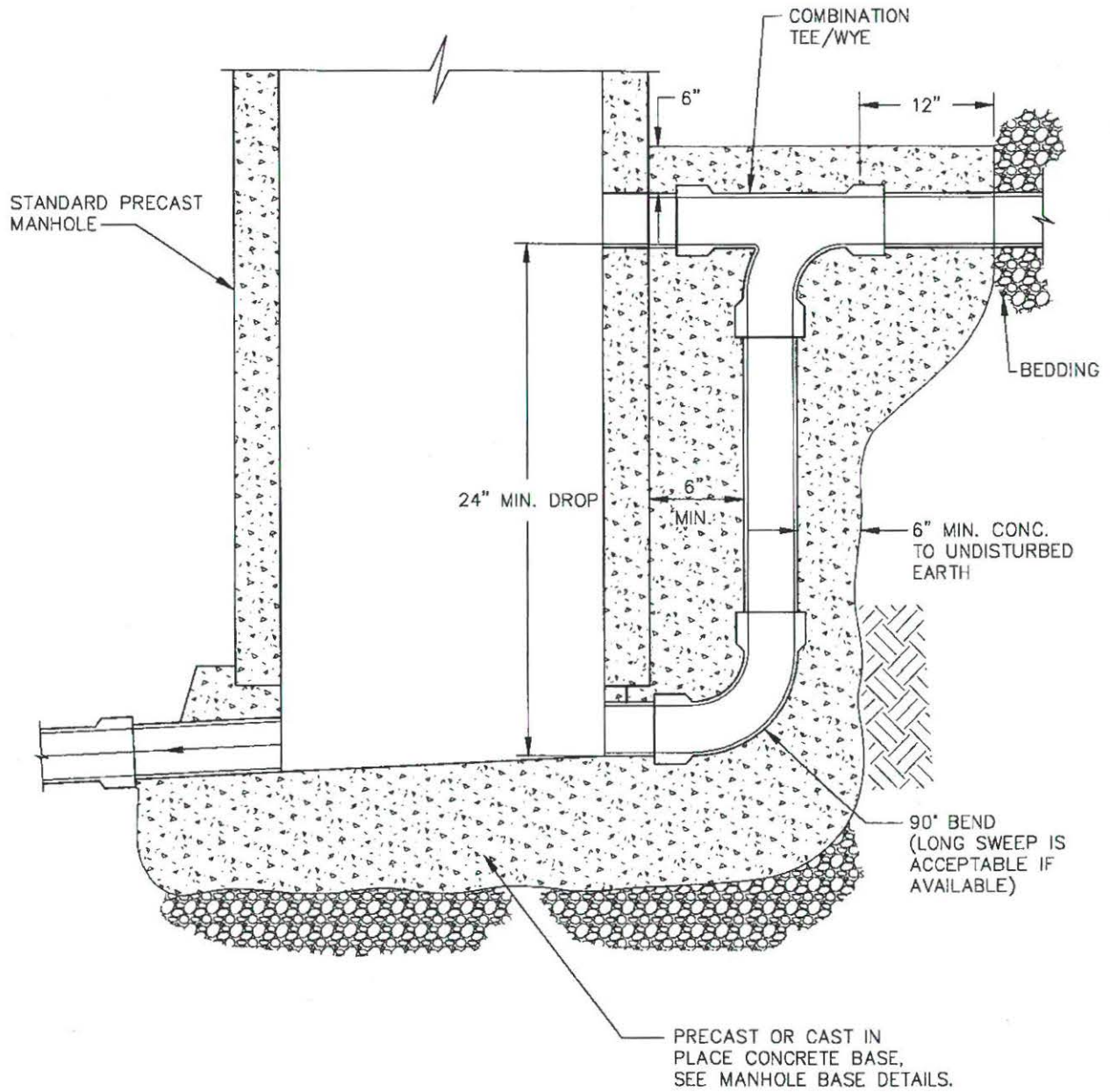
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**D.I.P. MECHANICAL
 JOINT TYPE A DROP
 MANHOLE DETAIL**

DATE:	1/26/2005
DRAWN BY:	ARB
CHK. BY:	
NO.	5119C

K:\161990400\dwg\5120A (DROP CONNECTION DETAIL).dwg, 12/9/2015 9:40:20 PM



NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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DROP CONNECTION DETAIL

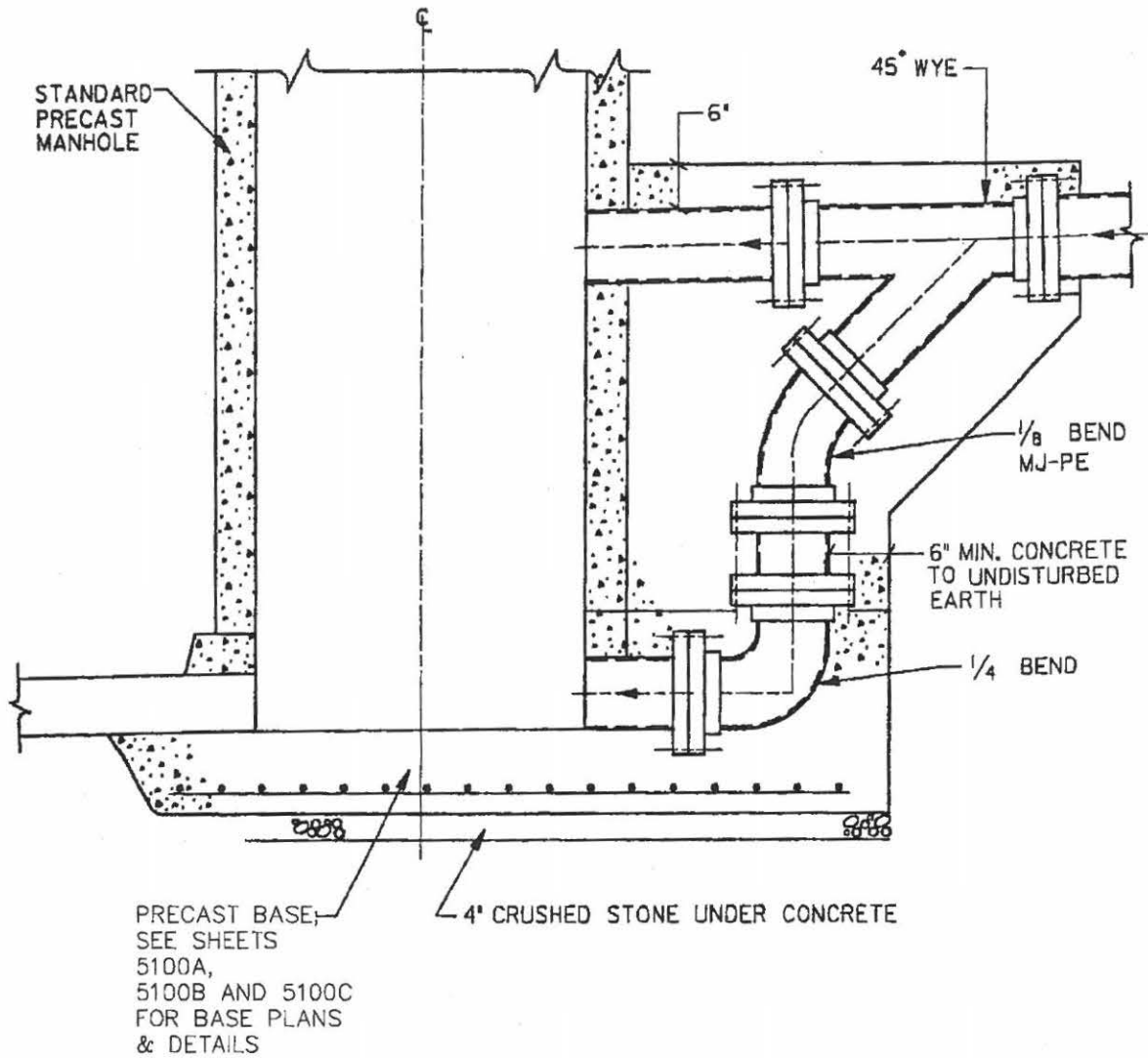
DATE: 6/9/2004

DRAWN BY: ARB

CHK. BY:

NO. 5120A

K:\161990400\dwg\5120C (DIP MECHANICAL JOINT TYPE B DROP MANHOLE DETAIL).dwg, 12/9/2015 9:41:33 PM



PRECAST BASE,
SEE SHEETS
5100A,
5100B AND 5100C
FOR BASE PLANS
& DETAILS

4\"/>

ELEVATION
TYPE B DROP MANHOLE DETAIL

<u>SIZE OF SEWER</u>	<u>MIN. DROP</u>
8"	4' - 2"
10"	4' - 8"
12"	5' - 2"
14"	5' - 7"
16"	6' - 0"

NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

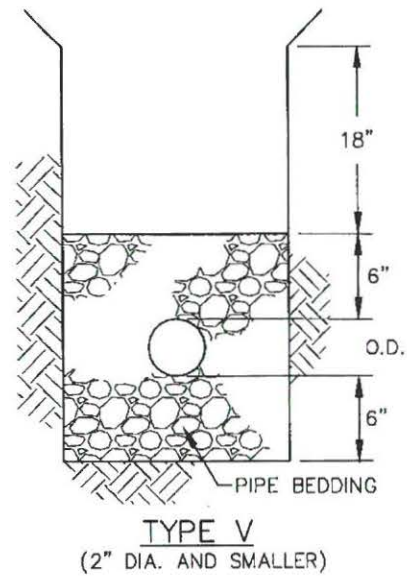
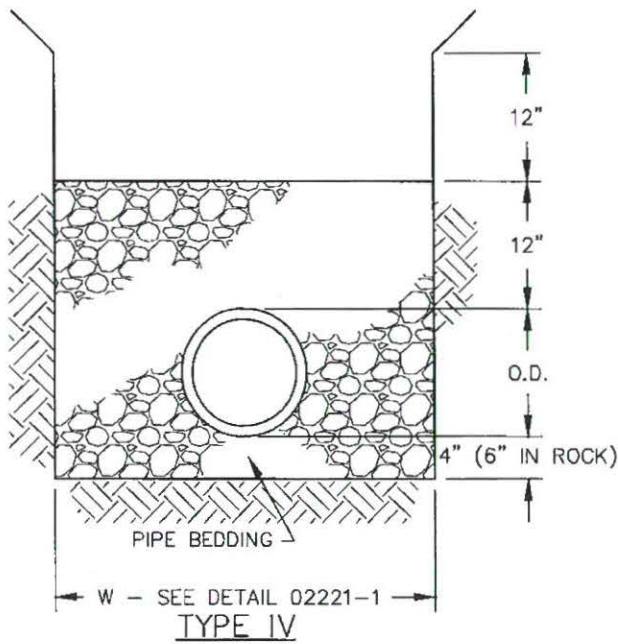
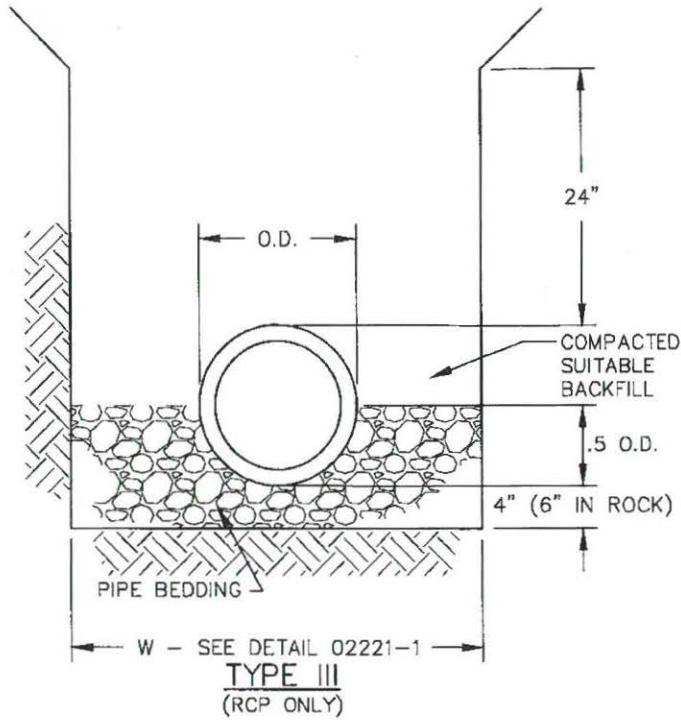


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**D.I.P. MECHANICAL
JOINT TYPE B
DROP MANHOLE
DETAIL**

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5120C

K:\161990400\dwg\5177 (PIPE BEDDING DETAILS).dwg, 12/9/2015 9:43:00 PM



NOTE: TYPE I AND II NOT PERMITTED.

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



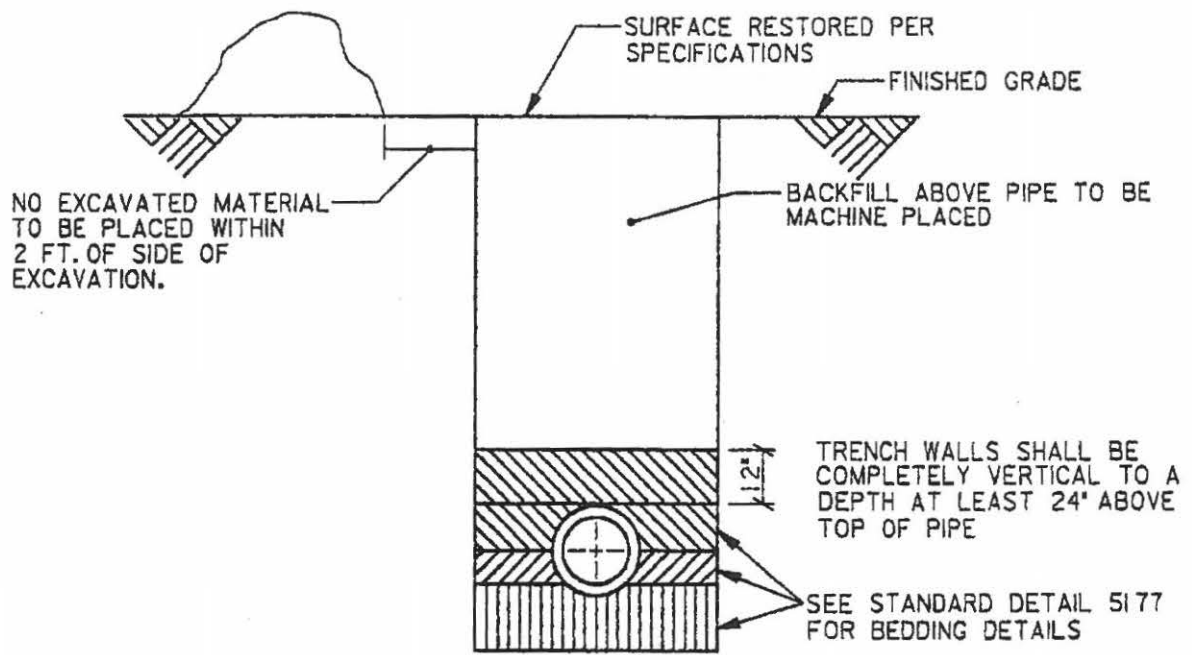
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PIPE BEDDING DETAILS

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5177

K:\161990400\dwg\5178A (PIPE TRENCH DETAIL).dwg, 12/9/2015 9:45:03 PM



NO EXCAVATED MATERIAL TO BE PLACED WITHIN 2 FT. OF SIDE OF EXCAVATION.

SECTION

NOTES: SHORING REQUIRED FOR ALL TRENCHES IN ACCORDANCE WITH APPLICATION REGULATIONS LAWS & SAFETY CODES.

BACKFILL AROUND PIPE; CLEAN DRY EARTH, CLAY, FINE GRAVEL OR SAND, FREE OF ORGANIC MATERIALS, STONE LARGER THAN 2", FROZEN OR WET MATERIAL.

PLACE BACKFILL AROUND PIPE BY HAND AND COMPACT IN 6" LAYERS. SEE BACKFILL CHART FOR COMPACTION REQUIREMENTS.

TRENCH WALLS SHALL BE COMPLETELY VERTICAL TO A DEPTH AT LEAST 24" ABOVE TOP OF PIPE
SEE STANDARD DETAIL 5177 FOR BEDDING DETAILS

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



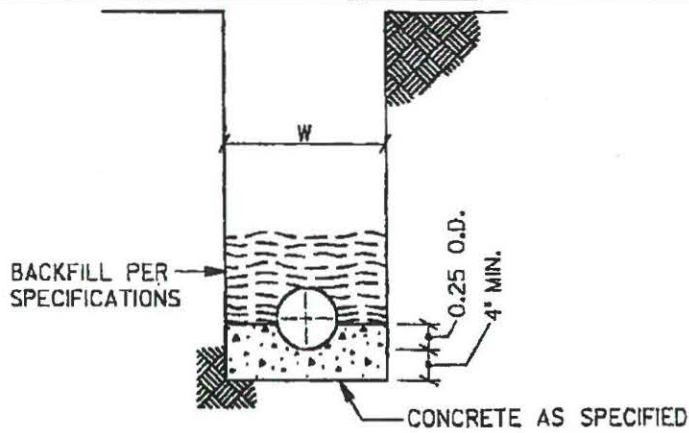
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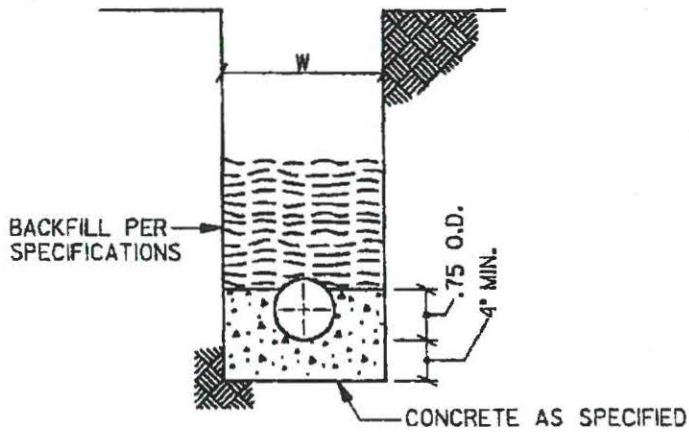
PIPE TRENCH DETAIL

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5178A

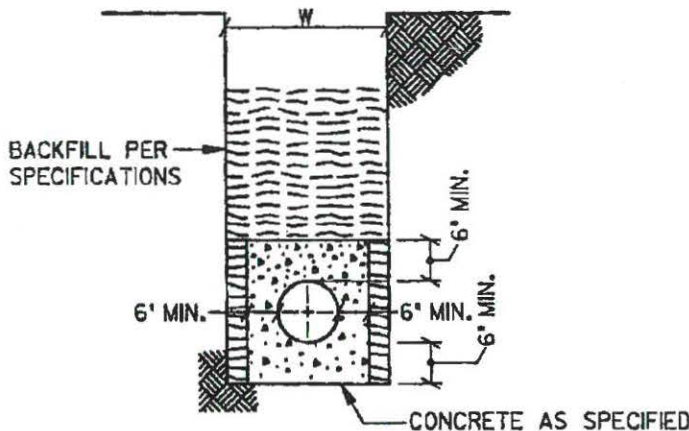
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LOW CONCRETE CRADLE



HIGH CONCRETE CRADLE



CONCRETE ENCASEMENT TYPE I

NOT TO SCALE

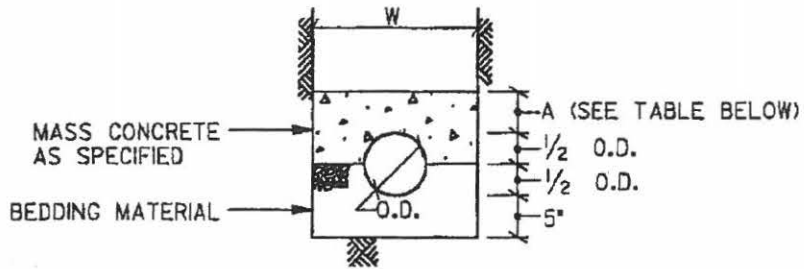
DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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CONCRETE CRADLE AND ENCASEMENT DETAILS

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5179



SECTION

NOTE:

1. CONCRETE & BEDDING MATERIAL SHALL EXTEND UNDISTURBED TRENCH SIDES.

W (FT.)	A (FT.)	W (FT.)	A (FT.)	W (FT.)	A (FT.)	W (FT.)	A (FT.)
1.9	.4	3.4	.5	5.1	.8	8.0	1.4
2.0	.4	3.5	.5	5.2	.8	8.1	1.4
2.1	.4	3.6	.5	5.3	.8	8.5	1.5
2.2	.4	3.7	.5	5.4	.8	8.6	1.6
2.4	.4	3.8	.6	5.6	.9	9.1	1.7
2.5	.4	4.0	.6	5.7	.9	9.6	1.8
2.6	.4	4.4	.6	6.2	.9		
2.8	.4	4.6	.6	6.7	1.0		
2.9	.4	4.7	.7	7.3	1.2		
3.1	.4	4.8	.7	7.4	1.3		
3.2	.4	4.9	.7	7.6	1.3		
3.3	.4	5.0	.7	7.9	1.3		

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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ENCASEMENT TYPE 2
 DETAILS

DATE: 6/16/2004

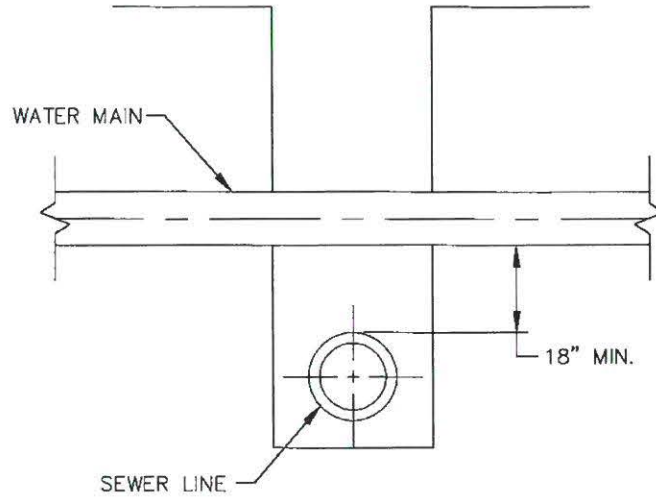
DRAWN BY: ARB

CHK. BY:

NO. 5179A

K:\161990400\dwg\5179A (ENCASEMENT TYPE2 DETAILS).dwg, 12/9/2015 9:47:56 PM

K:\161990400\dwg\5180 (VERTICAL WATER MAIN CLEARANCE).dwg. 12/9/2015 9:48:57 PM



NOTES:

1. IF JOINT ON WATER MAIN IS WITHIN LIMITS OF SEWER TRENCH, INSTALL MECHANICAL BELL JOINT CLAMP.
2. IF CLEARANCE IS LESS THAN 18", ENCASE SEWER PIPE 6 FEET ON EACH SIDE OF WATER MAIN.
3. IN NO CASE SHALL THE SEWER PIPE CONTACT ANY WATER MAIN, SERVICE LINE OR APPURTENANCE.

NOT TO SCALE

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**VERTICAL WATER
MAIN CLEARANCE**

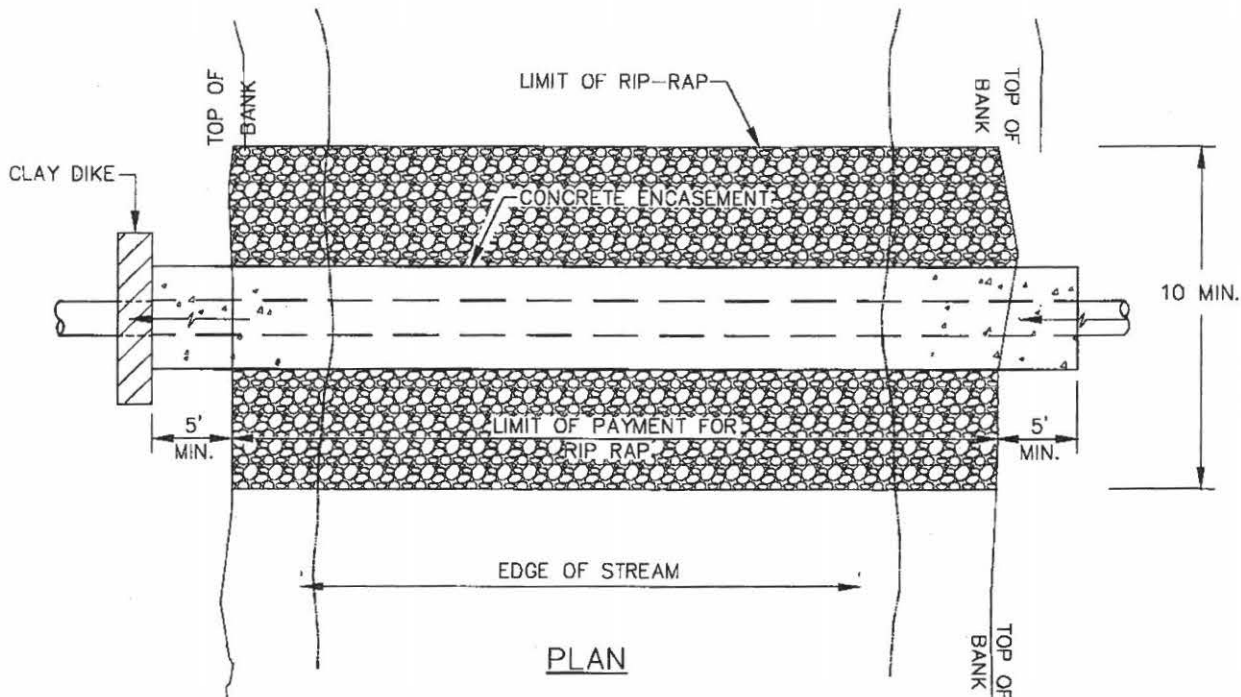
DATE: 6/16/2004

DRAWN BY: ARB

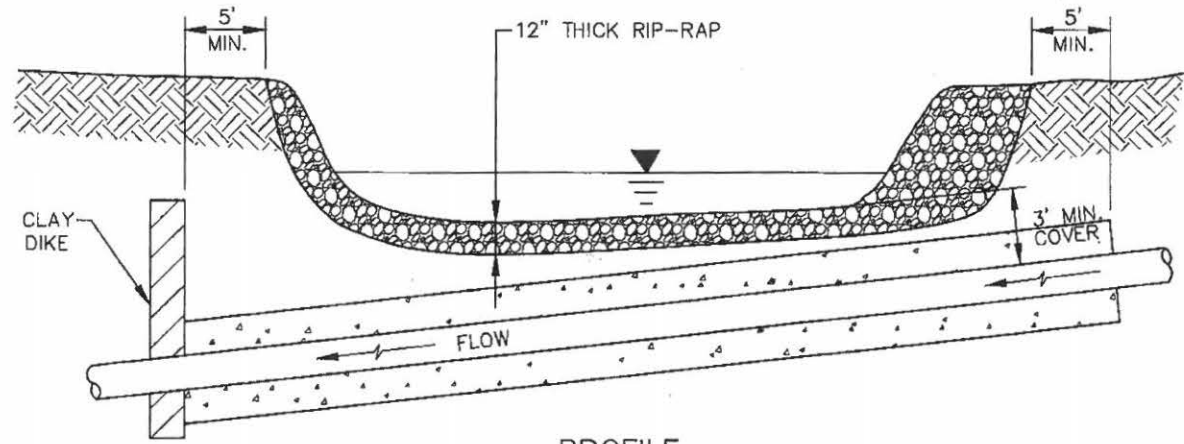
CHK. BY:

NO. 5180

K:\161990400\dwg\5180A (STREAM CROSSING DETAIL).dwg, 12/9/2015 9:50:11 PM



PLAN



PROFILE

NOTES:

1. STREAM CROSSING BID ITEM INCLUDES EXCAVATION, BACKFILL, AND OTHER WORK INCIDENTAL TO STREAM CROSSING CONSTRUCTION.
2. PIPE, RIP-RAP, CONCRETE ENCASEMENT, AND CLAY DIKE WILL BE PAID UNDER THEIR RESPECTIVE BID ITEMS.
3. WATER MAIN CROSSINGS WILL HAVE GATE VALVES INSTALLED ON EITHER SIDE OF STREAM. FIVE FEET FROM ENCASEMENT

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



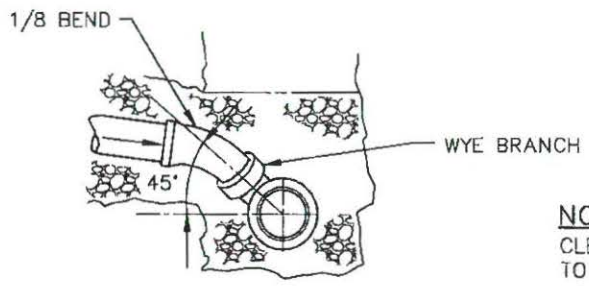
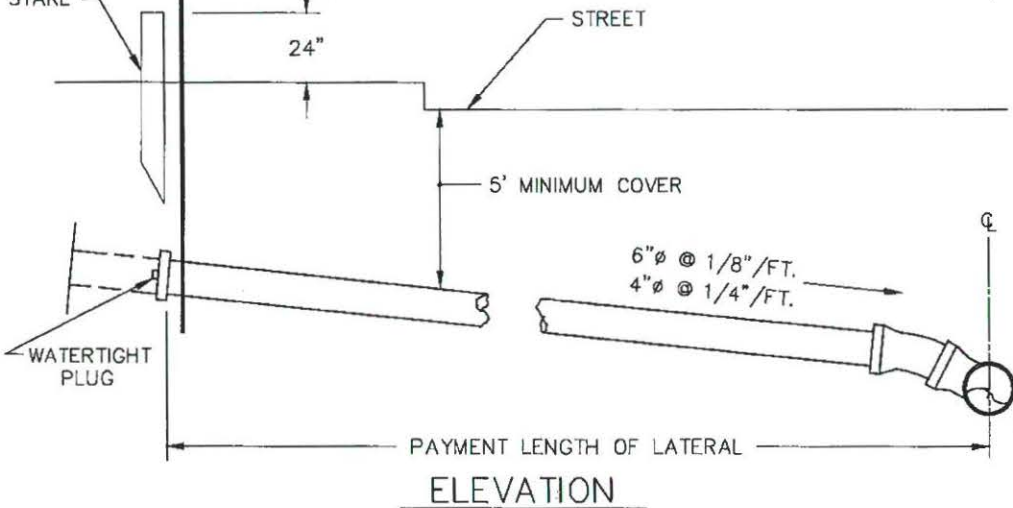
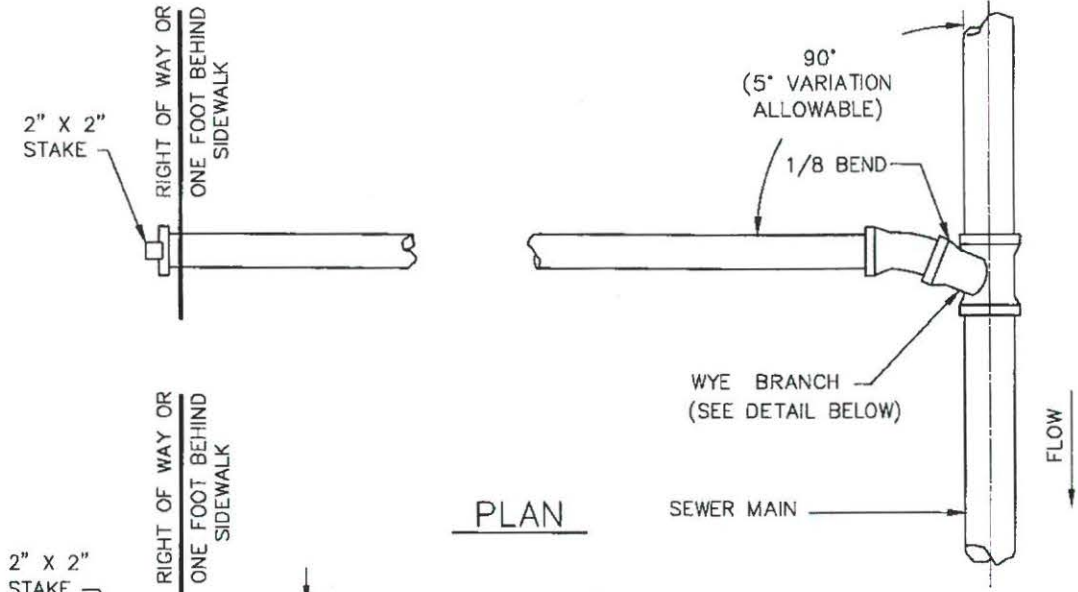
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**STREAM CROSSING
DETAIL**

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5180A

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NOTE:
CLEANOUT REQUIRED AT CONNECTION
TO LATERAL BY PLUMBER.

DETAIL

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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LATERAL DETAIL

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5187

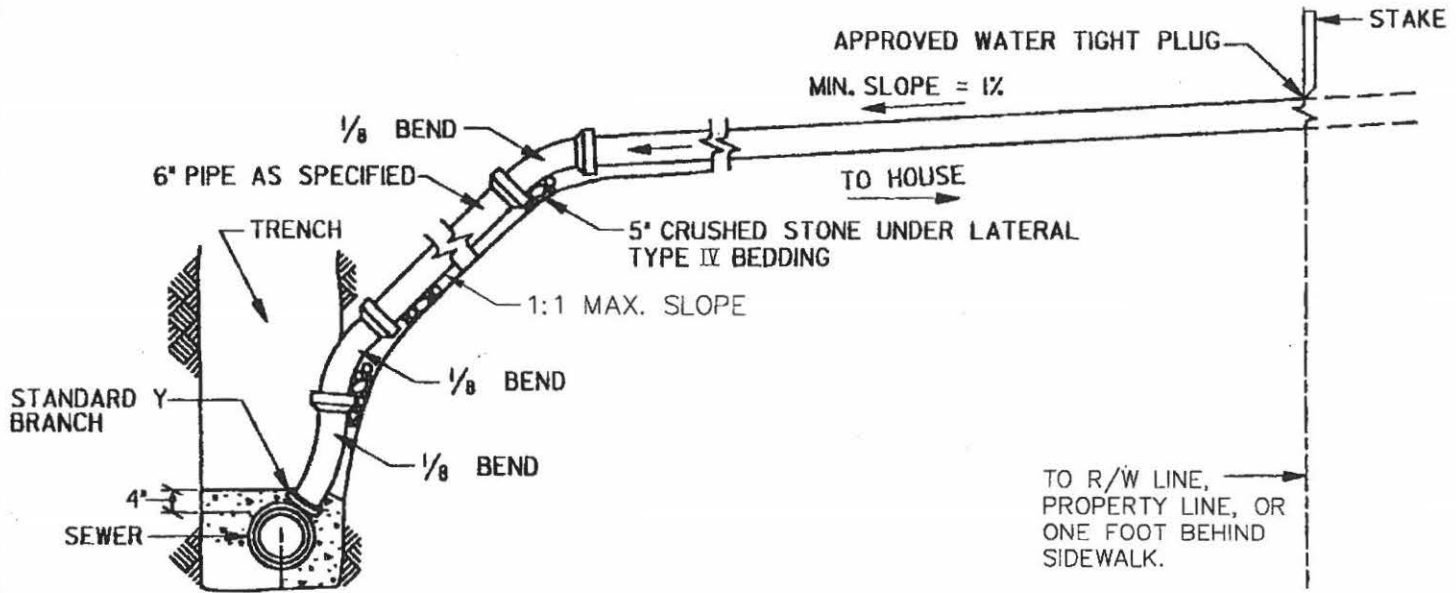


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DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

SLOPED RISER
 LATERAL DETAIL

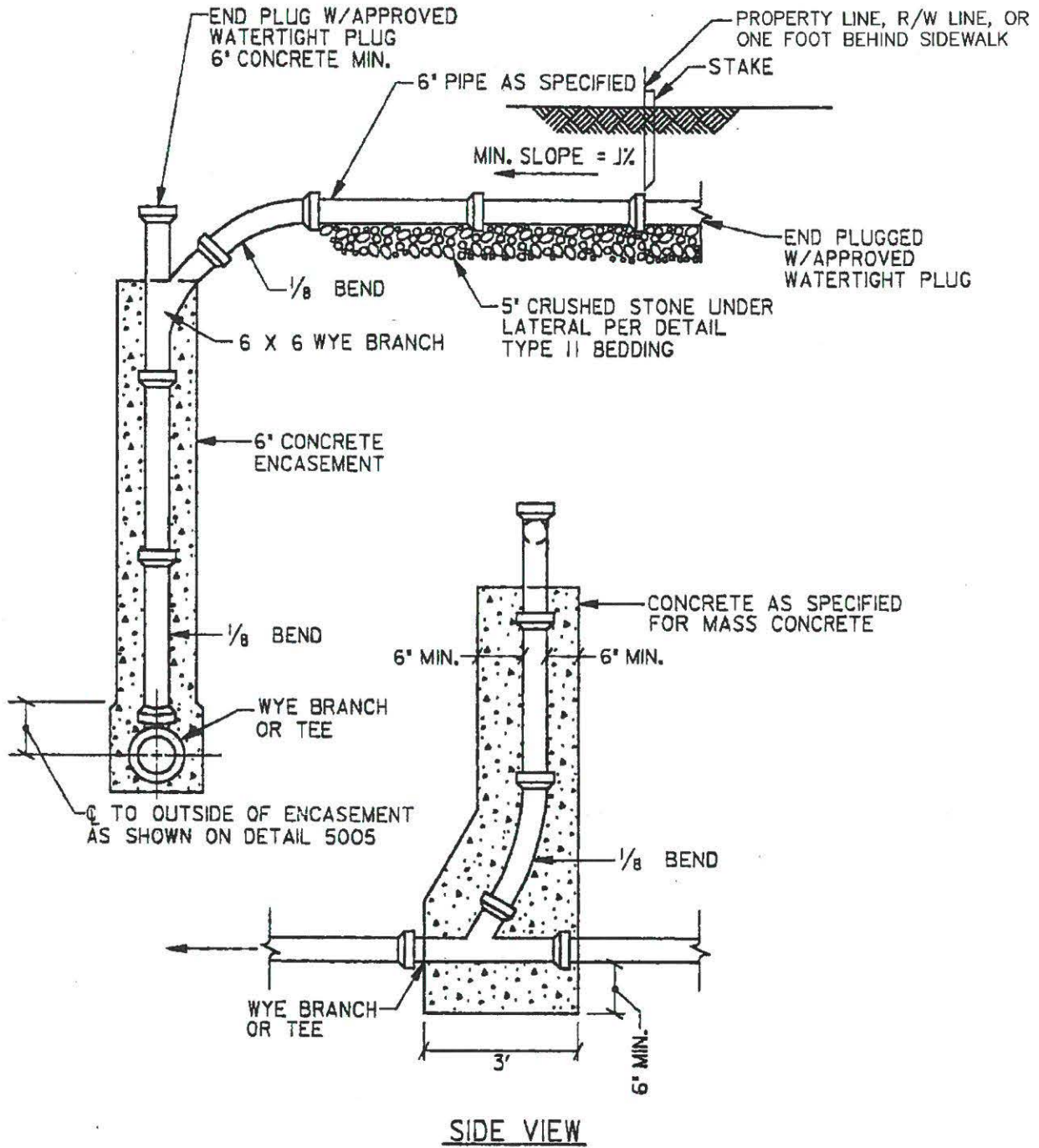


NOTE: NOT TO SCALE

NOTE: END OF LATERAL TO HAVE APPROVED WATER TIGHT PLUG.
 USE 2A STONE BACKFILL

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5187A

K:\161990400\dwg\5187B (VERTICAL RISER LATERAL DETAIL).dwg, 12/9/2015 9:53:38 PM



NOT TO SCALE

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VERTICAL RISER LATERAL DETAIL

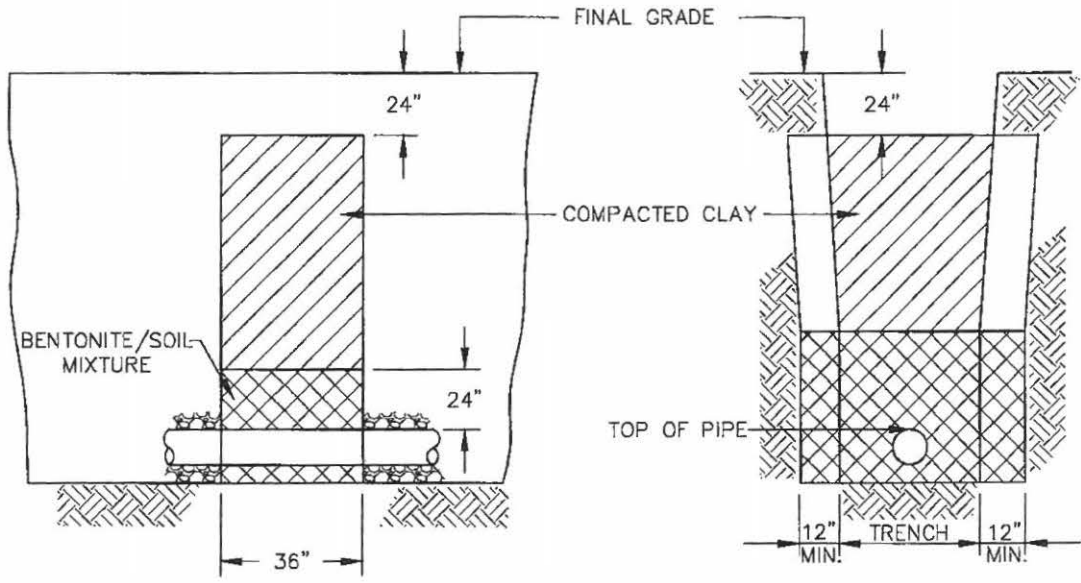
DATE: 6/16/2004

DRAWN BY: ARB

CHK. BY:

NO. 5187B

K:\161990400\dwg\5190 (CLAY DIKE DETAIL).dwg. 12/9/2015 9:55:08 PM



NOTES:

1. COMPACTED CLAY DIKES SHALL EXTEND VERTICALLY FROM UNDISTURBED GROUND AT BOTTOM OF TRENCH TO WITHIN 24" OF FINAL GRADE, AND FROM UNDISTURBED GROUND ON TRENCH SIDES FOR WIDTH OF TRENCH AND 12" BEYOND EACH SIDE OF TRENCH.
2. CLAY BACKFILL TO A POINT 24" OVER THE PIPE SHALL CONSIST OF A BENTONITE/SOIL MIXTURE AT A 5:1 MIX.
3. REMAINING BACKFILL SHALL CONSIST OF CLAY CONTAINING NO MORE THAN 15% (BY VOLUME) STONE NOT LARGER THAN TWO (2") INCHES IN DIAMETER. CLAY SHALL BE PLACED IN SIX (6") INCH LIFTS AND COMPACTED BY MECHANICAL TAMPER TO NOT LESS THAN 95% OF MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT.

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

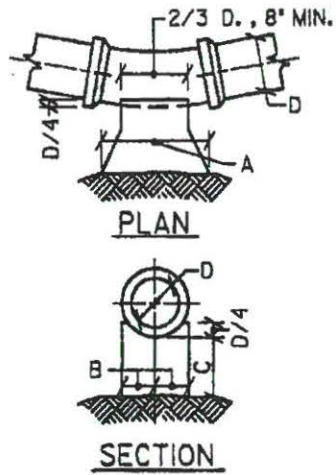


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CLAY DIKE DETAIL

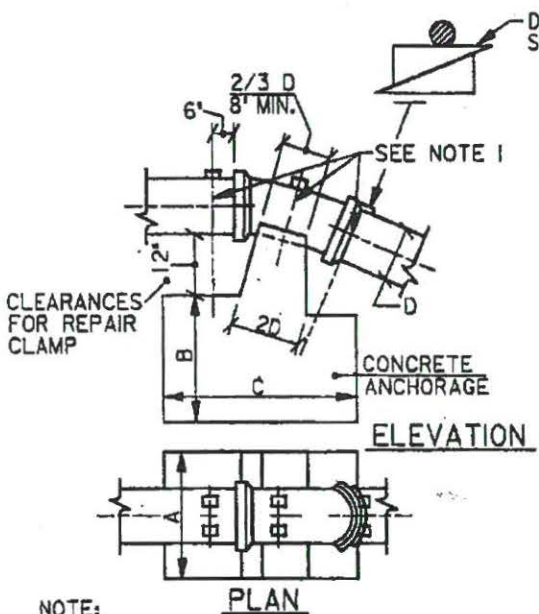
DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5190

K:\161990400\dwg\5195 (THRUST BLOCK FOR VERTICAL BENDS).dwg. 12/9/2015 9:56:26 PM



BUTTRESS FOR VERTICAL BENDS

BEND		BUTTRESS DIMENSIONS					
		SIZE					
		4"	6"	8"	10"	12"	16"
11 1/4°	A	4"	6"	8"	10"	1'-0"	1'-4"
	B	5"	7"	8"	9"	10"	1'-0"
1/2°	C	5"	7"	7"	8"	8"	9"
	A	6"	9"	1'-0"	1'-6"	1'-9"	2'-3"
22 1/2°	B	6"	7"	7"	8"	10"	1'-0"
	C	6"	7"	7"	8"	8"	9"
45°	A	10"	1'-3"	1'-8"	2'-1"	2'-6"	3'-4"
	B	7"	7"	8"	9"	11"	1'-3"
1/8°	C	7"	7"	8"	10"	11"	1'-3"



ANCHORAGE FOR VERTICAL BENDS

BEND		ANCHORAGE DIMENSIONS					
		SIZE					
		4"	6"	8"	10"	12"	16"
11 1/4°	A	1'-4"	1'-6"	1'-6"	2'-6"	3'-0"	4'-0"
	B	1'-0"	1'-6"	1'-9"	2'-0"	2'-6"	2'-6"
1/2°	C	2'-0"	2'-0"	2'-6"	3'-0"	3'-0"	4'-0"
	A	1'-8"	2'-0"	3'-4"	3'-8"	4'-0"	4'-4"
22 1/2°	B	1'-6"	1'-9"	2'-3"	2'-3"	2'-3"	2'-6"
	C	2'-0"	3'-0"	2'-8"	3'-10"	4'-0"	5'-9"
45°	A	2'-3"	2'-6"	3'-0"	4'-0"	4'-6"	5'-2"
	B	1'-9"	2'-6"	2'-9"	3'-0"	3'-6"	4'-0"
1/8°	C	2'-6"	3'-0"	4'-0"	4'-6"	4'-9"	6'-6"

NOTE:

1. USE 3 #6 REINFORCING BARS AS SHOWN. IMBED 30 DIAMETERS IN CONCRETE AND PAINT EXPOSED SURFACE WITH 2 COATS OF APPROVED BITUMINOUS PAINT.
2. ALL CONCRETE TO BE CLASS AS SPECIFIED FOR MASS CONCRETE.
3. ALL BUTTRESSES TO BE CARRIED TO UNDISTURBED EARTH.
4. BUTTRESS DIMENSIONS SHOWN ARE MINIMUM. DIMENSIONS ARE BASED UPON SOIL BEARING PRESSURE OF 3,000 P.S.F. AND STATIC WATER PRESSURE OF 150 P.S.I. WHERE PRESSURE EXCEEDS 150 P.S.I. OR WHERE SOIL BEARING PRESSURE IS LESS THAN 3,000 P.S.F. SPECIAL BUTTRESS DESIGN IS REQUIRED.
5. USE DIMENSIONS SHOWN UNDER 4" PIPE FOR ALL PIPES LESS THAN 4" Ø.

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

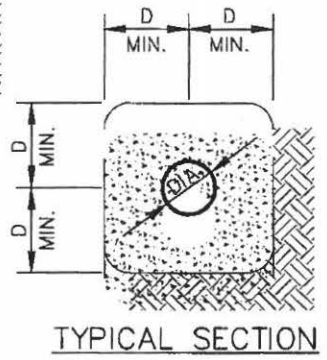
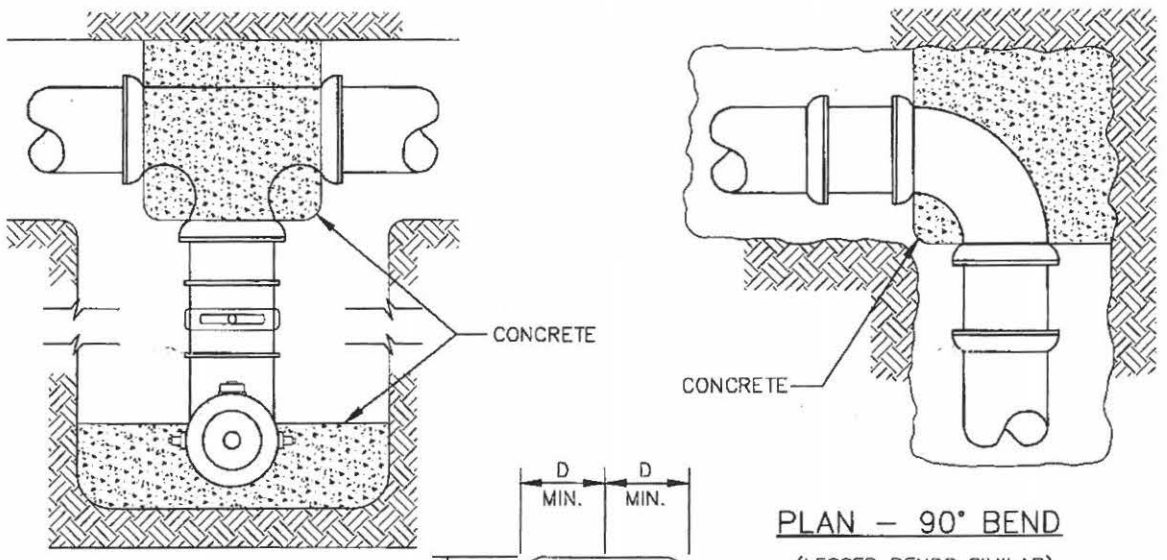
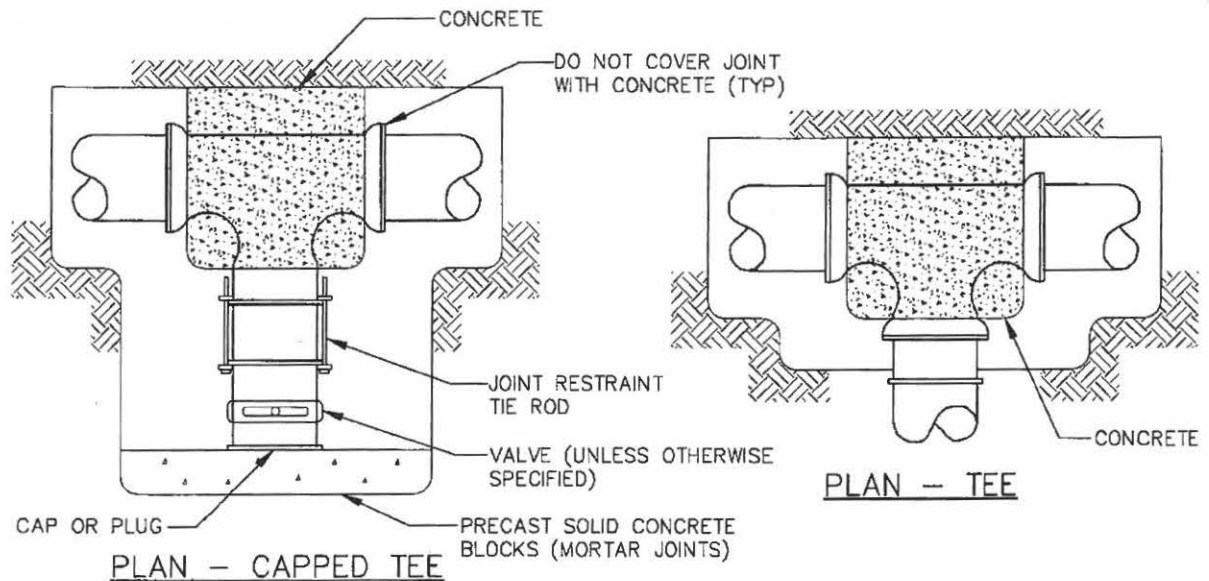


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THRUST BLOCK FOR VERTICAL BENDS

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5195

K:\161990400\dwg\5196 (THRUST BLOCKING DETAILS).dwg, 12/9/2015 9:57:31 PM



D= OUTSIDE DIAMETER OF PIPE

NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



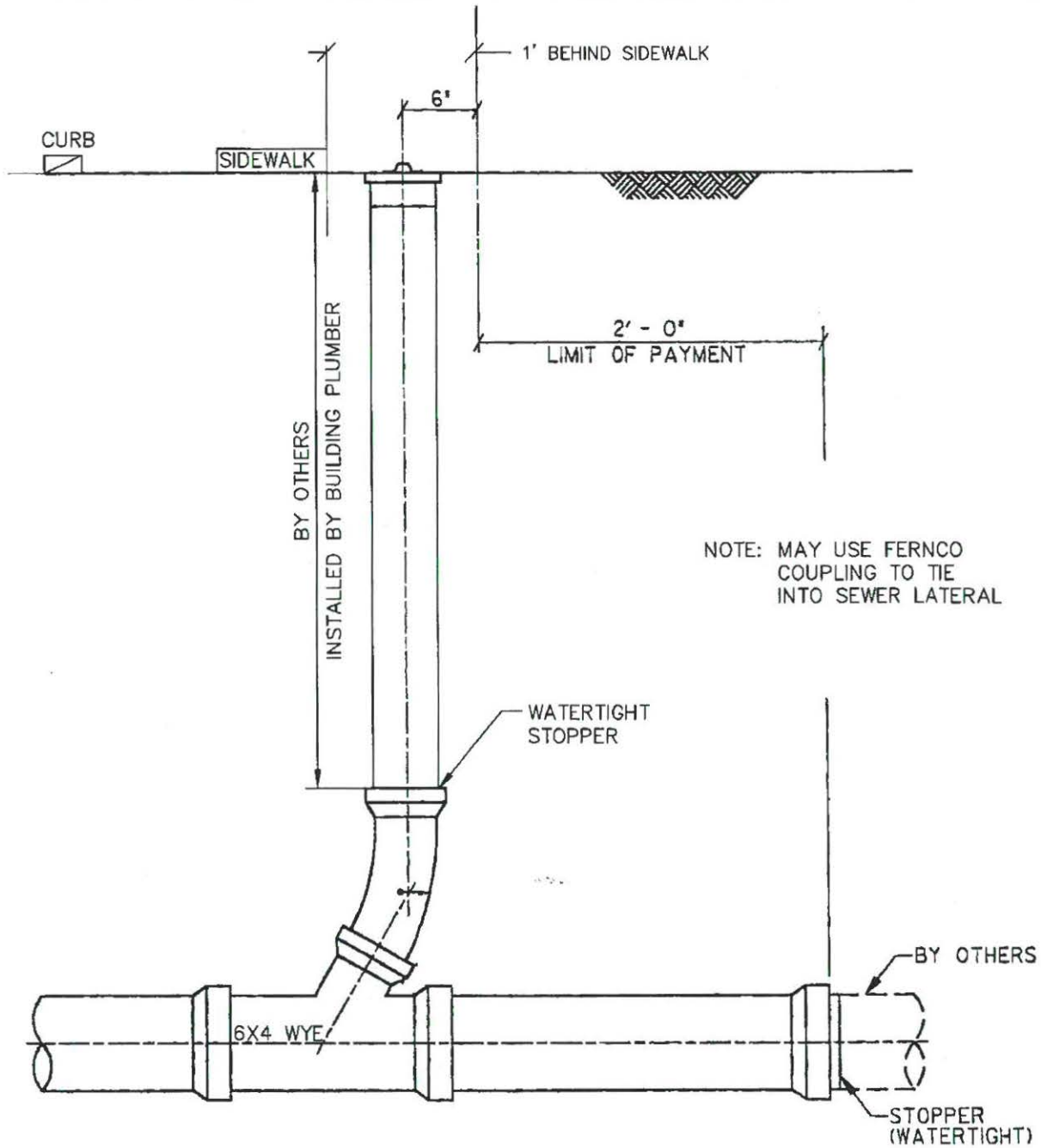
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**THRUST BLOCKING
DETAILS**

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5196

K:\161990400\dwg\5197 (HOUSE CONNECTION CLEANOUT).dwg, 12/9/2015 9:58:49 PM



NOTE: MAY USE FERNCO COUPLING TO TIE INTO SEWER LATERAL

ELEVATION

NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

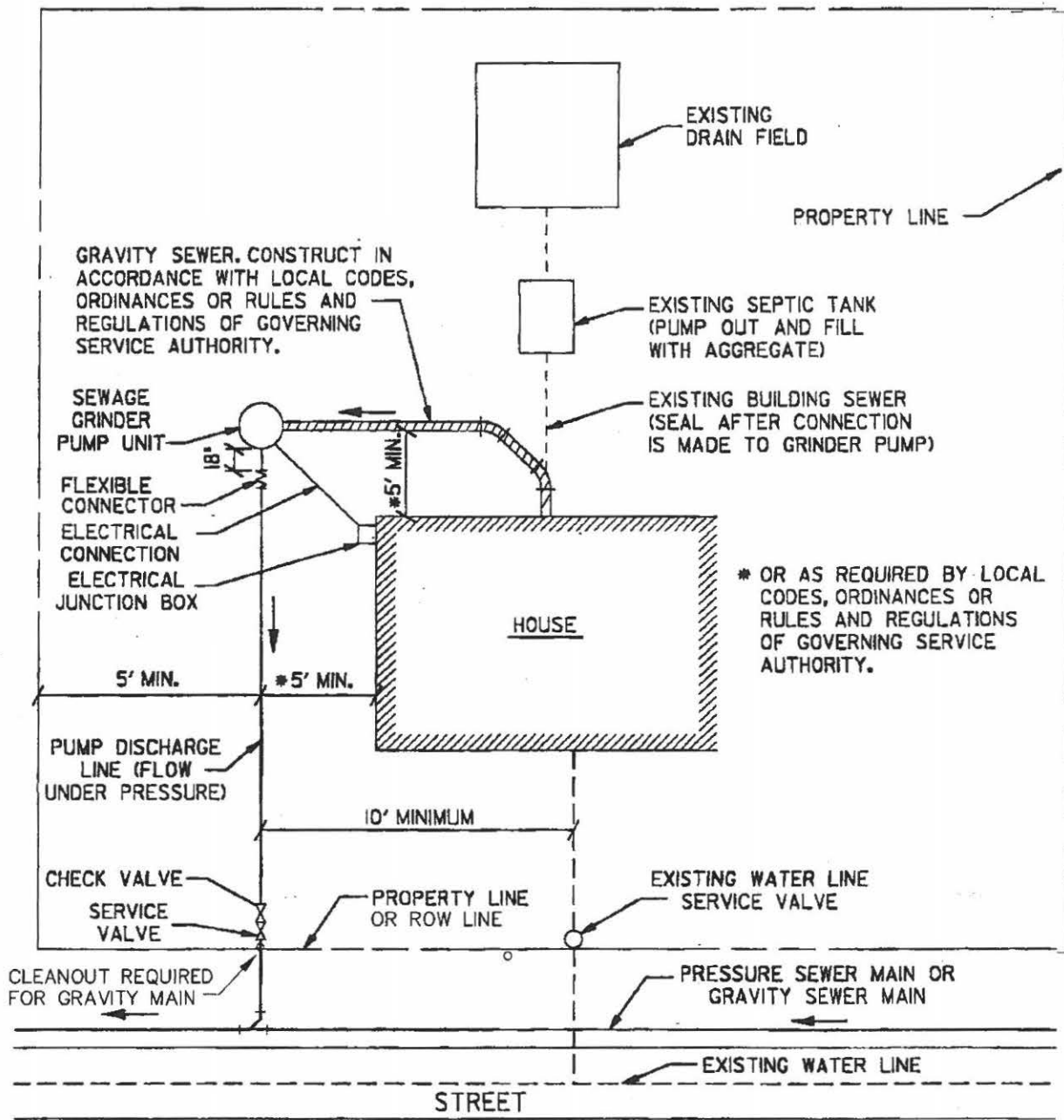


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HOUSE CONNECTION CLEANOUT

DATE:	1/26/2005
DRAWN BY:	ARB
CHK. BY:	
NO.	5197

K:\161990400\dwg\5220 (TYPICAL SERVICE SEWER SERVICE CONNECTION.dwg, 12/9/2015 10:00:06 PM



LEGEND:

- EXISTING WATER LINE
- EXISTING DRAIN LINE
- /// BUILDING SEWER
- SGP DISCHARGE LINE
- SGP SEWAGE GRINDER PUMP

NOTE:

DISCHARGE LINE CHECK VALVE NOT REQUIRED FOR CONNECTION TO GRAVITY SEWER MAIN. NEED CLEANOUT AT PROPERTY LINE. SEE 5226 FOR CLEANOUT DETAIL.

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



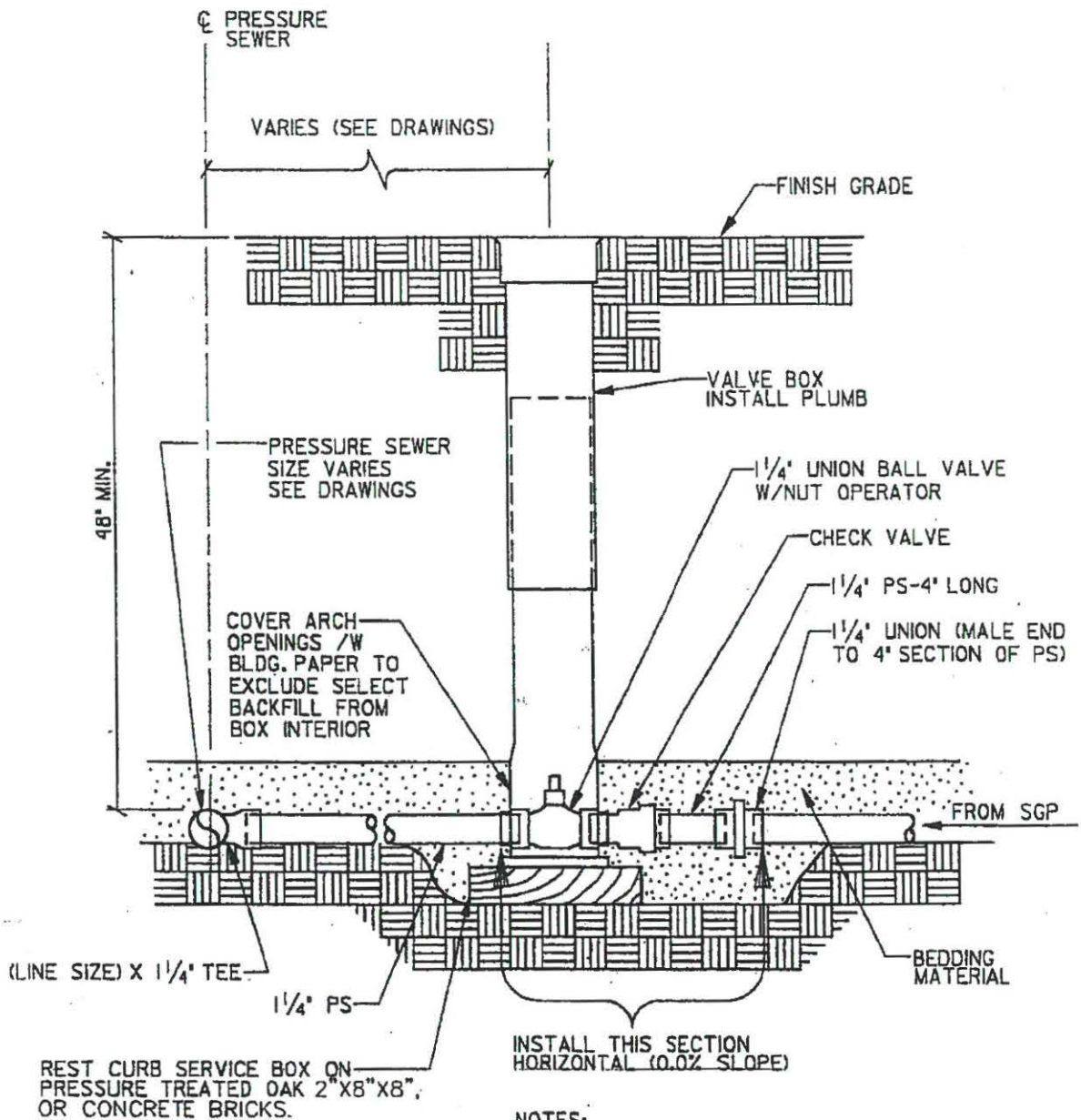
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TYPICAL PRESSURE SEWER SERVICE CONNECTION

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5220

K:\16\30\dwg\5223 (SERVICE VALVE ASSEMBLY FOR PRESSURE SEWER) STEM.dwg, 6/10/2004 11:21:23 AM, ARB, HP_5000.pc3



INSTALL THIS SECTION HORIZONTAL (0.02% SLOPE)

NOTES:

1. MAINTAIN 4 FT. MINIMUM COVER OVER PRESSURE SEWER.
2. OAK BOARDS OR CONCRETE BRICKS TO REST ON UNDISTURBED EARTH OR FIRM SUBGRADE.
3. ALL PVC CONNECTIONS SHALL BE SOLVENT WELD EXCEPT WHERE OTHERWISE NOTED.
4. SGP - SEWAGE GRINDER PUMP.

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



Excellence in Civil Engineering

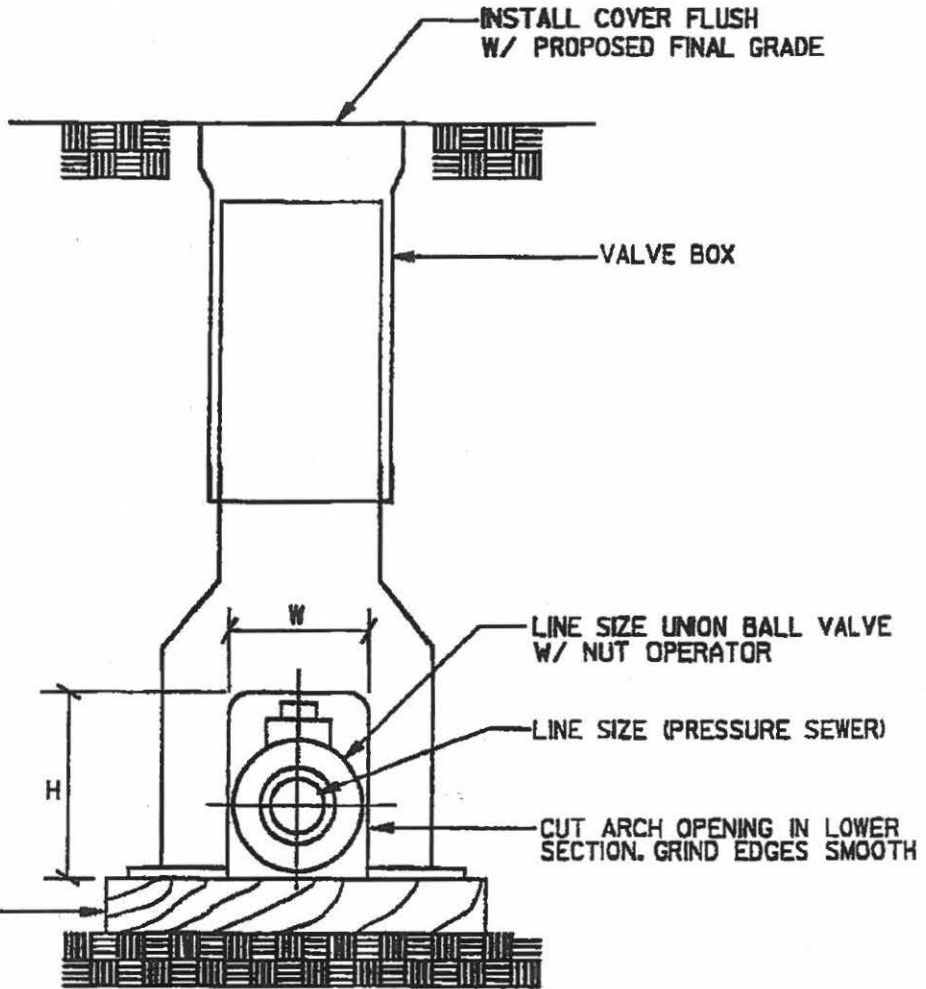
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SERVICE VALVE ASSEMBLY FOR PRESSURE SEWER SYSTEM

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5223

K:\161990400\dwg\5224 (VALVE BOX DETAIL FOR PRESSURE SEWER SYSTEM).dwg. 12/9/2015 10:01:30 PM

VALVE SIZE	H	W
1/4"	6"	4 1/2"
1/2"	6"	4 1/2"
2"	6"	4 1/2"
2 1/2"	6 1/2"	5 1/2"
3"	6 1/2"	6 1/2"



NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



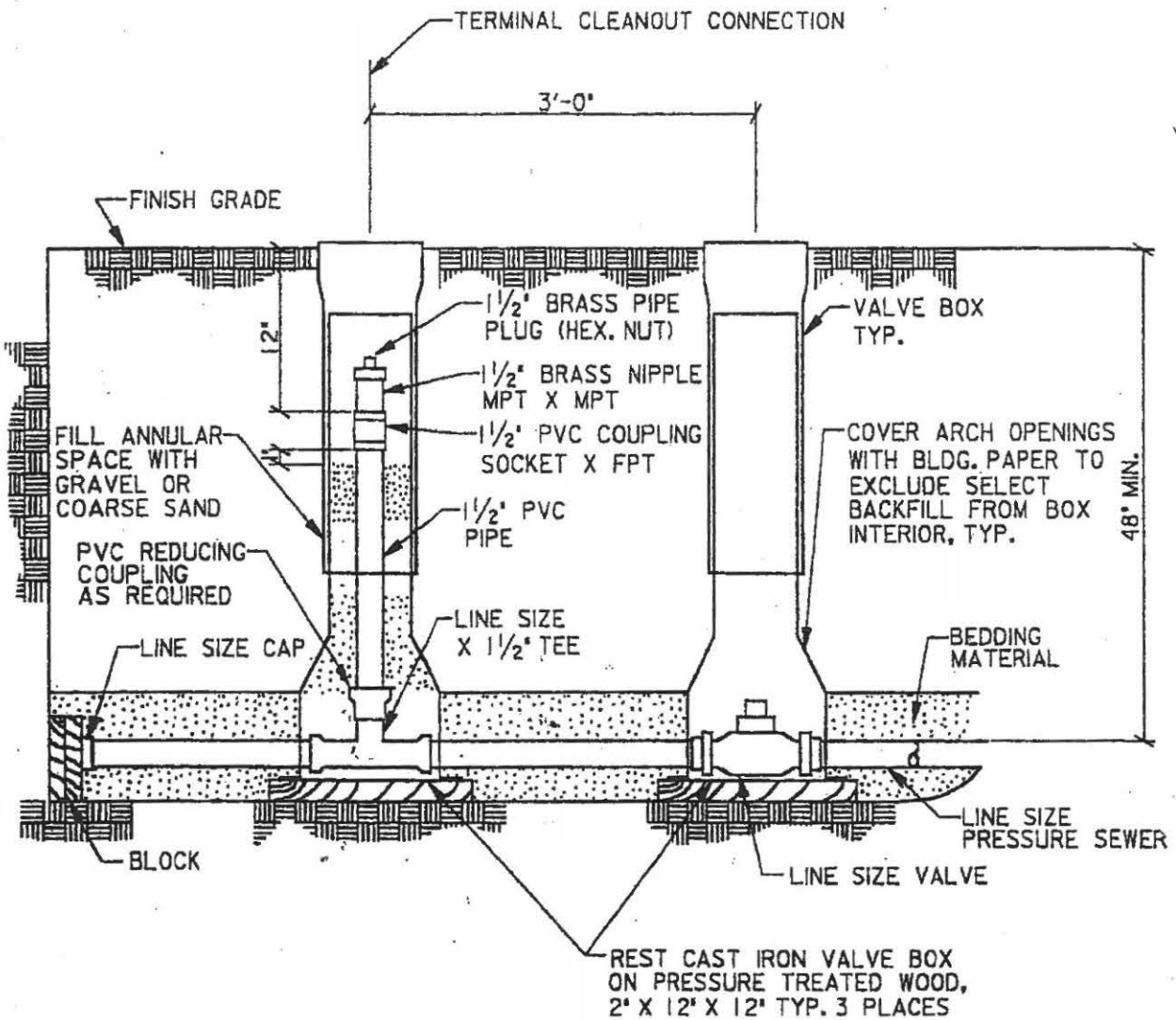
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VALVE BOX DETAIL FOR
PRESSURE SEWER
SYSTEM

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5224

K:\161990400\dwg\5226 (TERMINAL CLEANOUT CONNECTION FOR PRESSURE SEWER SYSTEM).dwg, 6/10/2004 11:24:03 AM, ARB, HP_5000.pc3



NOTES:

1. PRESSURE TREATED WOOD BOARDS OR CONCRETE BLOCK TO REST ON UNDISTURBED EARTH OR FIRM SUBGRADE
2. BLOCK FOR LINE SIZE CAP TO REST AGAINST UNDISTURBED EARTH.
3. ALL PVC CONNECTIONS SHALL BE SOLVENT WELD EXCEPT WHERE NOTED OTHERWISE, OR APPROVED BY TWP. ENGINEER.
4. ALL HDPE CONNECTIONS SHALL BE FUSION WELD EXCEPT WHERE NOTED OTHERWISE, OR APPROVED BY TWP. ENGINEER.

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



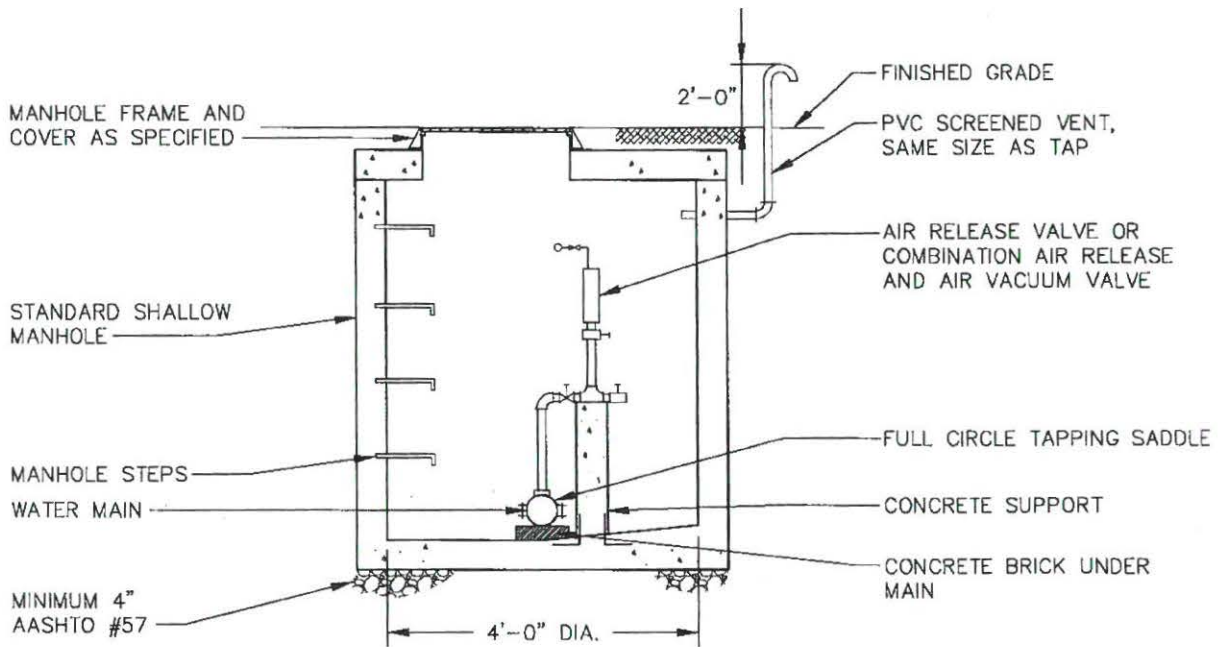
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**TERMINAL CLEANOUT
 CONNECTION FOR
 PRESSURE SEWER
 SYSTEM**

DATE:	6/9/200
DRAWN BY:	ARB
CHK. BY:	
NO.	5226

K:\161990400\dwg\5301 (AIR RELEASE VALVE).dwg, 12/9/2015 10:02:49 PM



MAIN SIZE	TAP SIZE
4"-12"	2"
14"-20"	3"
24"-36"	4"

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



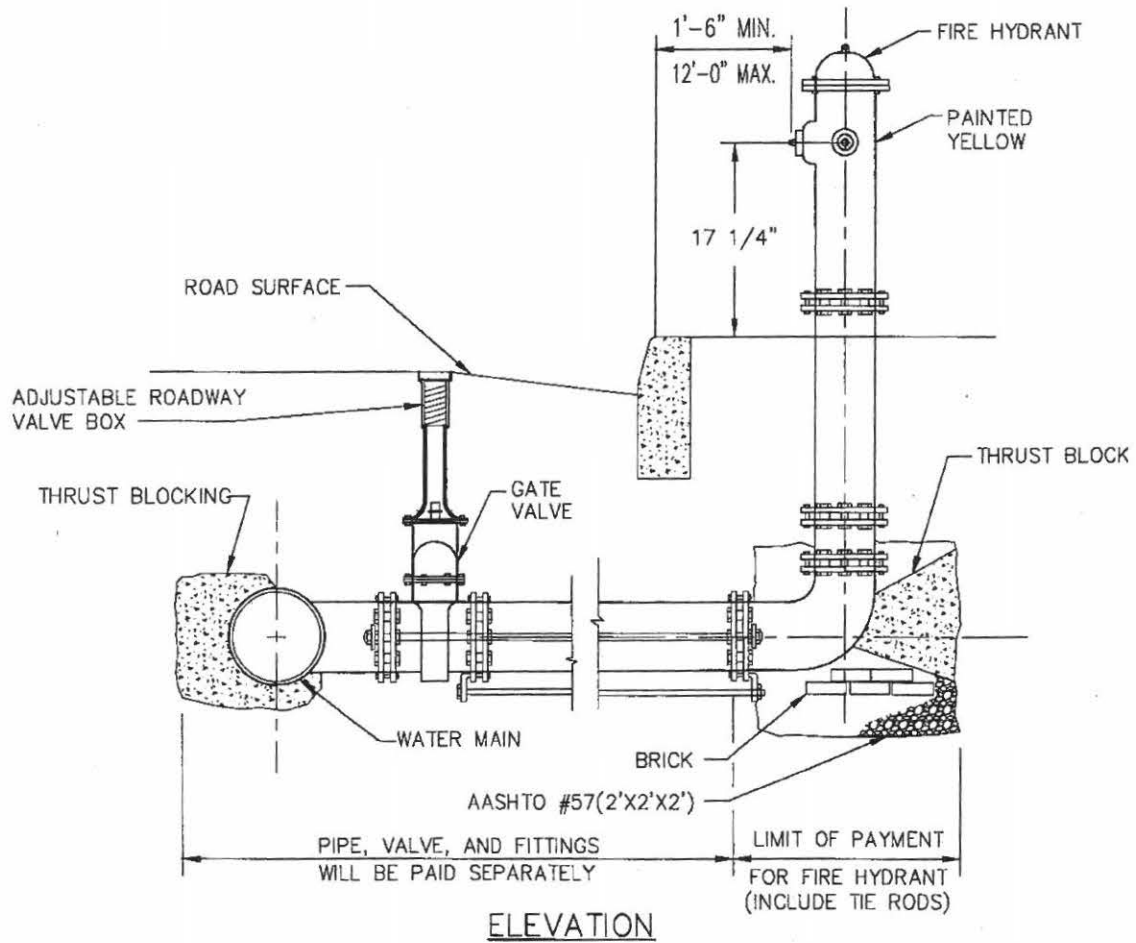
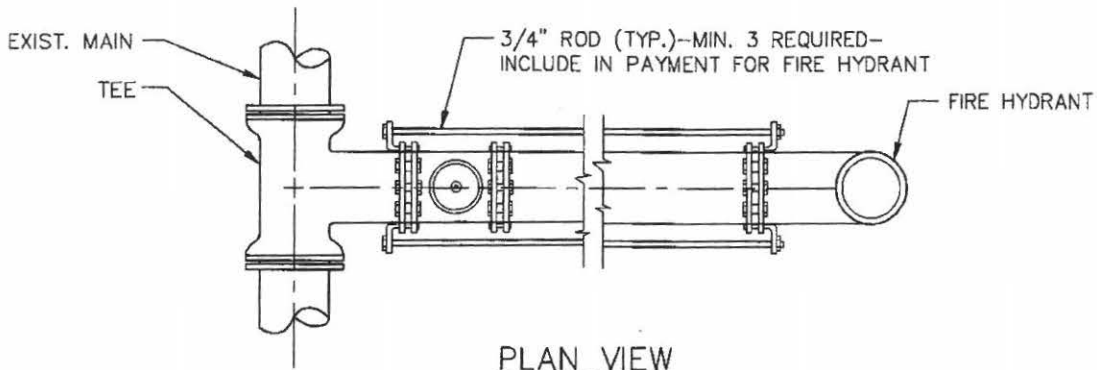
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AIR RELEASE VALVE

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5301

K:\161990400\dwg\5303A (FIRE HYDRANT SETTING DETAIL).dwg, 12/9/2015 10:04:06 PM



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**FIRE HYDRANT
SETTING DETAIL**

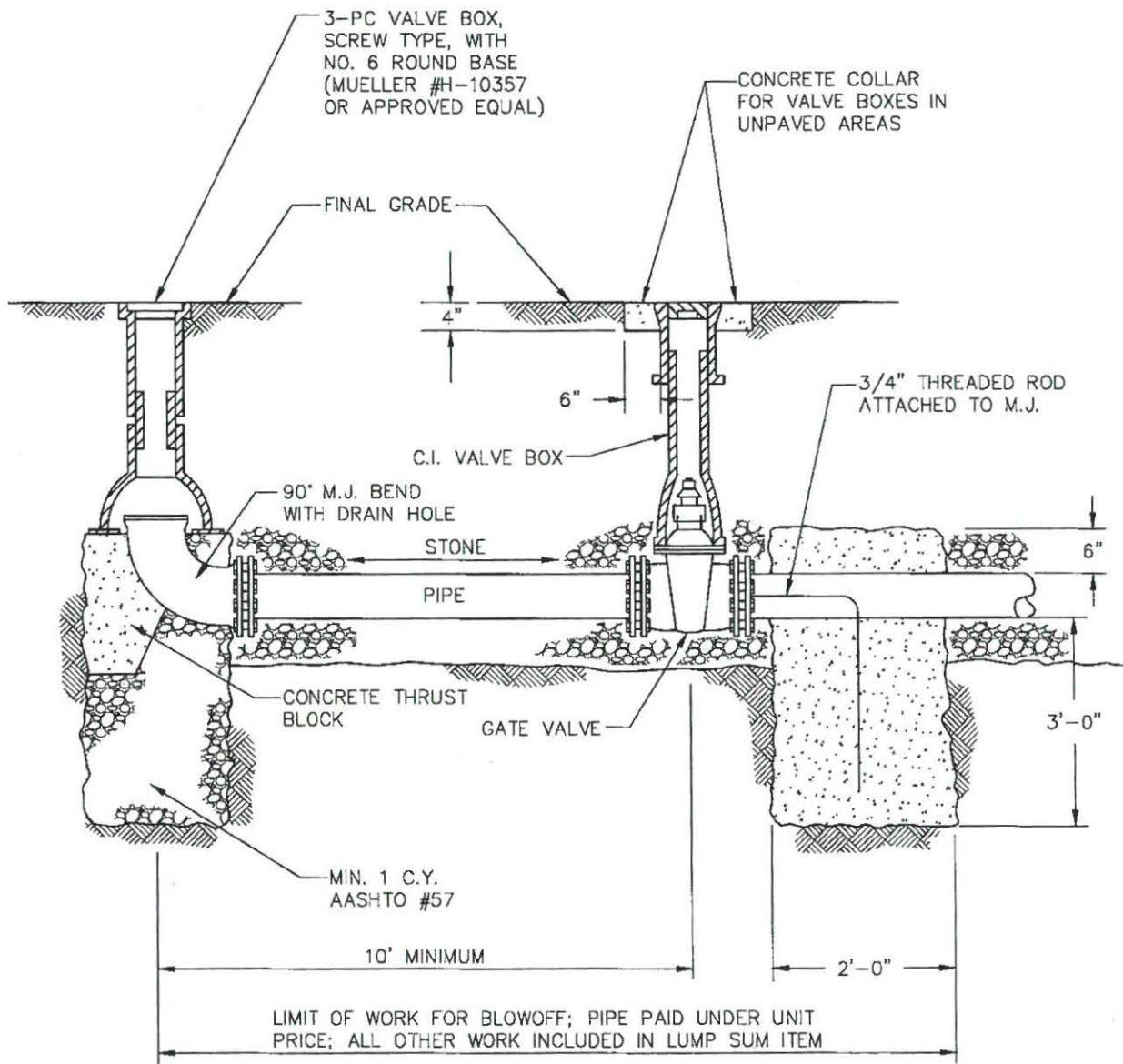
DATE: 1/26/2005

DRAWN BY: ARB

CHK. BY:

NO. 5303A

K:\161990400\dwg\5308 (BLOWOFF DETAIL).dwg, 12/9/2015 10:05:03 PM



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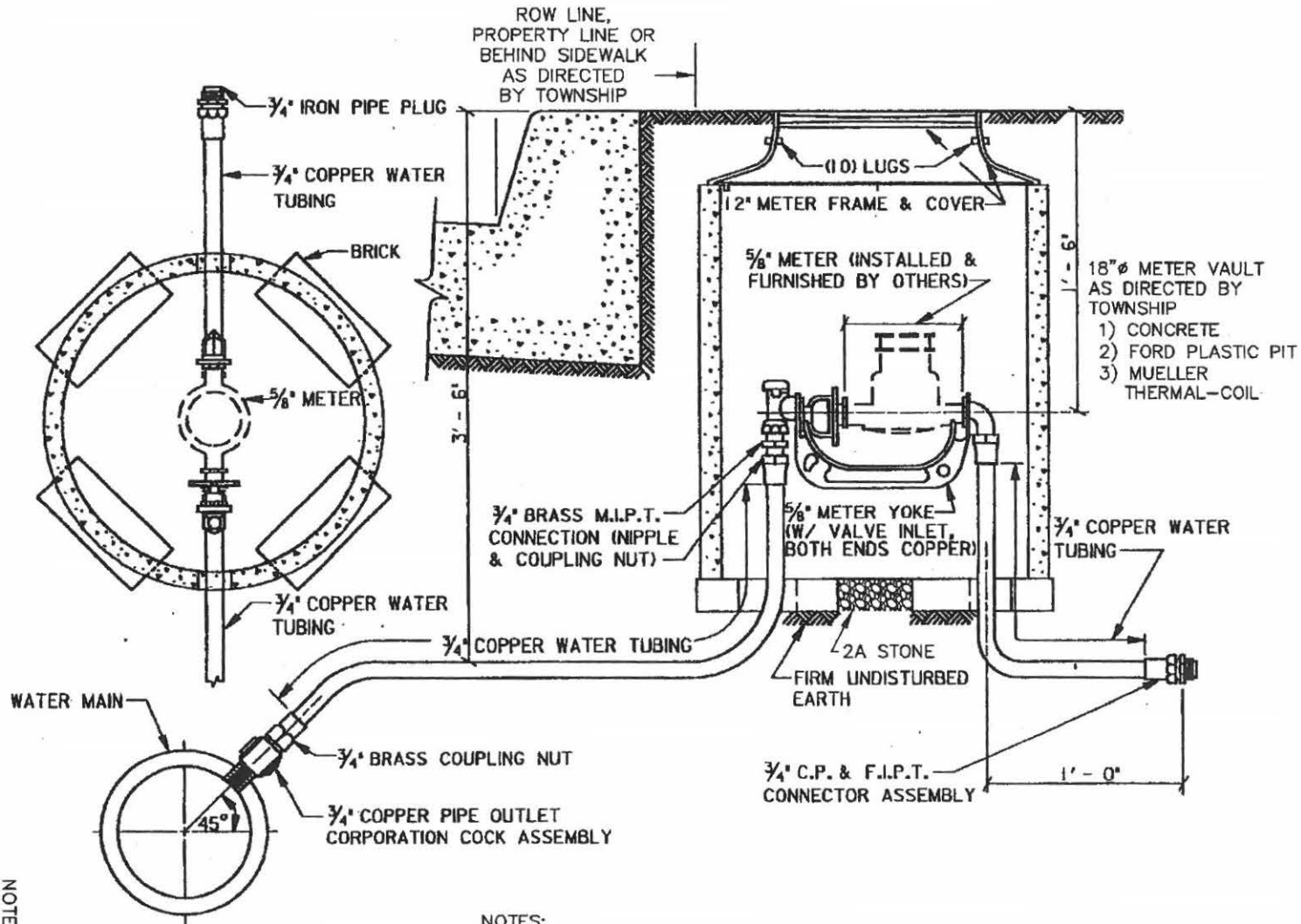
BLOWOFF DETAIL

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5308

C.S. Davidson, Inc.
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DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS
 STANDARD INSTALLATION
 3/4" METERED
 DOMESTIC SERVICE
 (SINGLE SETTING)

DATE: 6/16/2004
 DRAWN BY: ARB
 CHK. BY:
 NO. 5318

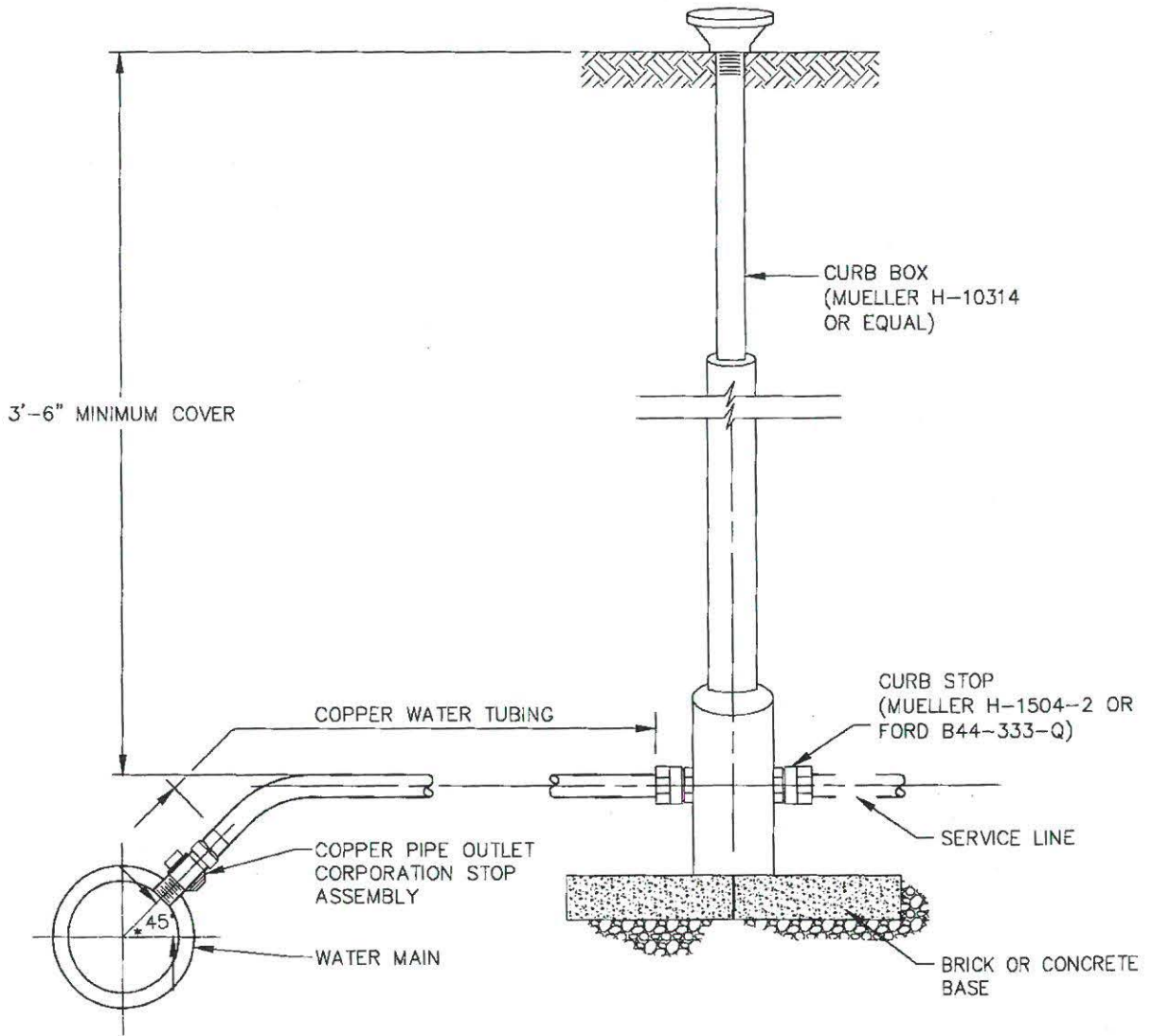


NOTE: NOT TO SCALE

NOTES:

1. USE METER PITS FOR WATER SERVICES GREATER THAN 100' OR FOR SERVICES TO MOBILE HOMES.
2. A CURB BOX AND CURB STOP MUST BE INSTALLED PRIOR TO METER PIT.

K:\161990400\dwg\5319 (WATER SERVICE INSTALLATION).dwg, 12/9/2015 10:07:15 PM



NOTE: NOT TO SCALE

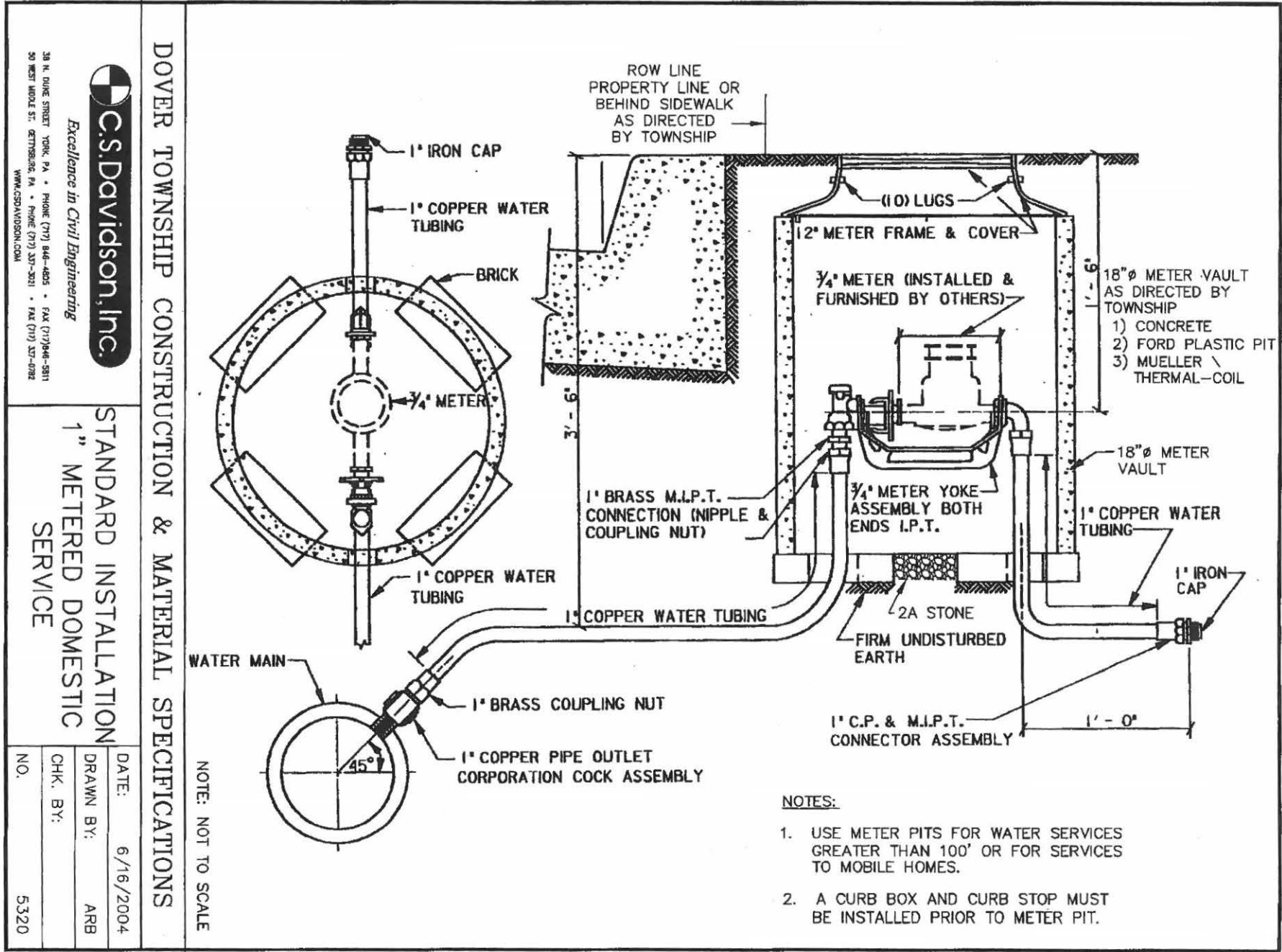


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 50 WEST MIDDLE ST. GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782
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WATER SERVICE INSTALLATION

DATE:	1/22/01
DRAWN BY:	J.S.L.
CHK. BY:	
NO.	5319



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38 N. DUKE STREET YORK, PA • PHONE (717) 846-4605 • FAX (717) 846-5811
 90 WEST MOORE ST. GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782
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DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

STANDARD INSTALLATION
 1" METERED DOMESTIC
 SERVICE

NOTE: NOT TO SCALE

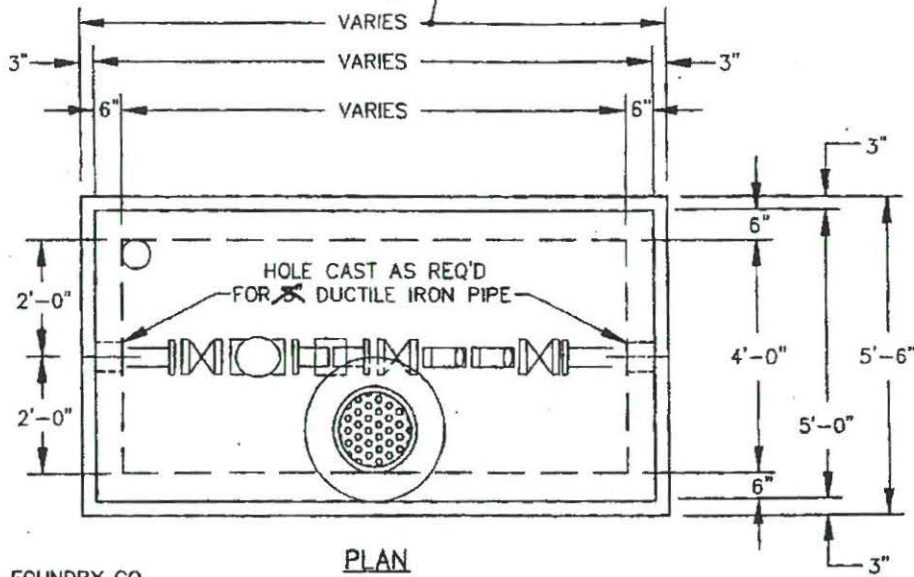
NOTES:

1. USE METER PITS FOR WATER SERVICES GREATER THAN 100' OR FOR SERVICES TO MOBILE HOMES.
2. A CURB BOX AND CURB STOP MUST BE INSTALLED PRIOR TO METER PIT.

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5320

NOTE: METER PIT SHALL BE ABLE TO WITHSTAND H-20 LOADING

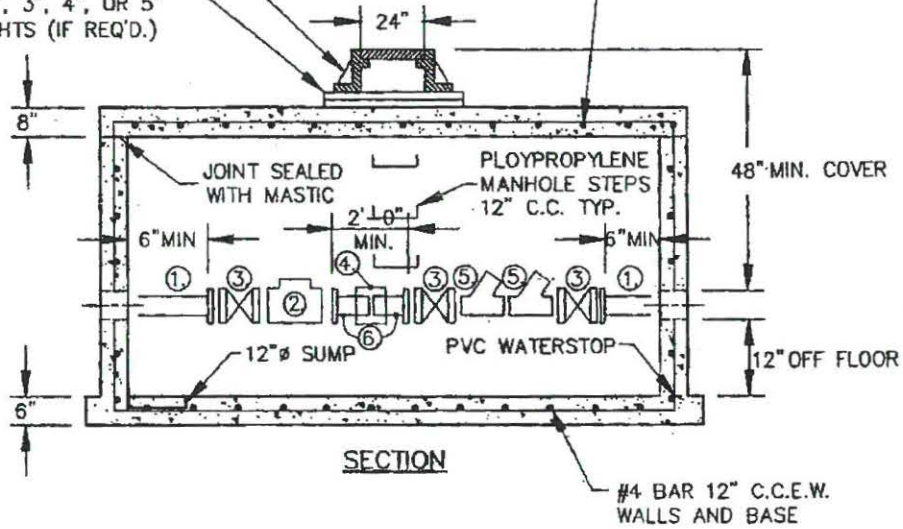
LENGTH AS REQUIRED TO PROVIDE MINIMUM DIMENSIONS SHOWN BELOW



(MADENA FOUNDRY CO. PATTERN # 430-W OR EQUAL)

CONCRETE ADJUSTING RINGS 1", 2", 3", 4", OR 5" HEIGHTS (IF REQ'D.)

#5 BAR @ 6" C.C.E.W. IN LID



PIPING SCHEDULE

①	FL X PE DIP T/C C/L (LENGTH AS REQUIRED)
②	METER AS APPROVED BY DOVER TOWNSHIP
③	FLG GATE VALVE OL NRS RESILIENT SEAT AWWA HANDWHEEL 200 PSI
④	DRESSER COUPLING OR EQUAL
⑤	DOUBLE CHECK BACKFLOW PREVENTER WITH RW NRS GATES
⑥	FL X PE DIP (LENGTH AS REQUIRED)

NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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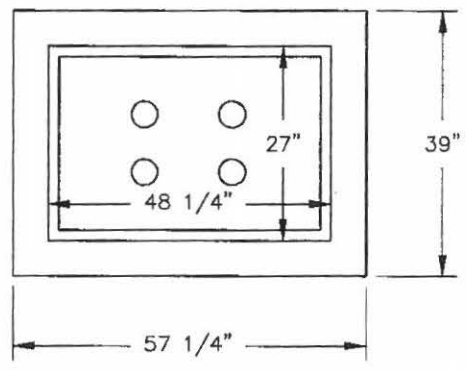
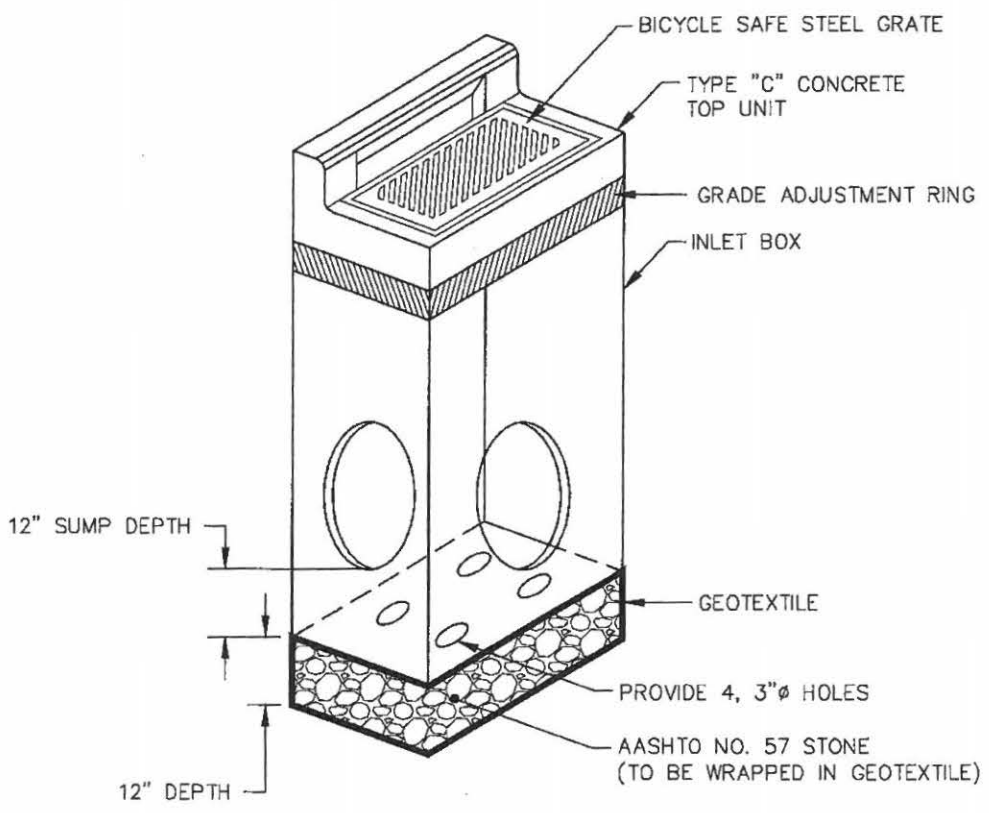
38 N. DUKE STREET YORK, PA • PHONE (717) 846-4805 • FAX (717) 846-5811
 50 WEST MIDDLE ST. GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0762
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PRECAST METER PIT
DETAIL

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5321

K:\161990400\dwg\5321 (PRECAST METER PIT DETAIL).dwg, 12/9/2015 10:09:51 PM

K:\161990400\dwg\5400 (WATER QUALITY INLET).dwg. 12/9/2015 10:11:18 PM



PLAN VIEW

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



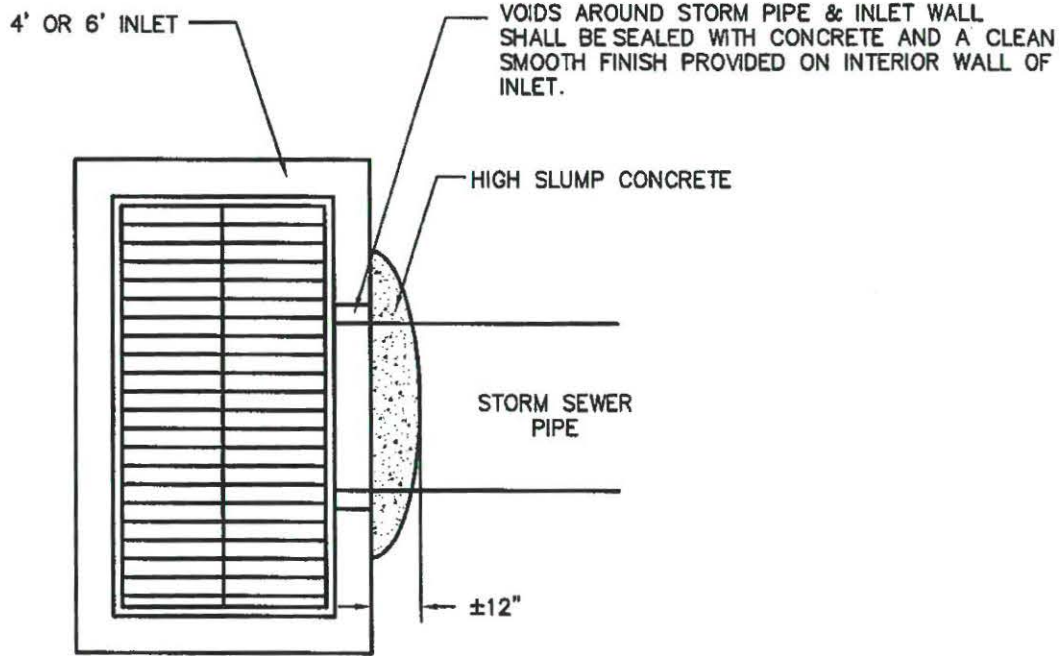
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WATER QUALITY INLET
 DETAIL

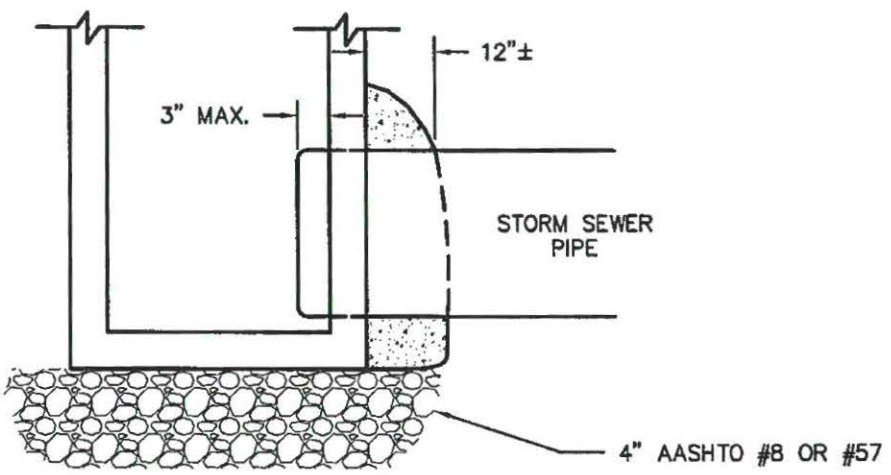
DATE:	8/20/2015
DRAWN BY:	BAM
CHK. BY:	
NO.	5400

K:\161990400\dwg\5401 (INLET-STORM PIPE INSTALLATION).dwg, 12/10/2015 8:03:05 AM



PLAN VIEW

NOTE:
NO MEASUREMENT OR PAYMENT WILL BE MADE FOR THE HIGH SLUMP CONCRETE THAT IS TO BE PLACED AT THE JUNCTION WITH ALL PIPES. THIS WORK IS TO BE CONSIDERED INCIDENTAL TO THE PRECAST STRUCTURE INLET, BID ITEM NO. 3.05.



ELEVATION

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



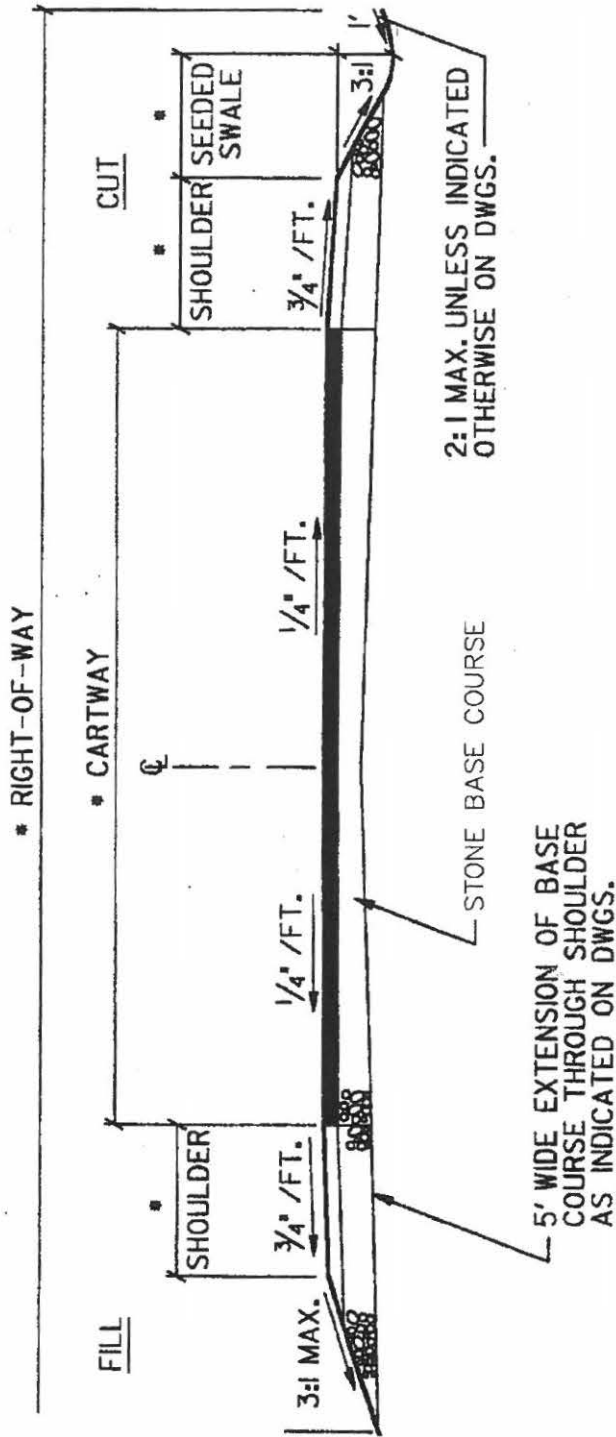
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**INLET/STORM PIPE
INSTALLATION DETAIL**

DATE:	11/18/2015
DRAWN BY:	BAM
CHK. BY:	
NO.	5401

K:\161990400\dwg\5600 (TYPICAL STREET CROSS-SECTION NOT CURBED).dwg, 12/9/2015 10:12:28 PM



NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



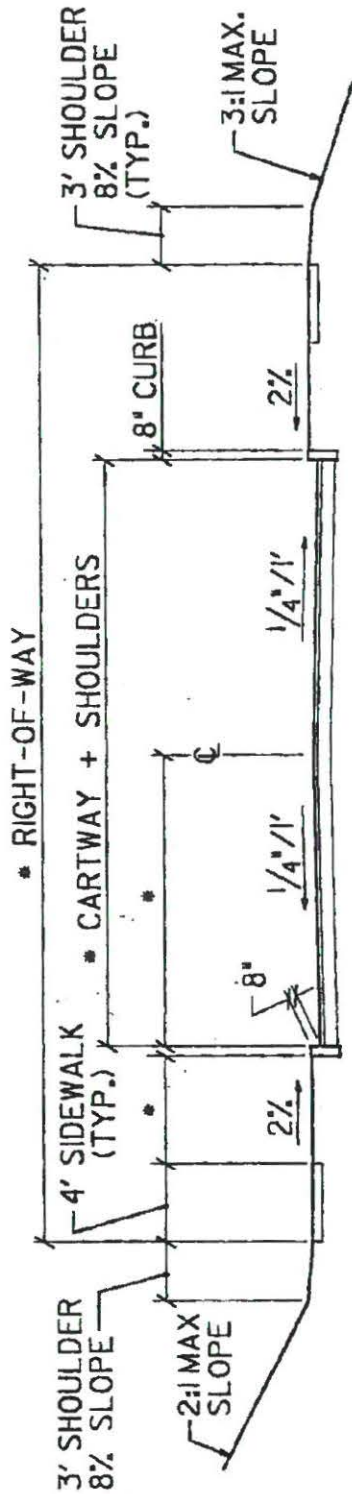
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TYPICAL STREET
 CROSS-SECTION NOT
 CURBED

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5600

K:\161990400\dwg\5601 (TYPICAL STREET CROSS-SECTION - CURBED).dwg, 12/9/2015 10:13:41 PM



NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



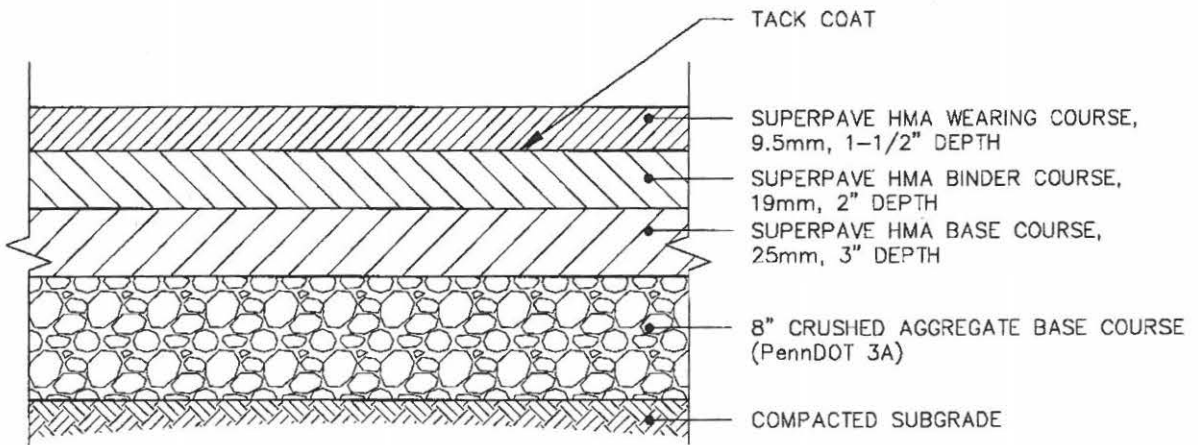
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TYPICAL STREET
 CROSS-SECTION -
 CURBED

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5601

K:\161990400\dwg\5602 (TYPICAL PAVING SECTION TOWNSHIP STREETS).dwg, 12/9/2015 10:15:18 PM



NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



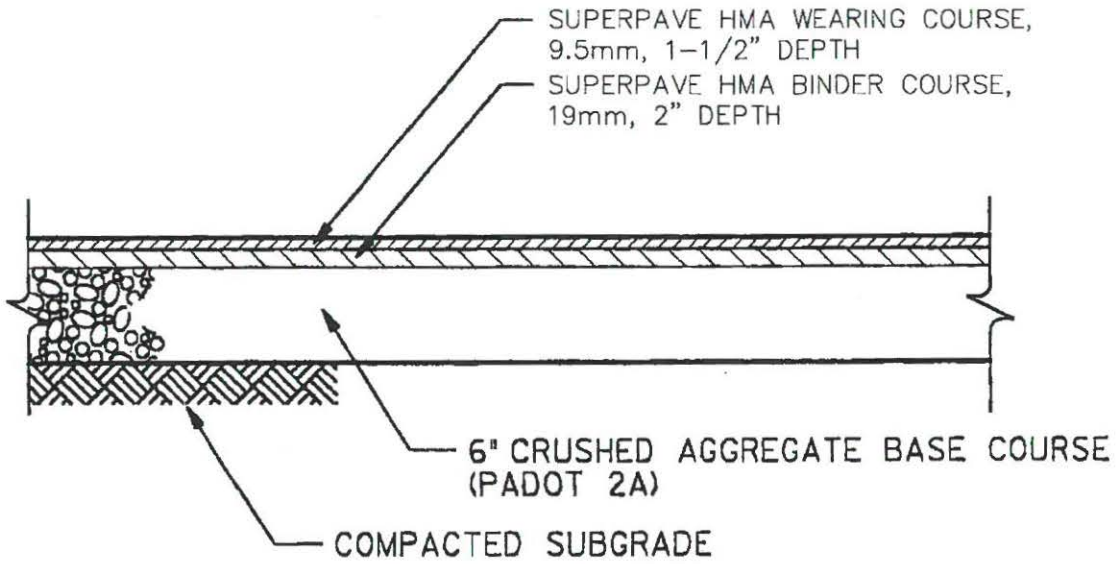
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TYPICAL PAVING SECTION TOWNSHIP STREETS

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5602

K:\161990400\dwg\5603 (TYPICAL PAVING SECTION PARKING LOTS).dwg. 12/9/2015 10:16:11 PM



NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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TYPICAL PAVING SECTION (PARKING LOTS)

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5603

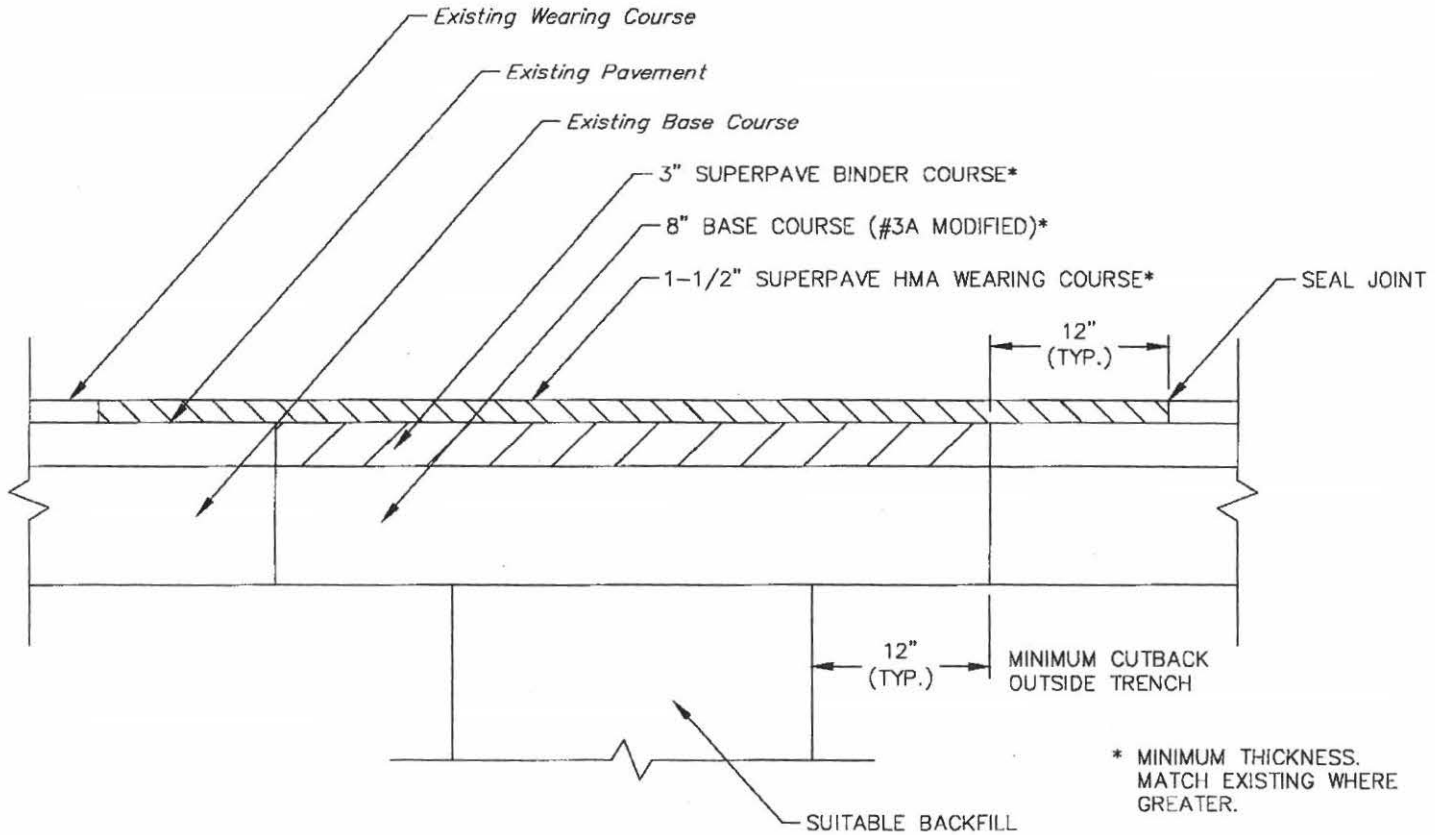
DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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 50 WEST WOOD ST. BETTISBURG, PA • PHONE (717) 337-3071 • FAX (717) 337-0782
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TYPICAL BITUMINOUS PAVEMENT RESTORATION DETAIL



* MINIMUM THICKNESS. MATCH EXISTING WHERE GREATER.

REV. 1/23/2015
 NOTE: NOT TO SCALE

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5604

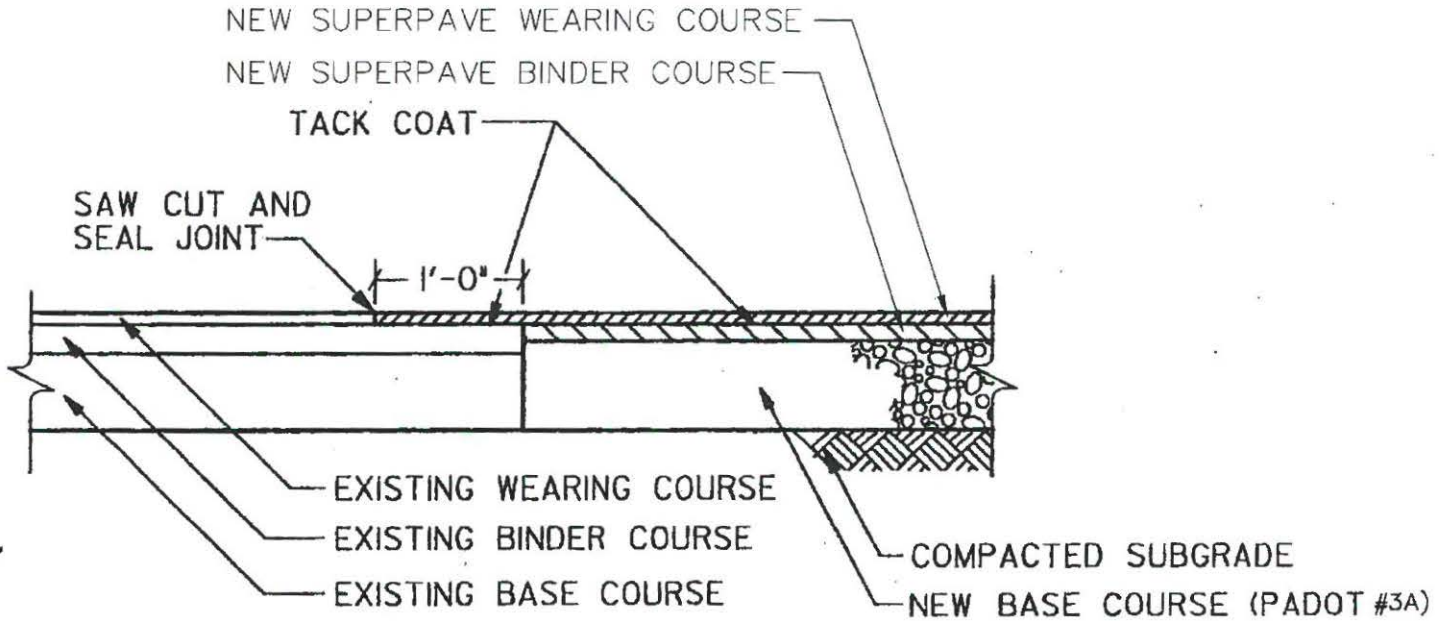
DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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PAVING NOTCH DETAIL

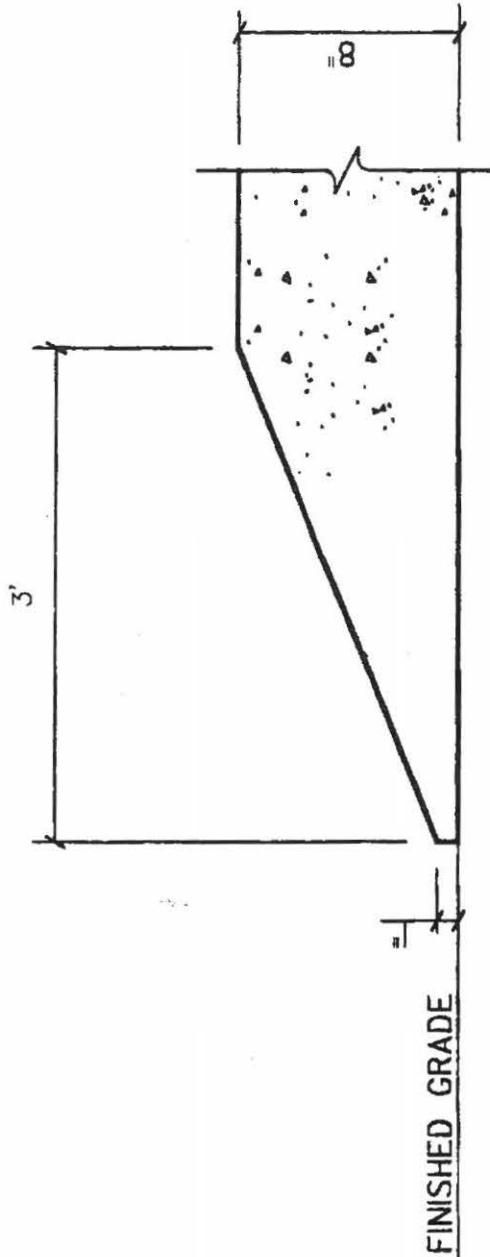


NOTE:
 WHERE NEW ASPHALT PAV'T, MEETS EXISTING
 ASPHALT PAV'T, CUT NOTCH 1'-0" WIDE BY
 DEPTH OF EXISTING WEARING COURSE.

NOTE: NOT TO SCALE

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5605

K:\161990400\dwg\5606 (CURB TERMINUS).dwg, 12/9/2015 10:19:27 PM



NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



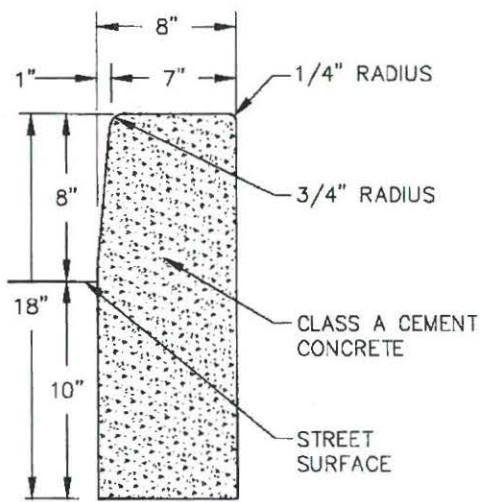
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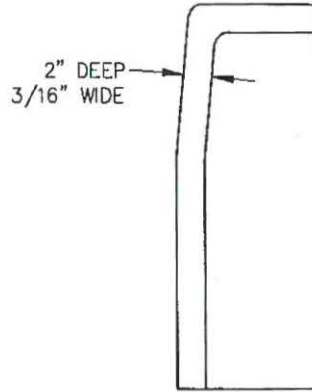
CURB TERMINUS

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5606

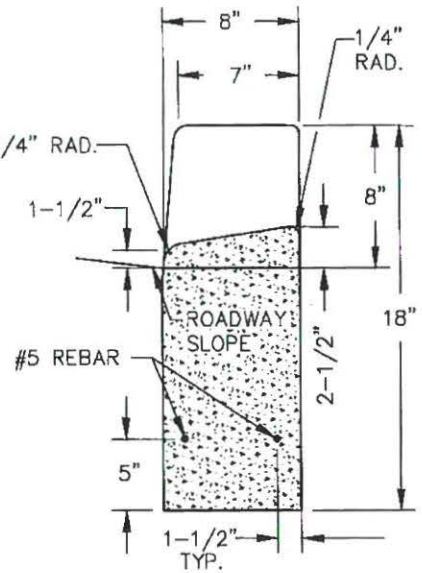
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TYPICAL CROSS SECTION
(RC-64 STD.)

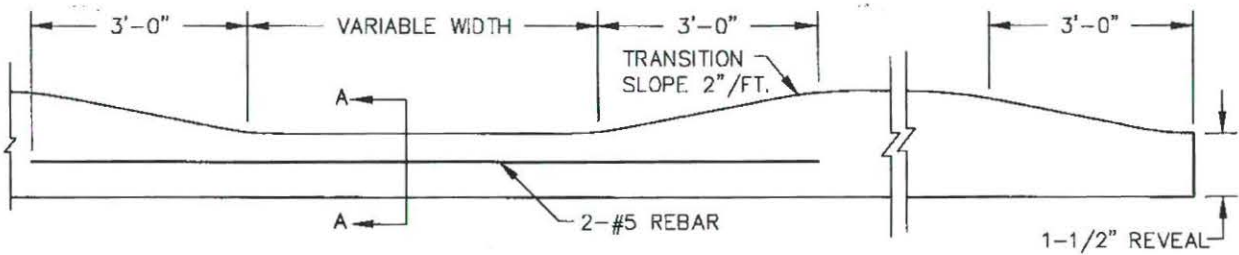


CONTRACTION JOINT



SECTION A-A

NOTE: 1) CONTRACTION JOINT SPACING 20'-0" MAX. TO 4'-0" MIN.
2) EXPANSION JOINT SPACING 60'-0" MAXIMUM



DEPRESSED CURBS FOR DRIVES

TERMINAL SECTION

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



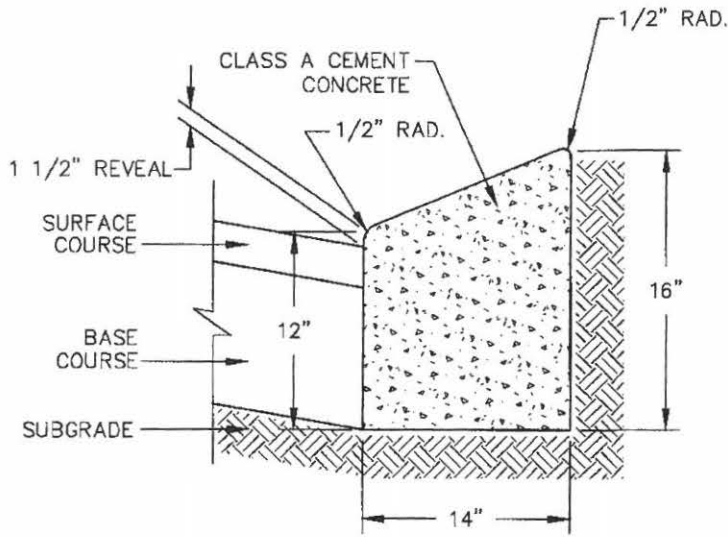
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50 WEST MIDDLE ST. GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782
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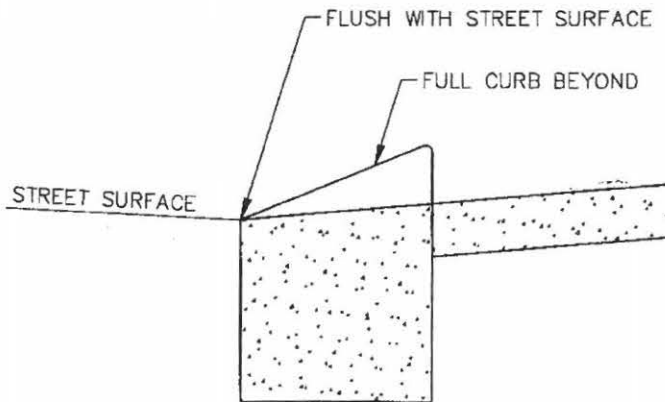
STANDARD CONCRETE
CURB DETAIL

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5607

K:\1619904\00\dwg\5607A (SLANT CONCRETE CURB DETAILS).dwg, 12/12/2015 3:45:43 PM



TYPICAL CROSS SECTION



CROSS SECTION AT HANDICAPPED RAMPS

NOTE: NOT TO SCALE



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SLANT
 CONCRETE CURB
 DETAILS

DATE: 1/22/01

DRAWN BY: J.S.L.

CHK. BY:

NO. 5607A



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DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

PAVEMENT BASE DRAIN

DATE: 6/16/2004

DRAWN BY: ARB

CHK. BY:

NO. 5608

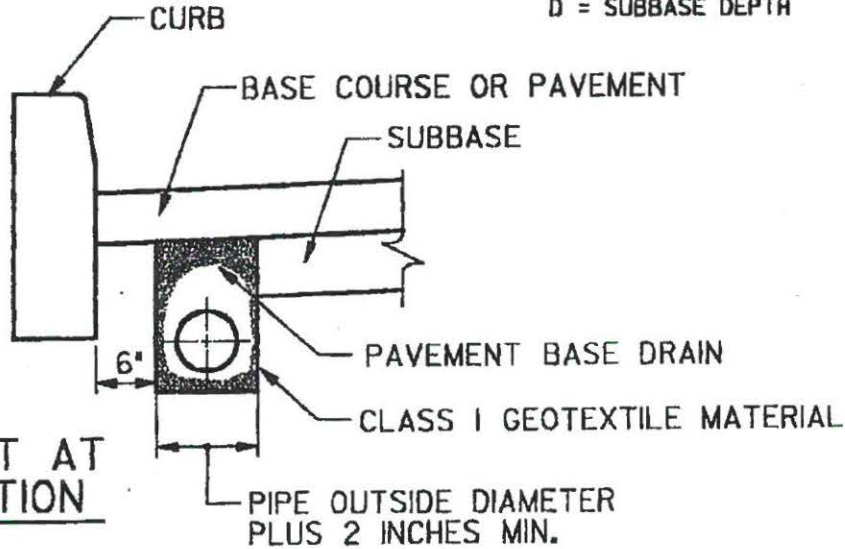
CRIMP AROUND OUTLET END OF PIPE AND SECURE TO PIPE WITH GALVANIZED STEEL WIRE OR OTHER ACCEPTABLE FASTENING METHODS



3/4" x 3/4" WIRE MESH SCREENING, 17 GAGE MINIMUM, GALVANIZED AFTER WEAVING

DETAIL A

WIRE MESH SHIELD



PLACEMENT AT CURB SECTION

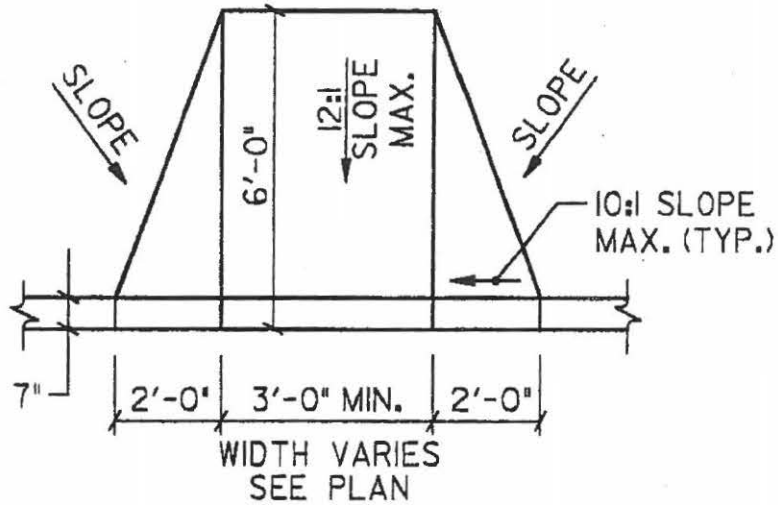
NOTE: NOT TO SCALE

- ▲ DEPTH BELOW SUBBASE EQUAL TO THE OUTSIDE DIAMETER OF SPECIFIED PIPE PLUS 2 INCHES.
- WHEN STORM SEWER IS REQUIRED AND IT INTERFERES WITH PLACEMENT OF PAVEMENT BASE DRAIN, ELIMINATE THE PAVEMENT BASE DRAIN AND USE COMBINATION STORM SEWER AND UNDERDRAIN.
- WHEN GEOTEXTILE MATERIAL IS USED FOR TYPE II BACKFILL, REPLACE FINE AGGREGATE FILTER BLANKET WITH EQUIVALENT DEPTH OF NO. 8 COARSE AGGREGATE. WHERE ACCESS BY TRENCH EQUIPMENT IS FEASIBLE, PROVIDE TRENCH WIDTH EQUAL TO PIPE OUTSIDE DIAMETER PLUS 2 INCHES, BUT NOT LESS THAN 6 INCHES, WHEN GEOTEXTILE MATERIAL IS INDICATED.

† TYPE I OR TYPE II BACKFILL

D = SUBBASE DEPTH

K:\161990400\dwg\5609 (DEPRESSED CURB DETAIL).dwg, 12/9/2015 10:22:49 PM



PLAN



ELEVATION

NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



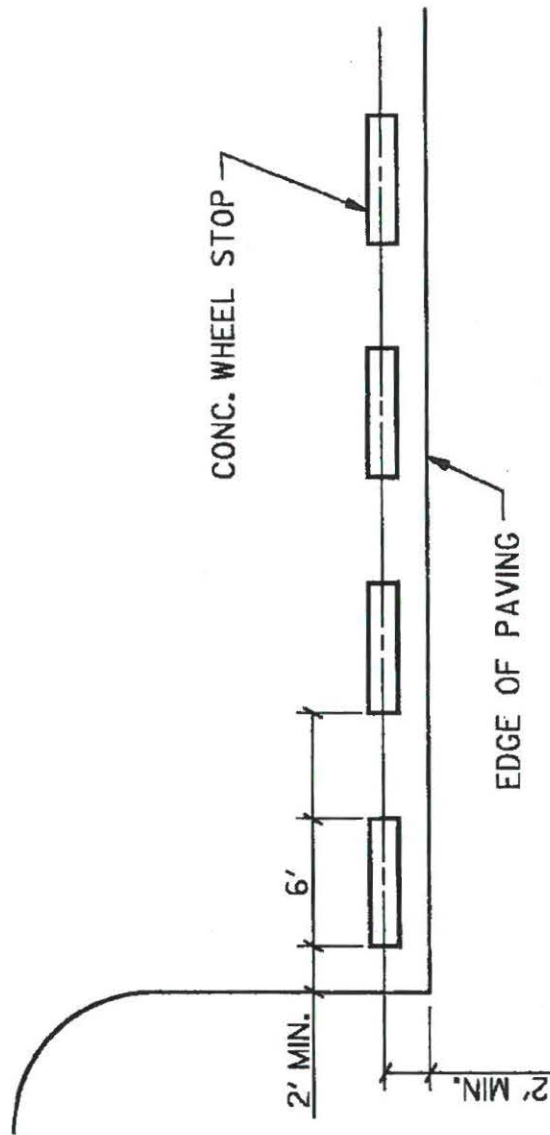
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DEPRESSED CURB
DETAIL

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5609

K:\161990400\dwg\5610 (TYPICAL WHEELSTOP LAYOUT 90 DEGREE PARKING).dwg, 12/9/2015 10:23:43 PM



NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



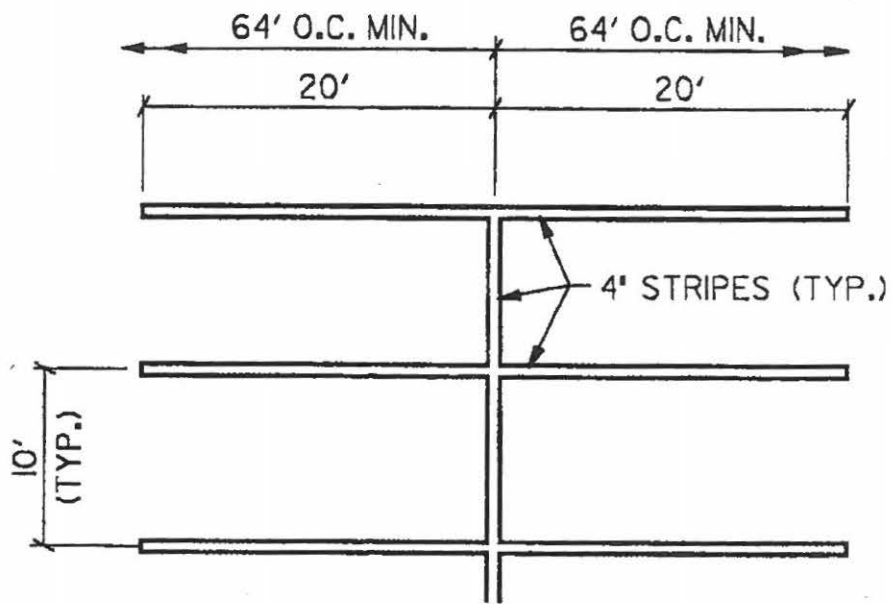
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TYPICAL WHEELSTOP LAYOUT (90° PARKING)

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5610

K:\161990400\dwg\5611 (90 DEGREE PARKING DETAIL).dwg, 12/12/2015 4:11:29 PM



NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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90° PARKING DETAIL

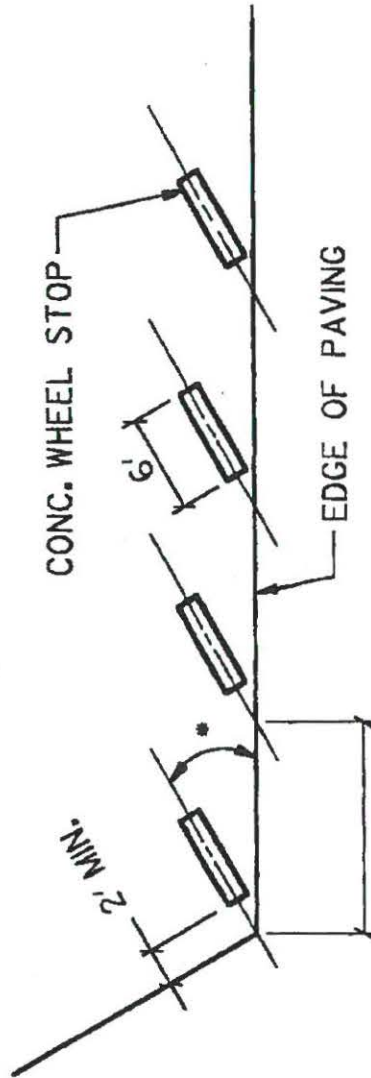
DATE: 6/9/2004

DRAWN BY: ARB

CHK. BY:

NO. 5611

K:\161990400\dwg\5612 (TYPICAL WHEEL STOP LAYOUT 60 DEGREE PARKING).dwg, 12/9/2015 10:24:37 PM



NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



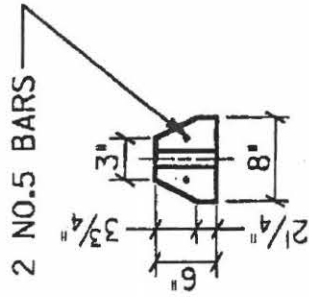
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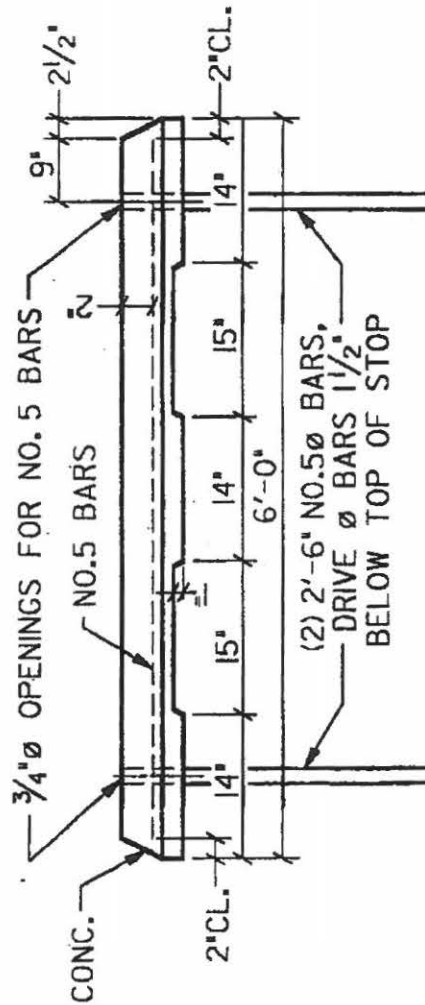
TYPICAL WHEEL STOP LAYOUT (60° PARKING)

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5612

K:\161990400\dwg\5613 (PRECAST CONCRETE WHEELSTOP).dwg, 12/9/2015 10:25:34 PM



SECTION



ELEVATION

PRECAST CONCRETE WHEELSTOP

SCALE: NONE

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



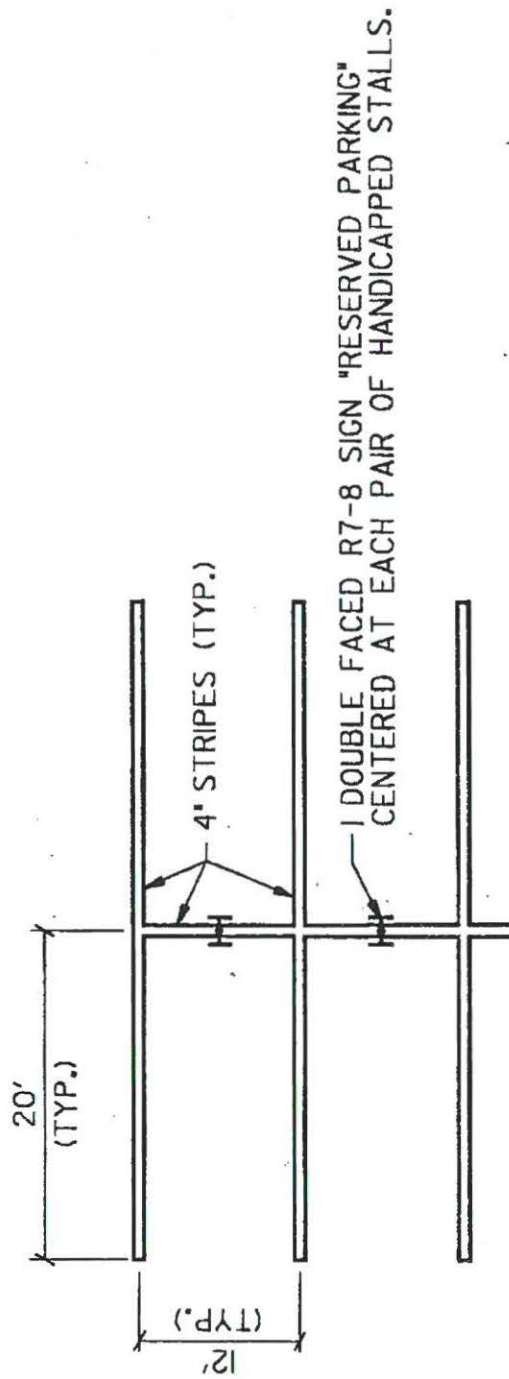
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**PRECAST CONCRETE
WHEELSTOP**

DATE:	11/30/2006
DRAWN BY:	BH
CHK. BY:	
NO.	5613

K:\161990400\dwg\5614 (90 DEGREE HANDICAP PARKING DETAIL).dwg, 12/9/2015 10:26:21 PM



90° HANDICAP PARKING DETAIL

SCALE: NONE

NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



Excellence in Civil Engineering

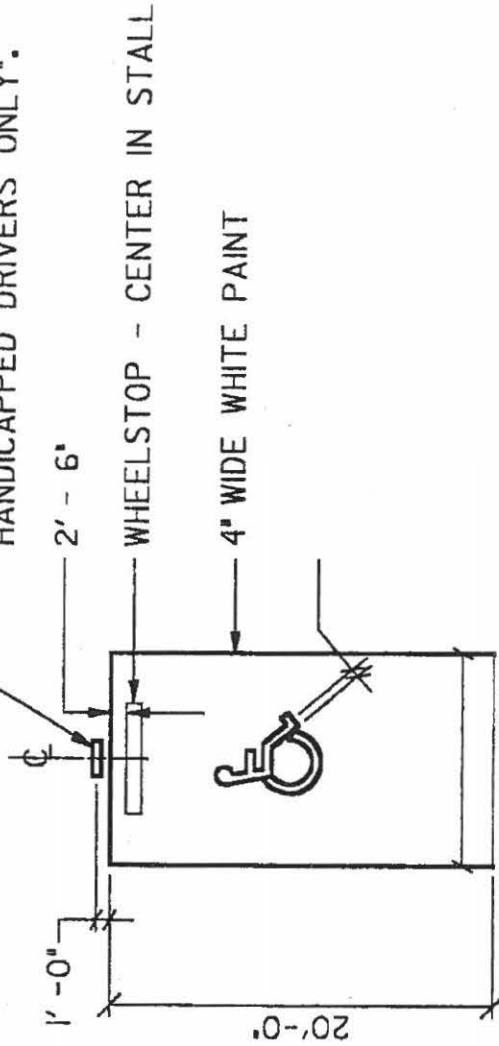
38 N. DUKE STREET YORK, PA • PHONE (717) 846-4805 • FAX (717) 846-5811
60 WEST MIDDLE ST. GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782
315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8890
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90° HANDICAP PARKING DETAIL

DATE:	11/30/2006
DRAWN BY:	BH
CHK. BY:	
NO.	5614

K:\161990400\dwg\5615 (SINGLE HANDICAP SPACE DETAIL).dwg, 12/9/2015 10:27:27 PM.

VISIBLE SIGN MOUNTED 3' - 6" ABOVE
GRADE. SIGN TO INCLUDE INTERNATIONAL
SYMBOL, WITH THE FOLLOWING WORDING;
"THIS SPACE RESERVED FOR PHYSICALLY
HANDICAPPED DRIVERS ONLY".



NOTE: NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



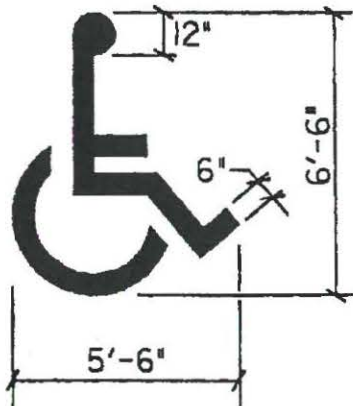
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SINGLE HANDICAP
SPACE DETAIL

DATE:	6/16/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5615

K:\161990400\dwg\5616 (HANDICAP STALL MARKING).dwg, 12/9/2015 10:29:58 PM



NOT TO SCALE

DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



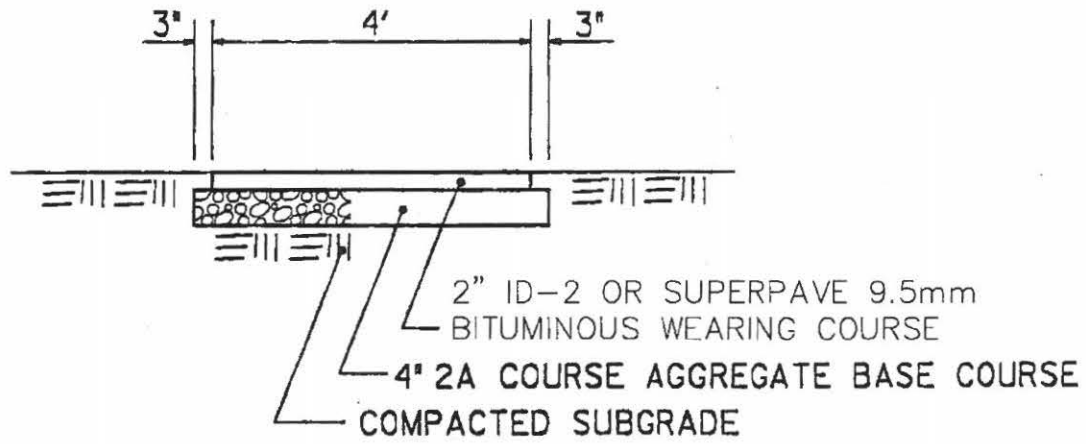
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HANDICAP STALL
MARKING
(CENTERED IN STALL)

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5616

K:\161990400\dwg\5617 (BITUMINOUS WALK SECTION).dwg, 12/9/2015 10:31:00 PM



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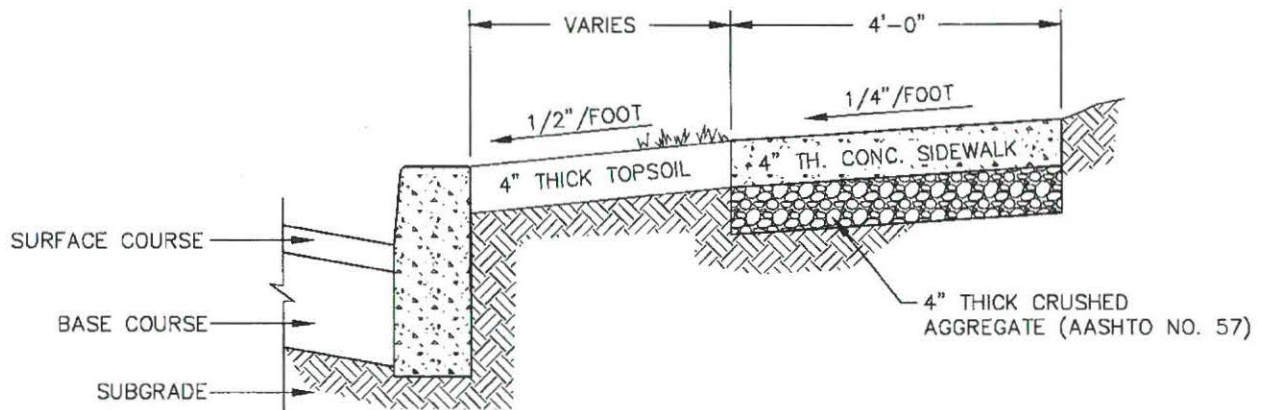
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BITUMINOUS WALK SECTION

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5617

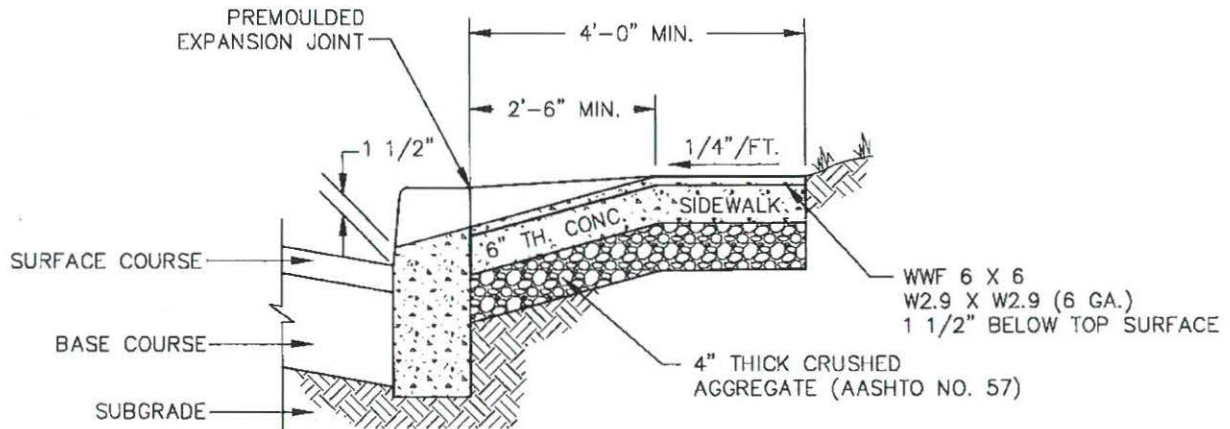
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TYPICAL SECTION THROUGH
CONCRETE CURB & SIDEWALK

NOTES:

- 1) EXPANSION JOINT 20' O.C.
1/4" BELOW TOP OF SIDEWALK.
- 2) DRIVEWAY APRON SHALL BE
6" THICK.



TYPICAL SECTION THROUGH
CONCRETE CURB & SIDEWALK
AT DRIVEWAY DEPRESSION

NOTE: NOT TO SCALE

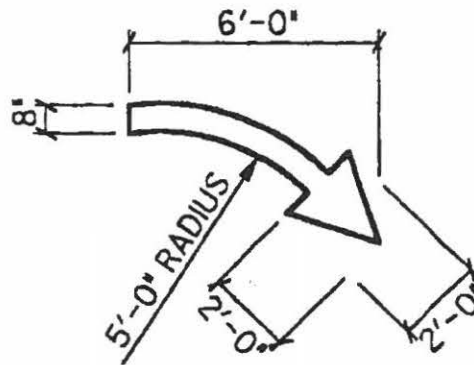
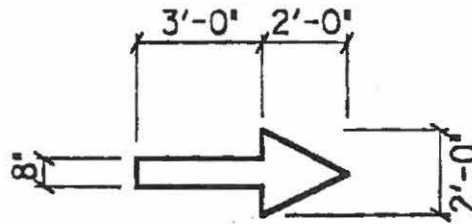
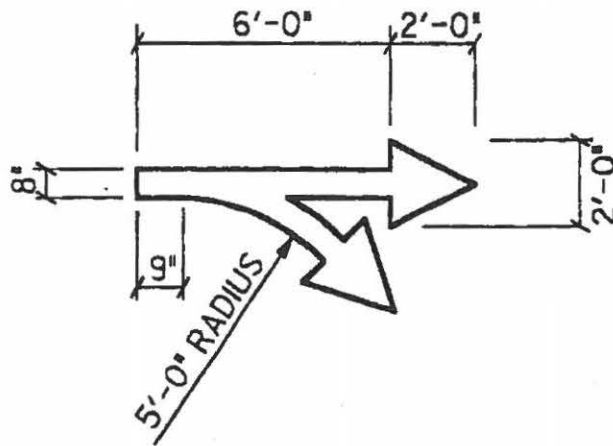


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CONCRETE
SIDEWALK DETAIL

DATE:	1/22/01
DRAWN BY:	J.S.L.
CHK. BY:	
NO.	5618

K:\161990400\dwg\5620 (DIRECTIONAL ARROWS).dwg. 12/9/2015 10:33:44 PM



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DIRECTIONAL ARROWS

DATE:	6/9/2004
DRAWN BY:	ARB
CHK. BY:	
NO.	5620

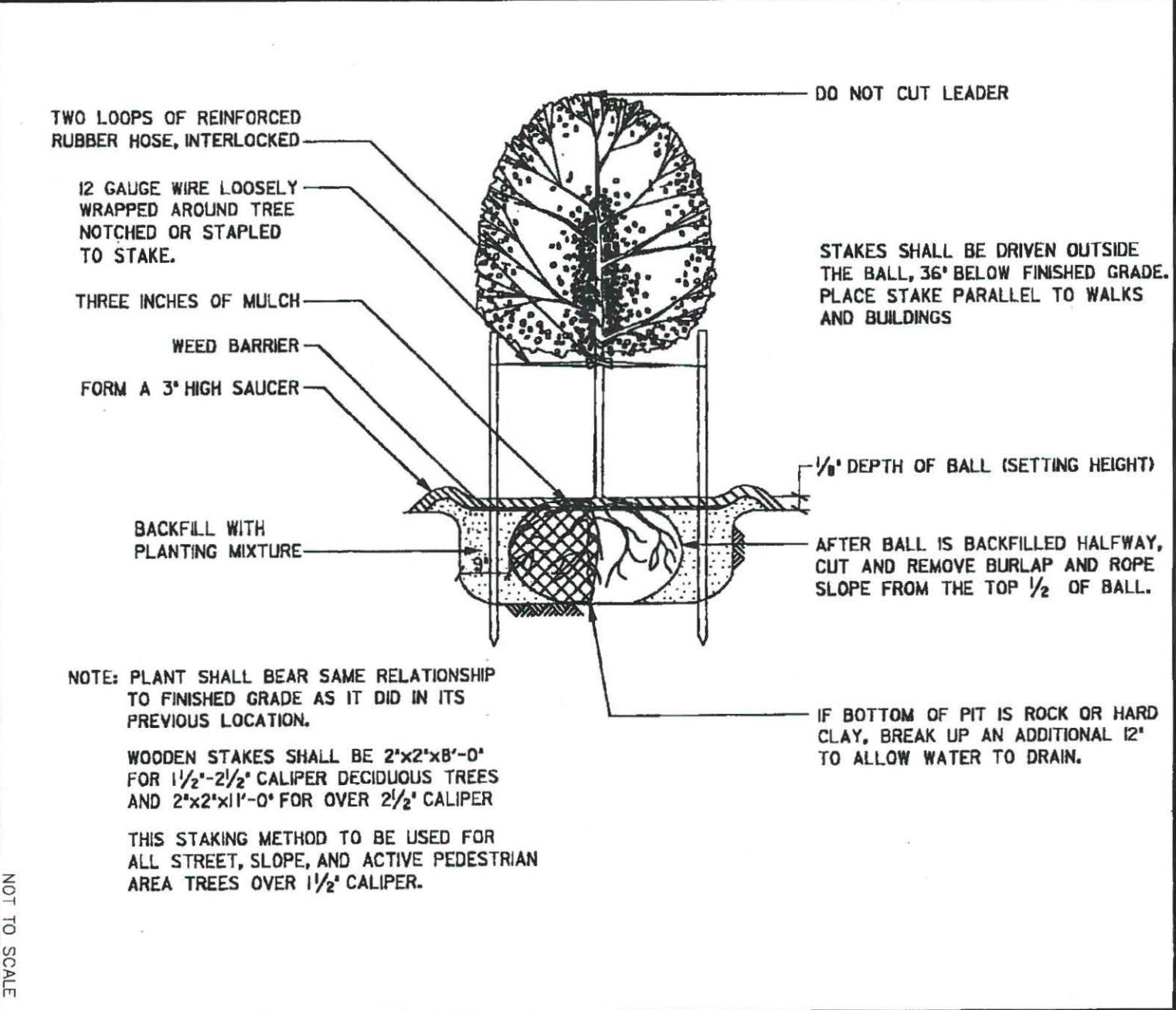
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DOVER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

PLANTING AND STAKING METHODS FOR TREES

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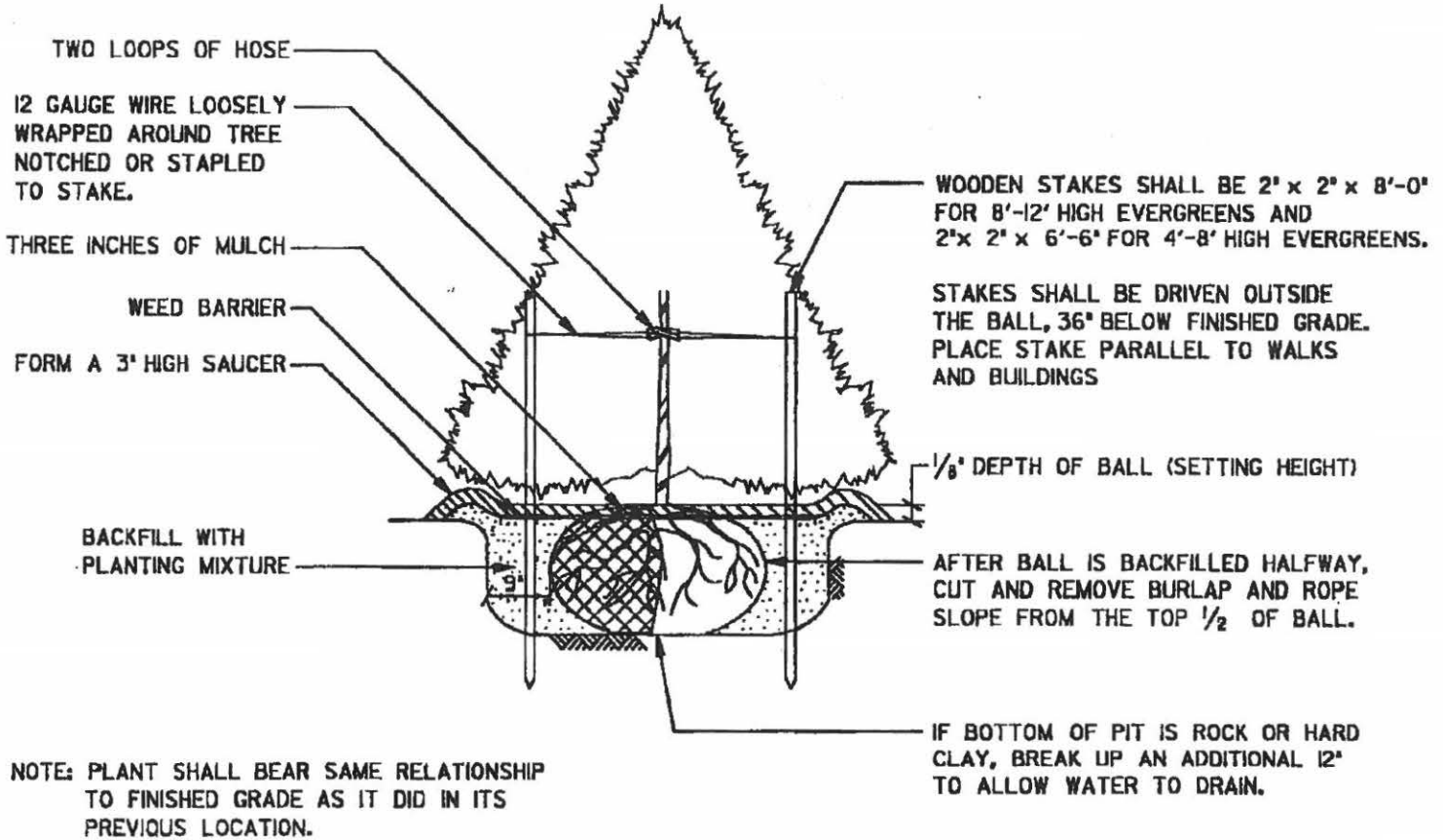
PLANTING AND STAKING
 METHODS FOR
 EVERGREEN TREES

DATE: 6/9/2004

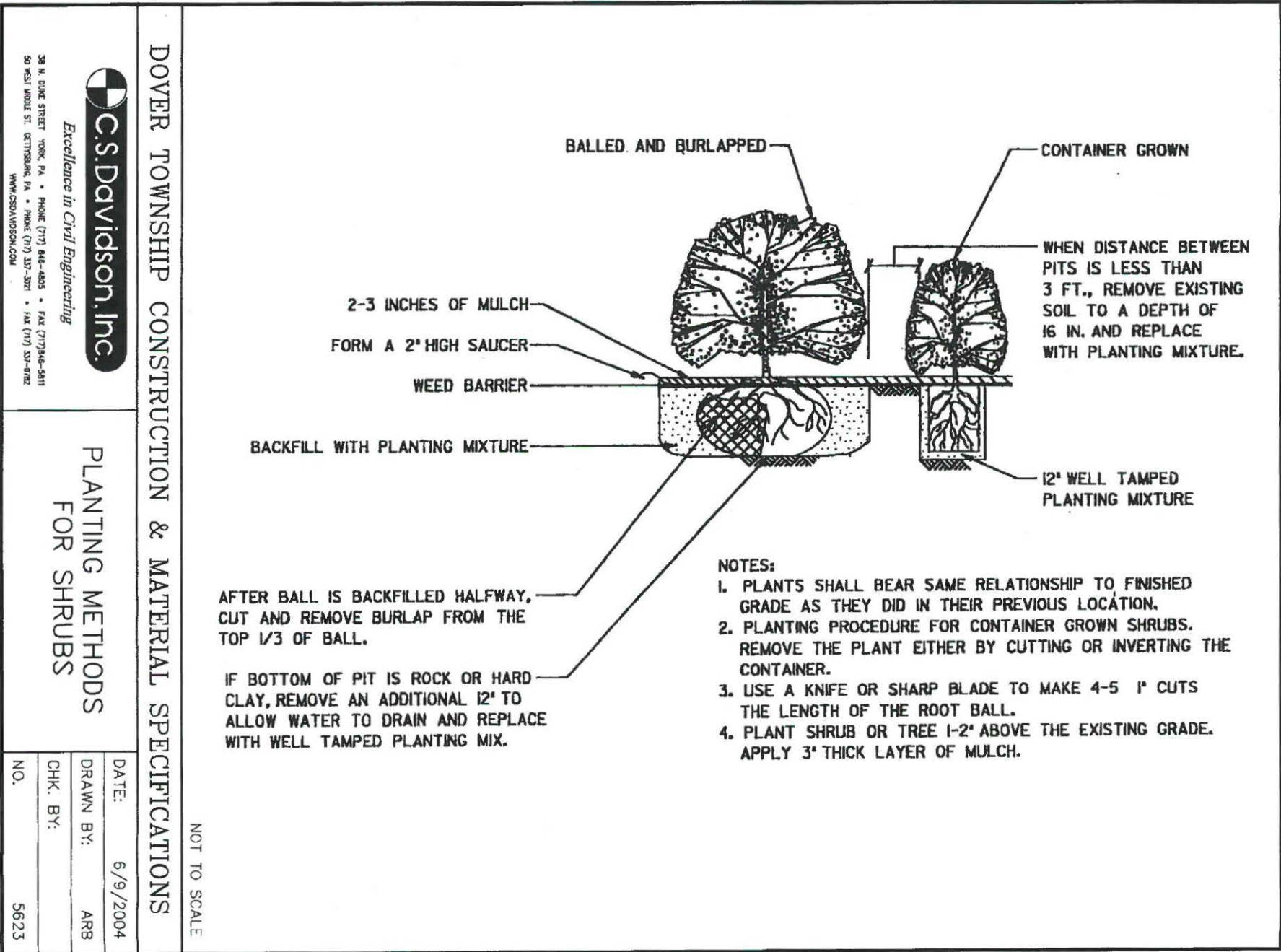
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PLANTING METHODS
FOR SHRUBS

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