STANDARD SPECIFICATIONS

BOROUGH OF WYOMISSING
BERKS COUNTY, PENNSYLVANIA

DECEMBER 2013

3005-241

BOROUGH OF WYOMISSING
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STANDARD SPECIFICATIONS

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STANDARD SPECIFICATIONS FOR THE BOROUGH OF WYOMISSING

I. SCOPE

These specifications cover the requirements for additions, extensions, replacements and repairs to the Borough of Wyomissing Water, Sanitary and Storm Sewer Systems, as well as the specifications for new Roadways, Curbs, and Sidewalks. Also included are the requirements for the on-lot connections of the water, sanitary and storm sewer systems between the building and the public systems. The requirements for excavation, backfill, and restoration work within the street right-of-ways performed by other utility companies or their contractors are also included in these specifications. All additions, extensions, replacements and repairs shall be completed in accordance with the requirements of the Borough of Wyomissing and these specifications.

The Work shall include furnishing of all plant, labor, new materials, equipment, supplies, transportation, fuel and power as may be required to prosecute the Work and performing all Work as required by the Specifications and including such detail drawings as may be required to prosecute the Work. The Work shall be executed in the best and most workmanlike manner by qualified, careful and experienced workmen.

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

Water System:

This specification includes the requirements for all new water mains, for the replacement of water mains, for new water services and for replacement of water services.

Where a water service is provided to a building, said building shall not be occupied prior to the setting of the water meter.

Water services, as described and regulated by this specification, shall include the piping from the municipal water main up to an accessible point immediately inside the exterior wall of the building. Where water meters are located inside the building, the type and size of the piping leading up to the meter shall be the same as the water service piping. There shall be no connections to the water service piping on the municipality's side of the water meter.

Emergency Domestic Water Supply: Building owners or their authorized representatives requesting an emergency water supply must comply with the regulations of the Borough of Wyomissing Water Department which are currently in force. No water consumer, except with written consent of the Borough's Water Department, is allowed to furnish water to other persons or facilities. The requirement for said written consent may be waived by the Borough in order to allow for temporary relief to consumers having frozen or broken water service pipes, or whose supply is cut due to a similar emergency.

An emergency water supply serving a distressed building shall protect the municipal water supply from backflow or back siphonage with the installation of two (2) spring-activated check valves or an equal system approved by the Borough's water Department. Emergency piping shall be rigid steel piping with a minimum rating of 150 psi at 160° F working conditions. Emergency service piping shall be connected to a source made available by the Borough's Water Department.

Sanitary Sewer System:

This specification includes the requirements for all new sanitary sewer mains, for the replacement of sanitary sewer mains, for new sanitary laterals and for the replacement of sanitary laterals.

Every building in which plumbing fixtures are installed and all premises having drainage piping shall be connected to the public sanitary sewer system. No private or individual sewage disposal systems are allowed in the Borough without specific approval of Borough Council prior to the property owner's application for such system to the PA Department of Environmental Protection.

Building Traps: All building house sewers shall be provided with an approved, manufactured horizontal running trap as detailed in the Borough's Standard Sanitary Sewer Details attached to this Specification. Except as approved by the Borough, said trap shall be set immediately adjacent to the curbline on the building lot side, and shall provide a fresh air inlet on the building side and a cleanout on the street side. The building's house trap shall not be installed in any driveway or ramp area unless approved by the Borough in writing.

Storm Sewer System:

This specification includes the requirements for all new storm sewer mains, for the replacement of storm sewer mains, and for storm sewer piping from buildings and lots.

All roofs, paved areas, yards, courts and courtyards shall drain into an on-lot storm sewer system which is totally separate from the sanitary sewer system.

All storm sewer systems shall comply with the requirements of the applicable Stormwater Management Ordinance as adopted by the Borough of Wyomissing.

Storm sewer discharge through the curb face and into the public street shall be allowed only with the approval of the Borough during the plan review and permitting process. Storm sewer discharge onto the surface of the ground, lawn or paved areas is prohibited without the express approval of the Borough during the plan review and permitting process.

II. LAYOUT OF THE WORK

Prior to the start of construction, the developer or person or persons hereinafter designated as the "Developer", shall submit to the Borough for its approval copies of the plans describing the Work proposed to be done. These plans may be part of subdivision or land development plans prepared to meet regulatory requirements pertaining to land development activities or the plans may be specially prepared to meet the requirements

of the Borough of Wyomissing. The Borough will cause the proposed additions, extensions, replacements or repairs as described in the plans and supporting documentation to be reviewed by its engineer, solicitor, and staff personnel. When the plans, describing the Work proposed to be done, are found to be acceptable for construction, copies of the final plans shall be submitted to the Borough for its use during observation of construction. As necessary, additional sets of drawings may be required for attachments to legal agreements which address the provisions through which the addition, extension, replacements or repairs to the system may be constructed.

All Drawings shall show the location of the sanitary sewer lines, service lines as applicable, other utilities and other necessary appurtenances required for the completion of the Work. All Drawings shall incorporate both a plan view and a profile Drawing which shall contain the proposed location of the sanitary and/or storm sewer lines along with the location of the water lines, storm sewer lines, and other underground utilities which are proposed to be installed. The plans shall also include detail sheets applicable to the Work.

Prior to delivery of any construction materials to the project site, five (5) copies each of all catalog cuts and shop drawings shall have been reviewed and approved by the Borough's engineer.

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

All sanitary sewer lines shall extend to the far property line of the last property proposed to be served during a given system extension or addition.

The final plans shall also be made available to the Borough in AutoCAD disk format for the Borough's use in updating plot plans, preparation of as-built plans, or similar uses. If plans cannot be submitted in AutoCAD format, the paper prints may be scanned to create the necessary magnetic medium data and the developer may be charged for the scanning costs incurred.

III. CONDUCT OF THE WORK

The Developer will only be permitted to use a CONTRACTOR, Project Superintendent, Project Foreman, etc. that is approved by the Borough or the ENGINEER. This approval is required before any work commences. The CONTRACTOR shall provide a certificate of insurance, naming the Borough and its consulting engineers, as additional insureds.

The proposed CONTRACTOR may be required to submit an experience record to the Borough documenting the CONTRACTOR'S experience with Water, Sanitary, Storm Sewer System and roadway construction of the type to be performed for the specific project.

The Developer, acting through its CONTRACTOR, shall make use of all reasonable means to maintain the normal flow of traffic on municipal streets and state highways

during all phases of construction. Should it become necessary to close or encroach upon any street or highway, the CONTRACTOR shall obtain the necessary permits prior to making such closure or encroachment. The CONTRACTOR shall comply with the applicable PennDOT traffic control procedures, including the erection of suitable warning lights, signs, channelization, and provision of flag persons to control traffic in a safe manner. The requirements of the Borough shall also be included in the compliance requirement.

IV. HIGHWAY AND STREET PERMITS

The Developer, acting through its CONTRACTOR, shall secure the necessary State Highway and municipal permits for Work within state highway and municipal streets. The CONTRACTOR shall comply with all PA Department of Transportation and municipal laws, rules and regulations, ordinances, including but not limited to furnishing bonds and insurance required and the cost of inspection of the Work. All PennDOT highway inspection fees charged by the PA Department of Transportation or other agency shall be paid by the Developer or CONTRACTOR. All Borough of Wyomissing charges for construction observation of the Work shall be paid by the Developer.

V. CONSTRUCTION OBSERVATION OF THE WORK

The Developer, acting through its CONTRACTOR, shall notify the Borough of Wyomissing three (3) working days in advance, when construction work is proposed to commence, so that appropriate construction observation time may be scheduled. No work may be prosecuted in the absence of construction observation, and any work performed without construction observation shall be re-excavated, exposed and observed by the Borough of Wyomissing's representatives as ordered by the Borough. Any defective work, or work not conforming to the specifications is to be replaced to the satisfaction of the Borough at no expense to the Borough. The allowable workdays are Monday through Friday of any week, excluding holidays.

VI. ACCEPTANCE OF SYSTEM EXTENSIONS AND ADDITIONS

After any sanitary, water, or storm sewer line has been extended from the existing system, and has been satisfactorily tested and approved by the Borough's representatives, and the system has been placed in operation, the Borough will notify the Developer of its intention to accept dedication of the line extension after a set maintenance period after the initial date of use of the system. During the maintenance period, all Work that may be required to make repairs or replacements, shall be the responsibility of the Developer, or its CONTRACTOR, and the Borough shall have no obligation to make these repairs or replacements. The Developer, or its CONTRACTOR, shall promptly address defects which may be identified. For extensions located in state roadways, the maintenance provision shall be two (2) years or such longer interval as PENNDOT may require.

No sanitary or storm sewer line addition or extension shall become the responsibility of the Borough of Wyomissing until a deed of dedication shall have been fully executed by the Borough and the Developer.

VII. SPECIFICATIONS AND MATERIALS OF CONSTRUCTION

The following sections provide information on the required items:

Division 1 - General Requirements
Division 2 - Site Work
Division 3 - Concrete Work
Standard Details

The content of the text in these Divisions may be modified on specific projects, including Work directly contracted by the Borough; or where Borough payment procedures, cross-references between additional Divisions, or other circumstances specific to a particular project necessitates such modification at the sole discretion of the Borough its consultants, solicitor, and staff.

* * *

DIVISION 1 - GENERAL REQUIREMENTS

01300 Submittals

01400 Quality Control

01600 Material and Equipment

01700 Contract Closeout

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittal procedures.

B. Schedules: construction progress, submittals.

C. Proposed Products list.

D. Shop Drawings.

E. Product data.

F. Samples.

G. Manufacturers' instructions.

H. Manufacturers' certificates.

I. Construction photographs.

1.02 RELATED SECTIONS

A. Section 01400 - Quality Control

B. Section 01600 - Material and Equipment

C. Section 01700 - Contract Closeout

1.03 SUBMITTAL PROCEDURES

A. Transmit each submittal in a format acceptable to the ENGINEER.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Identify Project, Contract number, CONTRACTOR, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate. Provide a written explanation of the Specification section number to which the submittal applies.

D. Apply CONTRACTOR'S stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Specifications.

E. Schedule submittals to expedite the Project, and deliver to ENGINEER. Coordinate submission of related items.

F. Identify variations from Specifications and Product or system limitations which may be detrimental to successful performance of the completed Work.

G. Provide blank space for CONTRACTOR and ENGINEER review stamps.

H. Provide Material Safety Data Sheets (MSDS) for all products and materials.

I. Revise and resubmit submittals as required. Identify all changes made since previous submittal.

J. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

K. For projects undertaken by the Borough as public works, review of resubmittals after the first resubmittal will be charged to the CONTRACTOR. The appropriate amount of charge will be deducted from CONTRACTOR payments.

L. An electronic copy in Adobe ".PDF" format, or similar program, of all submittals shall be provided. Three (3) copies of the submittals, product information sheets, catalog cut information, etc. will be retained by the Borough and/or ENGINEER, and electronic copy will be returned to the CONTRACTOR. It is the CONTRACTOR'S responsibility to duplicate/recopy the returned submittal information to produce adequate copies for the CONTRACTOR'S needs. Electronic copies may be distributed for review as well.

1.04 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial construction progress schedule and submittal schedule in duplicate 30 days prior to start of construction for ENGINEER review.

B. Revise and resubmit as necessary when changes occur.

C. Submit a horizontal bar chart with a separate line for each major section of Work or operation, identifying the first workday of each week.

D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

1.05 PROPOSED PRODUCTS LIST

A. Submit 15 days prior to start of construction a complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.06 SHOP DRAWINGS

A. Submit an electronic copy as denoted in Subsection 1.03.L which will be retained by the ENGINEER.

B. After review, reproduce and distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01700 - Contract Closeout.

1.07 PRODUCT DATA

A. Submit an electronic copy as denoted in Subsection 1.03.L which will be retained by the ENGINEER.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to the Project.

C. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01700 - Contract Closeout.

1.08 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of finishes, textures, and patterns for the OWNER'S selection.

C. Include identification on each sample, with full Project information.

D. Submit the number of samples specified in individual specification Sections; one of which will be retained by the ENGINEER.

E. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

1.09 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Specifications.

1.10 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification Sections, submit manufacturers' certificate to the ENGINEER for review, in quantities specified for Product Data. All manufacturers' certificates shall clearly provide a two (2) year unqualified

guarantee.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to the ENGINEER.

1.11 CONSTRUCTION PHOTOGRAPHS

A. Submit photographs to the ENGINEER as required.

B. Identify photographs with date, time, orientation, project identification, and description of the photograph content.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Quality assurance and control of installation.

B. References.

C. Field Samples

D. Inspection and testing laboratory services.

E. Manufacturers' field services and reports.

1.02 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 01600 - Material and Equipment

C. Section 01700 - Contract Closeout

1.03 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified, acceptable quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Specifications, request clarification from the ENGINEER before proceeding.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.04 REFERENCES

A. Conform to reference standard by date of issue, current on date of Agreement.

B. Obtain copies of standards when required by Specifications.

C. Should specified reference standards conflict with Specifications, request clarification from the ENGINEER before proceeding.

1.05 FIELD SAMPLES

A. Install field samples at the site as required by individual specifications Sections for review.

B. Acceptable samples represent a quality level for the Work.

C. Where field sample is specified to be removed in individual Sections, clear area after field sample has been accepted by the ENGINEER.

1.06 TESTING LABORATORY SERVICES

A. CONTRACTOR shall employ services of an independent testing firm, approved by the ENGINEER to perform the testing required by the specifications.

B. The independent firm shall perform tests and other services specified in individual specification Sections and as required by the ENGINEER.

C. Reports shall be submitted by the testing firm to the ENGINEER, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

D. CONTRACTOR shall cooperate with testing firm in furnishing samples of materials, design mix, equipment, tools, storage and assistance as requested.

1. Notify the ENGINEER and testing firm 24 hours prior to expected time for operations requiring services.

2. Make arrangements with testing firm and pay for additional samples and tests required for the CONTRACTOR'S use.

E. Retesting required because of non-conformance to specified requirements shall be performed by the same testing firm on instructions by the ENGINEER.

1.07 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual specification Sections, the OWNER may require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, as applicable, and to initiate instructions or startup when necessary.

B. Submit qualifications of observer to the ENGINEER 30 days in advance of required observations. Observer subject to approval of the ENGINEER.

C. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Submit report in duplicate within 30 days of observation to the ENGINEER for review.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01600
MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Product options.

E. Substitutions.

1.02 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 01400 - Quality Control

C. Section 01700 - Contract Closeout

1.03 PRODUCTS

A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Specifications.

B. Provide interchangeable components of the same manufacture, for components being replaced.

1.04 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and Products are undamaged.

C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.05 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturers' instructions, with seals and labels intact and legible.

B. Store sensitive Products in weather tight, climate controlled enclosures.

C. For exterior storage of fabricated Products, place on sloped supports, above ground.

D. Provide off-site storage and protection when site does not permit on-site storage or protection.

E. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of Product.

F. Store loose granular materials on solid flat surfaces in a well- drained area. Prevent mixing with foreign matter.

G. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

H. Arrange storage of Products to permit access for inspection. Periodically inspect to assure Products are undamaged and are maintained in acceptable condition.

I. Unless otherwise stated for specific contracts, the OWNER will not pay any percentage cost for stored materials. The CONTRACTOR shall schedule deliveries to follow the work sequence.

1.06 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

D. Products Specified by Naming Only One Manufacturer: No options, no substitutions allowed.

1.07 SUBSTITUTIONS

A. Document each request with complete data substantiating compliance of proposed Substitution with these specifications.

B. A request constitutes a representation that the CONTRACTOR:

1. Has investigated the proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty for the Substitution as for the specified product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be completed at no additional cost to the OWNER.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

C. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without a separate written request or when acceptance will require revisions to other aspects of the project.

D. ENGINEER will determine acceptability of proposed substitution and will notify CONTRACTOR of acceptance or rejection, in writing, within a reasonable amount of time.

E. Only one request for substitution will be considered for each product. When substitution is not accepted, CONTRACTOR shall provide the specified product.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Adjusting.

D. Project record documents.

E. Operation and maintenance data.

F. Warranties.

G. Spare parts and maintenance materials.

1.02 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 01400 - Quality Control

C. Section 01600 - Material and Equipment

1.03 CLOSEOUT PROCEDURES

A. Submit written certification that Specifications have been reviewed, Work has been inspected, and that Work is complete in accordance with Specifications and ready for the ENGINEER'S review.

B. Provide submittals to the ENGINEER that are required by governing or other authorities.

1.04 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean site; sweep paved areas, rake clean all landscaped surfaces.

C. Remove waste and surplus materials, rubbish, and construction equipment from the site.

1.05 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.06 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work:

1. Drawings.

2. Specifications.

3. Reviewed Shop Drawings, Product Data, and Samples.

4. Manufacturer's instruction for assembly, installation, and adjusting. This document(s) shall be bound in a 3-ring notebook binder as described in 1.07 of this Section.

B. Ensure entries are complete and accurate, enabling future reference by the OWNER.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

1. Manufacturer's name and product model and number.

2. Product substitutions or alternates utilized. Substitutions or alternates shall have the prior approval of the OWNER or ENGINEER as appropriate.

3. Changes made by Addenda and Modifications.

F. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

4. Field changes of dimension and detail.

5. Details not on original Contract Drawings.

G. Submit documents to the ENGINEER prior to final approval.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit data on 8-1/2 x 11 inch (216 x 279 mm) text pages, in a three-D ring, side binder with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of Project, and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on 24 pound white paper, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of the ENGINEER, CONTRACTOR, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

   a) Significant design criteria.
   b) List of equipment.
   c) Parts list for each component.
   d) Operating instructions.
   e) Maintenance instructions for equipment and systems.

   f) Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:

   a) Shop Drawings and product data.
   b) Air and water balance reports.
   c) Certificates.
   d) Photocopies of warranties and bonds.

E. Submit 1 draft copy of completed volume(s) 30 days prior to final inspection. This copy will be reviewed and returned after final inspection, with the ENGINEER'S comments. Revise content of all document sets as required prior to final submission.

F. Submit four sets of revised final volume(s), within 10 days after final inspection.

1.08 WARRANTIES

A. Provide duplicate notarized copies.

B. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in three D ring, side binder with durable plastic cover.

D. Submit prior to final Application for Payment.

E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.09 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to Project site. Obtain receipt prior to final approval.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

DIVISION 2 - SITE WORK

02073 Minor Demolition
02150 Boring, Jacking & Tunneling
02200 Excavation and Earthwork
02225 Trenching, Backfilling and Compacting
02270 Erosion and Sedimentation Control
02322 Flowable Fill
02575 Paving and Resurfacing
02580 Pavement Markings
02601 Manholes
02603 Precast Utility Structures
02605 Manhole Repair and Rehabilitation
02640 Valves and Fire Hydrants
02660 Water Mains
02661 Water Service Connections
02675 Testing and Disinfecting Water Mains
02720 Storm Sewer Pipe
02730 Gravity Sanitary Sewer Pipe
02731 Sanitary Sewer Lateral Connections
02733 Internal Closed Circuit Television Inspection of Sanitary Sewers
02734 Testing and Repair of Sanitary Sewers
02751 Sewer Pipeline Testing
02923 Landscape Grading
02930 Seeding
02938 Sodding
02950 Trees, Plants and Ground Cover

SECTION 02073
MINOR DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of designated construction.

B. Disposal of materials.

C. Identification of utilities.

1.02 RELATED SECTIONS

A. Section 01400 - Quality Control

B. Section 02200 - Excavation and Earthwork

1.03 REGULATORY REQUIREMENTS

A. Conform to applicable section of codes for demolition work, dust control, and products requiring electrical disconnections.

B. Obtain required permits from authorities.

C. Do not close or obstruct egress width to any building or site exit.

D. Conform to procedures applicable when hazardous or contaminated materials are discovered.

1.04 PROJECT CONDITIONS

A. Conduct demolition to minimize interference with adjacent building areas. Maintain protected egress and access at all times.

B. Cease operations immediately if structures appear to be in danger and notify the ENGINEER. Do not resume operations until directed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 PREPARATION

A. Provide, erect, and maintain temporary barriers as necessary.

B. Protect existing materials, equipment, and utilities which are not to be

demolished or altered.

C. Prevent movement of structures; provide bracing and shoring as necessary.

D. Notify affected utility companies before starting work and comply with their requirements.

E. Mark location and termination of utilities.

F. Provide appropriate temporary signage including signage for exit or building egress.

3.02 DEMOLITION

A. Disconnect, remove, cap, and identify designated utilities within demolition areas.

B. Demolish in an orderly and careful manner. Protect existing structures and utilities. Apply water to any structure being demolished to eliminate dust emissions.

C. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

D. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

3.03 REMOVALS

A. Utilities to be removed shall be disconnected and terminated in an approved manner.

B. Paving

1. Concrete pavements: Where it is necessary to excavate a trench across or make a cut in concrete paved areas the CONTRACTOR shall first score the concrete in neat straight lines to a depth of not less than 2 inches with an approved concrete cutting saw prior to removing concrete.

2. Bituminous pavements: Where it is necessary to excavate a trench across or make a cut in bituminous paved areas, the CONTRACTOR shall cut paving along neat straight lines using an approved pneumatic spade, or construction saw equipped for trench saw cutting.

3. Restoration of paved areas: Restore all paved areas to their original condition using material of like type and quality as the removed paving and in compliance with PennDOT Form 408. Repaired surfaces shall match existing adjacent paving.

END OF SECTION

SECTION 02150
BORING, JACKING, TUNNELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Trench Excavation

B. Installation of Casing Pipe or Liner

C. Installation of Carrier Pipe

1.02 RELATED SECTIONS

A. Section 01400 - Quality Control

B. Section 02200 - Excavation and Earthwork

C. Section 02225 - Trenching, Backfilling and Compacting

D. Section 02575 - Paving and Resurfacing

E. Section 02720 – Storm Sewer Pipe

F. Section 02730 - Gravity Sanitary Sewer Pipe

G. Section 02731 - Sanitary Sewer Lateral Connections

1.03 QUALITY ASSURANCE

A. CONTRACTOR Qualifications:

1. Construction operations shall be undertaken only by a CONTRACTOR well experienced in operations of similar magnitude and condition under transportation arteries, surface areas, and subsurface infrastructure which cannot be disturbed. As evidence of experience, the CONTRACTOR shall submit a detailed list of successfully completed projects. At least three (3) equivalent projects are required to be listed.

B. Design Criteria:

1. Pipe and joints of leakproof construction, designed for the earth and/or other pressure present, plus highway H25 loading or railway E80 loading with the associated recommended impact loading.

2. Design bracing, backstops, and use jacks of sufficient rating so that the jacking can proceed without stoppage, except for adding pipe sections and as conditions permit, to minimize the tendency of the ground material to 'freeze' around the casing pipe.

C. Allowable Tolerances:

1. Do not overcut excavation by more than 1" greater than the outside diameter of the casing pipe.

2. Install casing pipe with the determined vertical and horizontal alignment prior to installation of the carrier pipe.

D. Reference Codes and Specifications:

1. Comply with applicable federal, state and local ordinances, codes, statutes, rules and regulations, and affected jurisdictional bodies.

2. Comply with Pennsylvania Department of Transportation Publication 408 Specifications, and any other PennDOT requirements.

1.04 SUBMITTALS

A. Submit description of proposed construction methods, including methods to establish and maintain vertical and horizontal alignment.

B. Submit tunnel liner design calculations and manufacturer's data on tunnel liner plate when used, showing sizes, shapes, methods of attachment and connection details, and details of grout holes.

1. Highway Crossings: Design tunnel for earth and/or other pressure loads present, plus AASHTO H25 live loading.

2. Railroad Crossings: Design tunnel for earth and/or other pressure loads present, plus Cooper's Railroad E80 live loading with 50-percent added for impact.

1.05 JOB CONDITIONS

A. Conduct operations so as not to interfere with, interrupt, damage, destroy, or endanger the integrity of surface or subsurface structures or utilities, and landscape in the immediate or adjacent areas.

B. When boring, jacking or tunneling under state highways and railroads, comply with applicable right-of-way occupancy permits.

C. If boring is obstructed, provide boring auger cutting head with rock cutting capability.

D. Provide temporary access to adjacent properties when necessary for ingress or egress of people and vehicles.

E. Slope all casing pipe to one end to allow drainage through drain pipe.

PART 2 PRODUCTS

2.01 STEEL CASING PIPE

A. ASTM A53; 35,000 psi minimum yield strength.

B. Full circumference welded joints.

C. Diameter and wall thickness as shown on the drawings.

D. The minimum diameters and wall thickness as shown in the Standard Details with minimum of 20 mils bitumastic coating, inside and outside.

2.02 TUNNEL LINER PLATE

A. Steel: ASTM A569, Minimum Yield Strength 28,000 psi. Galvanized.

B. Bolts and Nuts: ASTM A307, galvanized.

C. Coated with minimum of 20 mils of bitumastic coating. Coating shall be on all sides.

2.03 TIMBER SKIDS - Section not used.

2.04 FINE AGGREGATES

A. Sand - Section 703.1, Publication 408 Specifications, Table A, Type A.

B. Fine Stone - Section 703.2, Publication 408 Specifications, Table C, AASHTO #10.

2.05 GROUT

A. One part Portland cement (ASTM C150), and 6 parts mortar sand mixed with water to a consistency applicable for pressure grouting.

2.06 DRAIN PIPE

A. Polyvinyl Chloride (PVC) Plastic Pipe - ASTM D1785, one (1) inch inside diameter.

2.07 CASING SPACERS

A. Casing spacers will generally be required to center the carrier pipe in the casing.

B. Casing spacers shall be used to center the carrier pipe, aid in installation, and provide clearance for bell of pipe as shown on the Standard Details

C. Constructed as follows:

1. Band - 14 gauge T-304 stainless steel

2. Liner - .090" thick PVC

3. Length - 8" up to 12" carrier pipe
12" in excess of 12" carrier pipe

4. Runners - 2" wide polymer plastic

D. Spacers shall be placed a maximum of one foot from each side of joint and installed with a maximum of 12' separation between spacers. At least four (4) spacers shall be provided per length of carrier pipe.

E. Acceptable Manufacturers:

1. Advance Products & Systems, Inc.

2. Cascade Waterworks Manufacturing Company

3. Substitutions in accordance with Section 01600.

PART 3 EXECUTION

3.01 APPROACH TRENCH

A. Excavate approach trench using methods as site conditions require.
B. Ensure pipe entrance faces as near perpendicular to alignment as conditions permit.

C. Establish a vertical entrance face at least 1 foot above top of casing or tunnel lining.

D. Install adequate excavation supports as specified in Section 02225 - Trenching, Backfilling and Compacting.

3.02 CASING PIPE INSTALLATION METHODS

A. Boring:

1. Push the pipe into the ground with a boring auger rotating within the pipe to remove the spoil. Do not advance the cutting head ahead of the casing pipe except for that distance necessary to permit the cutting teeth to cut clearance for the pipe. The machine bore and cutting head arrangement shall be removable from within the pipe. Arrange the face of the cutting head to provide a barrier to the free flow of soft material.

2. If unstable soil is encountered during boring, retract the cutting head into the casing to permit a balance between the pushing pressure and the ratio of pipe advancement to quantity of soil.

3. If voids should develop greater than the outside diameter of the pipe by approximately one inch, grout to fill voids. Grouting to fill voids will be at

the expense of the CONTRACTOR.

4. If rock is encountered, provide a cutting head which will satisfactorily remove the rock material.

B. Ramming:

1. Push the pipe through the ground using a pipe driving hammer, i.e. Grundoram, or equivalent.

2. Inject a high density slurry to the head of the casing and inside the casing where necessary.

3. Remove spoil in pipe by flushing with compressed air and water.

C. Jacking:

1. Construct adequate thrust wall normal to the proposed line of thrust.

2. Impart thrust load to the pipe through a suitable thrust ring that is sufficiently rigid to ensure distribution of the thrust load on the pipe.

C. Drilling and Jacking:

1. Use an oil field type rock roller bit or plate bit made up of individual roller cutter units solidly welded to the pipe which is turned and pushed for its entire length by the drilling machine to give the bit the necessary cutting action.

2. Inject a high density slurry (oil field drilling mud) to the head as a cutter lubricant. Inject slurry at the rear of the center units to prevent jetting action ahead of the pipe.

D. Mining and Jacking:

1. Utilize manual hand-mining excavation from within the casing pipe as it is advanced with jacks, allowing minimum ground standup time ahead of the casing pipe.

3.03 TUNNELING:

A. Advance excavation for the tunnel liner in increments sufficient for the erection of one ring of liners and install liner plates immediately after each increment of excavation. Carry on excavation in such a manner that voids behind the liner plates are held to a minimum. Completely fill such voids with grout followed immediately by grout placed under pressure.

B. Excavate to the lines, grades, dimensions and tolerances as specified and shown, to accommodate the initial support and permanent lining.

C. Installation of Tunnel Linings:

1. Install the tunnel lining in a manner that will not damage the lining or coating.

2. Ensure that the edges are clean and free from material that could interfere with proper bearing.

3. Install bolts for liner plates in accordance with liner plate manufacturer's recommendations and re-tension or replace if necessary any bolt which does not meet the requirements.

3.04 DEWATERING

A. Intercept and divert surface drainage, precipitation and groundwater away from excavation through the use of dikes, curb walls, ditches, pipes, sumps or other means.

B. Develop a substantially dry subgrade for the prosecution of subsequent operations.

C. Comply with Federal and State requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.

3.05 PRESSURE GROUTING

A. Pressure grout the annular space between the casing pipe and surrounding earth.

3.06 CARRIER PIPE INSTALLATION

A. All provisions regarding cleaning, inspection and handling specified under pipe material sections apply to this work.

B. Place the carrier as shown on the Standard Details. Exercise care to prevent damage to pipe joints when carrier pipe is placed in casing.

C. Support pipeline within casing so that no external loads are transmitted to carrier pipe. Attach casing spacers to barrel of carrier pipe; do not rest carrier pipe on bells.

D. Close ends of casing as shown on the Standard Details.

END OF SECTION

SECTION 02200
EXCAVATION AND EARTHWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and Grubbing

B. Pavement Removal

C. Stripping and Stockpiling Topsoil

D. Rock Excavation

E. Excavation

F. Subgrade Preparation

G. Filling

H. Backfilling

I. Rough Grading

J. Shoring, Bracing and Sheeting

K. Underpinning

L. Explosives

1.02 RELATED SECTIONS

A. Section 01400 - Quality Control

B. Section 02225 - Trenching, Backfilling and Compacting

C. Section 02575 - Paving and Resurfacing

D. Section 02923 - Landscape Grading

E. Section 02930 - Seeding

F. Section 02950 - Trees, Plants and Ground Cover

1.03 REFERENCES

A. ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D1556 - Density of Soil in Place by the Sand Cone Method.

C. ASTM D1557 - Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 Pound Rammer and 18-inch Drop.

D. ASTM D2167 - Density of Soil in Place by the Rubber Balloon Method.

E. ASTM D2487 - Classification of Soils for Engineering Purposes.

F. ASTM D2922 - Density of Soil and Soil Aggregate in place by Nuclear Methods.

G. ASTM D4318 - Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

H. NFPA 495 - Manufacture, Transportation and Storage and Use of Explosives.

I. AASHTO - M14 - Materials for Aggregate and Soil Aggregate.

1.04 QUALITY ASSURANCE

A. All blasting of subsurface rock must be performed under the supervision and direct control of a licensed blaster with a minimum of five years of documented experience.

B. All filling and backfilling and subgrade may be laboratory and field tested to verify compaction requirements and conformance with specifications. Testing will be done in accordance with Section 01400 -Quality Assurance.

C. Provide materials of each type from same source throughout the work.

1.05 REGULATORY REQUIREMENTS

A. Conform to local code requirements for disposal and/or burning of debris.

B. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.

C. Comply with all state, county and local regulations governing use of explosives for removal of subsurface rock.

D. Comply with NFPA 495 - Code for the Manufacture, Transportation, Storage and Use of Explosive Materials.

E. Rules and regulations of the various utility companies and other authorities having jurisdiction over such Work shall be observed in the performance of all earthwork operations.

1.06 EXAMINATION

A. Verify site conditions prior to starting work.

B. Verify that survey bench mark and intended elevations for the work are as indicated.

C. Verify all underground and above ground utility line locations, pipes and other infrastructure whether or not these items are included within the categories incorporated in the PA Underground Utilities Act 187 or any amendments thereto.

1.07 PROTECTION

A. Do not damage or disturb any existing monuments, bench marks, structures, fences, sidewalks, paving, curbs and other markers. Provide suitable protection where required before starting Work. Restore any damage to original condition or repair as directed at CONTRACTOR cost.

B. Before starting Work, protect any trees or shrubs shown or designated to be saved by boxing or wire fencing staked securely in place or by other approved means. Protection shall be maintained until completion of work, or until removal is be directed by the OWNER and the ENGINEER.

C. Protect and maintain above and below grade utilities that are to remain.

D. Protect excavations and adjacent property and structures by shoring, bracing, sheet piling, underpinning or other methods as required to prevent cave-in, damage, and/or loose soil from falling into the excavation at no additional cost to the OWNER.

E. Underpin adjacent structures and utilities which may be damaged by excavation work.

F. The OWNER and ENGINEER shall be notified immediately if any unexpected subsurface condition, such as buried structures or utility lines are encountered, and discontinue work in that area until notified to proceed. The ENGINEER will determine the disposition of the obstruction. The Contractor shall adequately protect and support the obstruction until a determination is made and relocate, realign or dispose of the obstruction as directed by the ENGINEER at no additional cost to the OWNER.

G. Protect the bottom of excavations and soil adjacent to and beneath foundations from frost.

H. The top of the excavation shall be mounded or graded to prevent surface water runoff from entering the excavation.

I. Do not interfere with 45° bearing splay of foundations.

J. Erect and maintain guide rails, fences, warning lights or other protection as required for the safety of all persons at the excavations.

1.08 SUBMITTALS

A. As-built record drawings shall be submitted in accordance with Section 01700 - Contract Closeout. Record drawings shall accurately locate both new and existing utilities. Utilities shall be located both horizontally from some permanent

structure and vertically by elevation.

B. Submit samples of each type of fill and backfill material to be used in accordance with Section 01400, Quality Control. Each sample shall be representative of the fill type, weighing 10 pounds, and shall be sealed in an air-tight container and delivered to the ENGINEER or to the designated testing laboratory, if required by the ENGINEER.

C. Materials Source: Submit names of material sources.

PART 2 PRODUCTS

2.01 Topsoil: excavated material, graded free of roots, rocks larger than 1 inch, subsoil, debris, weeds and foreign matter.

2.02 Subsoil: excavated material, graded free of soil masses larger than 6 inches, rocks larger than 3 inches, and debris.

2.03 Rock: any material which cannot be dislodged by a D-8 Caterpillar tractor, or equivalent, equipped with a hydraulically operated power ripper (or by a CAT 235 hydraulic backhoe or equivalent) without the use of extraordinary rock excavation techniques. Boulders or masses of rock exceeding 1/2 cubic yard in volume shall also be considered rock excavation. This classification does not include materials such as loose rock, concrete or other materials that can be removed by means other than extraordinary rock excavation techniques, but which for reasons of economy in excavating the CONTRACTOR chooses to remove by extraordinary rock excavation techniques.

2.04 Buried Structures: concrete and masonry structures not shown on the Drawings and encountered during the excavation and requiring removal shall be classified as rock.

2.05 Blasting Materials: explosive, delay devices, blasting mats and other associated materials shall be the type recommended by the explosives firm and as required by the authorities having jurisdiction.

2.06 Select Fill Materials:

A. Type A - Crushed Stone: natural stone free of shale, clay, friable materials, debris and organic materials size and grading to comply with AASHTO No. 57 (PennDOT No. 2B).

B. Type B - Crushed Stone: natural stone free of clay, shale, friable material, debris and organic materials and graded in accordance AASHTO No. 3.

C. Type C - Crushed Stone or Gravel: free of shale, clay, friable materials, debris and organic materials graded in accordance with PennDOT Number 2A.

D. Type D - Sand: natural river or bank sand, washed, free of silt, clay, loam, friable or soluble materials and organic matter graded in accordance with ANSI/ASTM C136 within the following limits:

Sieve Size	Total Percent Passing
#4	100
14	60-100
50	20-80
100	10-30
200	0

E. Type E - Structural Fill: consisting of CL or better material according to ASTM D2487 with a maximum particle size of 3 inches.

2.07 Common Fill Materials - Subsoil; either reused or imported soil material free of soil masses larger than 6 inches, rocks larger than 3 inches, roots, organic material and debris. No more than 5% by weight of fill material shall consist of rocks.

2.08 Accessories:

A. Silt Barrier Fence - PennDOT Class 3, Type B.

B. Separation Geotextile Fabric - PennDOT Class 4.

PART 3 EXECUTION

3.01 CLEARING AND GRUBBING

A. Clear and grub all areas required for access to the site and execution of the Work. Remove all trees and shrubs within the marked areas designated for removal.

B. Protect all trees and shrubs designated to be maintained or relocated.

C. Grub out all stumps and roots to a minimum of three feet below finished grade. Clear undergrowth and dead wood without disturbing the subsoil.

D. Remove and dispose of all perishable and objectionable material including but not limited to trees, brush, vines, shrubs, bushes, logs, stumps, roots, weeds, rubbish and other organic material.

E. Trees in rights-of-way shall not be cut down except by authorization of the ENGINEER. Excavation by hand, or tunnelling may be required in vicinity of trees left standing.

3.02 PAVEMENT REMOVAL

A. Remove all pavement, road surfaces, curbing, driveways and sidewalks within the lines of excavation. Saw-cut or mill areas to be removed, to provide a clean cut in the pavement.

B. Cement concrete pavements shall be opened by sawing. Asphaltic concrete pavements shall be cut to neat straight lines with channeling machines or other methods to provide a clean cut in the pavement and base without undue

shattering.

C. All debris and material resulting from the removal shall be removed from the site and legally disposed of by the CONTRACTOR.

3.03 PREPARATION

A. Identify required lines, levels, contours and datum.

B. Identify all utilities and mark locations.

C. Maintain and protect existing utilities which pass through the work area and are to remain in service.

D. Notify utility companies to remove and/or relocate utilities as required.

E. Upon discovery of unknown utilities or concealed conditions, discontinue Work in the affected area and notify the ENGINEER.

F. Implement all procedures as required by the sediment and erosion control plan. Temporary seeding shall be employed on all areas that are disturbed and remain exposed for more than twenty days.

3.04 STRIPPING TOPSOIL

A. Before starting excavation, remove topsoil to its full depth, from all areas that are to be further excavated, relandscaped or regraded. Do not excavate saturated topsoil.

B. Topsoil shall be stockpiled at the site as directed for use in further finish grading. All stockpiles shall receive temporary seeding.

3.05 STOCKPILING

A. Stockpile materials on site at suitable locations, or as directed by the ENGINEER.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

E. Clean stockpile area of excess fill material. Leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

3.06 ROCK EXCAVATION

A. The CONTRACTOR shall excavate and remove rock by mechanical methods to the dimensions and elevations as required for the proposed construction.

B. If rock cannot be excavated by suitable mechanical means, the CONTRACTOR shall:

1. Notify the ENGINEER and the Borough in writing;

2. Obtain all necessary permits for explosive methods,

3. Advise owners of adjacent buildings or structures in writing of intended blasting operations,

4. Proceed with rock disintegration under supervision of licensed blaster using charges, delay devices and safety measures as required by the explosives firm engaged for the Work.

C. Cut away rock at excavation bottom to form a sound level bearing surface. Shattered, fractured or otherwise unsound shale layers shall be removed.

D. All excavated material shall be removed from the site and legally disposed of by the CONTRACTOR.

3.07 EXCAVATION

A. The CONTRACTOR shall perform all excavation required to construct all facilities, structures and Work incidental thereto. Excavation shall extend a sufficient distance to allow working space and inspection, except where concrete is to be deposited directly against excavated surfaces.

B. All loose material shall be removed from excavations, and bottoms shall be carefully leveled to grade.

C. None of the above provisions shall be construed to relieve the CONTRACTOR of his responsibility to make a careful personal examination of the site in order to satisfy himself as to the nature and location of the Work required, the conformation of the ground, the soil and rock conditions and the character, quality, and quantity of the materials.

D. Excavated materials to be used for backfill or other purposes shall be piled away from the edge of the excavated area a sufficient distance to prevent overloading the bank, and graded in such a way as to prevent surface water from entering the excavated area. Excess material from excavation not suitable nor required for backfill or other purposes shall be hauled from the site.

E. Excavations shall not be carried below existing structure foundations until underpinning and/or shoring, to be performed by the CONTRACTOR, has been completed.

F. Do not excavate to full depth when rain or freezing conditions are imminent. Where soil surfaces are damaged by water, mud, or otherwise disturbed, all loose mud or other materials shall be removed and the surface regraded.

G. The CONTRACTOR shall furnish adequate advance notification to the ENGINEER of times when footing excavations are to be completed so that the bearing quality of bottoms may be inspected and/or tested before forms are constructed or concrete placed.

H. If suitable bearing is not encountered at the depth indicated on the Drawings for foundations, the CONTRACTOR shall immediately notify the ENGINEER. The CONTRACTOR shall not proceed further until instructions are given and necessary measurements made for the purpose of establishing additional volume of excavation.

I. The CONTRACTOR shall pump or otherwise remove any water which may be found in the excavation, and he shall provide drainage ditches, underdrains, flumes, well points, pumping equipment or other materials as necessary to keep the excavation free of water so that all required Work can be done in the dry.

J. The CONTRACTOR shall shore, brace, and use sheet piling as necessary to prevent caving in accordance with Federal and State laws and codes. Cover holes and trenches when work is not in progress. Fence or barricade sharp changes in plane of more than 3 feet in height. Protect persons from injury and property from damage. The CONTRACTOR shall satisfactorily repair or remove and replace work that has been damaged due to failure to provide adequate support or through negligence or fault of the CONTRACTOR in any other manner. The CONTRACTOR shall remove shoring, sheet piling and temporary items as work progresses, and shall not leave temporary wood in concrete, masonry, or earth fill.

3.08 SUBGRADE PREPARATION

A. After excavating and/or stripping topsoil in the areas of buildings, roads and other structures, the existing subgrade shall be proofrolled with at least ten complete coverages of a 10 ton capacity roller, to obtain a firm unyielding subgrade. The CONTRACTOR shall notify the ENGINEER at least seventy-two hours in advance of the proofrolling operation, so that a representative can observe the process.

B. If during the proofrolling operations any soft, unstable or yielding areas are found, they shall be overexcavated to a depth and width as ordered by the ENGINEER and backfilled with select fill compacted to an in-place density of ninety-eight percent of the maximum dry density or otherwise stabilized or modified as directed by the ENGINEER.

3.09 FILLING, BACKFILLING AND ROUGH GRADING

A. Filling and backfilling shall be performed to the rough grades and compaction percentages as indicated in the schedule below by placing and compacting select fill or approved common fill in continuous layers not exceeding 8 inches loose depth.

B. The fill or backfill material shall be maintained at $\pm$3% of the optimum moisture content, as determined by laboratory testing, to insure proper compaction.

C. No backfill shall be placed on frozen, wet, spongy or unstable subgrade surface. No frozen material shall be used for fill.

D. The CONTRACTOR shall employ a placement method to avoid damage to foundation walls, dampproofing, buried piping and accessories.

E. Horizontally bench existing slopes greater than 1 to 4, to key placed fill material to slope to provide firm bearing.

F. Foundation walls shall be completely cured, tested for watertightness and braced prior to backfilling.

G. When walls are to be backfilled on both sides, the backfilling shall be done simultaneously never exceeding a differential fill height of 2 feet.

3.10 BACKFILL SCHEDULE

A. The paragraphs below identify location, fill material to be used in layers from the prepared existing subgrade up to the proposed rough grade or base elevation and compaction as a percentage of the maximum density as determined by laboratory testing.

B. Only vibratory compaction equipment approved by the ENGINEER and listed below shall be utilized.

1. Vibratory drum rollers utilizing cleated or sheepsfoot style drums, i.e., RAMEX style.

2. Hydraulic plate soil compactors (Head Shakers), i.e. Tramac Compactors.

3. If existing conditions warrant, other soil compaction equipment may be used when approved by the ENGINEER.

The recommendations of the equipment manufacturers as to the maximum lift thickness which can be placed, and the method of compaction to be used with the equipment to achieve the required compaction shall be followed. In no case shall maximum lift thickness placed exceed the maximum limits specified by the manufacturers' recommendations. However, if the equipment manufacturer's lift thickness recommendation is followed and the specified compaction is not obtained, the CONTRACTOR shall, at his own expense, remove, replace, and retest as many times as is required to obtain the specified compaction.

C. Compaction testing shall be performed in accordance with Section 01400 - Quality Control. If tests indicate Work does not meet the specified requirements, it shall be removed, replaced and retested until compliance is achieved.

D. Schedule

1. Slabs on grade - approved compacted Type E structural fill compacted to 95% with a six (6) inch thick cover of AASHTO No. 57 crushed stone

(PennDOT No. 2B) compacted to 98%.

2. Building and equipment foundations - approved compacted Type E structural fill compacted to 95% with a six (6) inch thick cover of AASHTO No. 57 crushed stone (PennDOT No. 2B) compacted to 98%.

3. Buried Tank Slabs - six (6) inch thick leveling layer of AASHTO No. 57 crushed stone (PennDOT No. 2B) compacted to 98% placed on approved subgrade. Subgrade shall have a minimum modulus of subgrade reaction of 120 pci.

4. Exterior side of foundation walls - subsoil over granular filter material surrounding drainage pipes to proposed subgrade compacted to 95%.

5. Grassed Areas - subsoil to four (4) inches below finished grade compacted to 95%.

6. Landscaped Areas - subsoil to twelve (12) inches below finished grade compacted to 95%.

7. Subsurface drains and weepholes – AASHTO No. 3 stone one (1) cubic foot per foot and one (1) cubic yard at weepholes compacted to 95%.

8. Asphalt or concrete walkways - approved common fill compacted to 95% with a four (4) inch thick cover of AASHTO No. 57 crushed stone (PennDOT No. 2B) compacted to 95%.

9. Asphalt or concrete roadways, driveways and parking areas - approved common fill compacted to 95% with a cover of PennDOT Number 2A Modified crushed stone select fill (thickness as shown on the Drawings) compacted to 95%.

10. Interior crawl spaces - approved common fill compacted to 95% with a two (2) inch thick cover of Type D select fill compacted to 95%.

E. All areas disturbed during construction shall be rough graded to the elevations as indicated on the Drawings (±1 inch). Slope grade away from the building a minimum of 2 inches in 10 feet unless noted otherwise on the Drawings. Changes in grade shall be gradual and slopes shall be blended into level areas.

F. Clean stockpile areas of excess fill material and remove surplus from the site. Any paved area (new or existing) over which hauling operations or other equipment moving is or was conducted shall be kept clean and any soil or other material left on paved surfaces shall be promptly removed by the CONTRACTOR.

G. Any areas damaged or disturbed during the course of the Work shall be restored to their original condition as directed by the ENGINEER.

3.11 SEQUENCE

A. Site Preparation:

1. All trees and brush, including large roots shall be cleared and removed from the portion of the site on which improvements are to be made. All topsoil in proposed paved areas and building sites shall be stripped and stockpiled for non-structural fill or grading purposes.

B. Preliminary Rolling:

1. After site preparation to acceptable limits and before any fill or construction is placed, proofrolling of the entire surface to receive compacted fill shall take place with at least ten complete coverages of a 10 ton capacity roller, to obtain a firm unyielding subgrade. The CONTRACTOR shall notify the ENGINEER at least 72 hours in advance of proofrolling operation. The fill area shall be rolled in each of two perpendicular directions, and each pass of the proofrolling equipment shall overlap slightly the previous pass. To insure conditions along existing building walls, hand tamp the surface within 4' of all existing walls, also in two perpendicular directions, overlapping previous passes.

2. Compacted structural fill for building and pavement support should consist of CL or better material according to ASTM D2487 with a maximum particle size of three inches. A six inch capillary break consisting of open-graded stone meeting the gradational characteristics of AASHTO No. 57 (PennDOT no. 2B) aggregate should be installed below all floor slabs on-grade. The compaction will be checked by the ENGINEER and fill shall not be placed until the compaction of subgrade is approved by the ENGINEER.

3. As the proofrolling operation progresses, and discloses soft spots or irregularities within the subgrade, they shall be excavated to firm material and then backfilled or leveled to grade with layers of approved fill material previously described, not exceeding loose lifts of approximately 8" and compacted to such a degree that the in-place dry density of the compacted fill shall not be less than 95% of the maximum dry density as determined by ASTM D698, Standard Proctor. This procedure is applicable to any soft spots discovered by handtamping along existing walls.

C. Moisture Control:

1. The control of moisture during the construction of the fills shall be based on the results of the Modified Proctor Compaction Tests, ASTM Designation D1557. Compaction curves resulting from tests on approved fill material or other suitable material shall be prepared by the Testing Agency to show the optimum water contents for compaction. The approved fill materials shall be placed at moisture contents within limits defined by the Modified Proctor Compaction Test such that the specified degree of compaction can be attained.

2. Should the fill material be of such moisture content at the time of placement that the above moisture criterion is not met, then immediate steps shall be taken to dry or to wet the material, as the need may be, to bring the moisture content within the tolerances as above described.

D. Placement of Materials and Compaction:

1. No fill material shall be placed on any point of the surface of the fill to be compacted which has free water standing on it or which is excessively wet, nor shall any fill be placed or compacted in a frozen condition or on top of frozen material.

2. If the moisture contents of the fill materials during placement are too low to achieve the specified degree of compaction, the surface of the loose fill shall be uniformly sprinkled to raise its moisture content approximately to the optimum content. Moisture contents of fill materials which are too high for proper compaction shall be reduced to approximately the optimum moisture content by harrowing and working the soil prior to compaction rolling.

3. At the end of each days operation, the CONTRACTOR shall leave the surface of the fill in such shape so as to provide easy run-off for rainfall.

4. Completed work that fails to conform to the design requirements, as specified above, may lead to rejection of the work, and shall be repaired or replaced in a manner approved by the ENGINEER. Such work shall be executed by the CONTRACTOR at no additional expense to the OWNER, and shall include laboratory tests and costs for re-examination if necessary.

E. Site Grading:

1. Cut, fill, compact and grade project area to subgrade elevation. Grade so that any new grades will meet existing conditions evenly.

F. Excavation:

1. To the extent required under these Specifications, all excavation shall be performed as outlined in this Section. All excavation shall be performed on the basis of UNCLASSIFIED MATERIAL. All excavation for footings shall be carried to the minimum depth indicated on the Drawings.

2. Allow space for construction and inspection operations. Clean and shape bottom of excavation to solid and level surface.

G. Backfilling Within Structures:

1. As far as practicable, all backfill shall be placed as soon as possible after completion of foundation walls, retaining wall, and pits, etc.

2. No fill shall be placed on frozen ground or snow, and no lumber, trees, roots, stumps, frozen soil, or other perishable material shall be buried in any fill. Special care shall be taken in placing backfill around footings, walls, pipes, and other structural components.

3. All backfill material shall be placed in loose layers not exceeding 8" and shall be thoroughly compacted with compactors as approved by the ENGINEER to a dry density of not less than 95% of the maximum dry density according to ASTM D698, Standard Proctor.

H. Rough and Finish Grading, Outside Building Lines:

1. Fill materials outside the building lines shall be compacted to 95% of the Modified Proctor maximum density.

2. Grade finish uniformly with rounded surfaces at the tops and bottoms of abrupt changes of plane. Hand grade steep slopes and areas that are inaccessible for machine work.

3. Finish surfaces properly for landscaping, paving, or as indicated. Variation from a plane shall not exceed 1" in 10 feet. Protect graded areas from undue erosion, or repair and regrade. Refill where noticeable settlement occurs.

3.12 EXCAVATING AND GRADING TOLERANCES

		Elevation	Line
A.	Footings		+2" (Location) -2" (Location)
		Top +1" Bottom -4"	+4" (Width) -0" (Width)
B.	Subgrade for Paving & Slabs	+1" -2"	N/A N/A
C.	All other Work	+2" -2"	+6" -6"

3.13 EXPLOSIVES

A. When explosives are used, work shall be executed by experienced powdermen or persons who are licensed or otherwise authorized to use explosives. Explosives shall be stored, handled, and used in accordance with local regulations and the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc. Any damage to foundations or other work caused by use of explosives shall be corrected at the CONTRACTOR'S expense.

3.14 TESTS AND INSPECTION

A. All testing during the placement of fill and backfilling shall be performed by an independent testing agency in accordance with Section 01400 - Quality Control. The CONTRACTOR shall extend his full cooperation so as to permit the safe and proper execution of field tests, and the procurement of samples for laboratory testing.

B. During the proofrolling operations and during the placement of all types of fill, including backfill to the extent required under this Contract, the Testing Agency and ENGINEER shall be present on the site for the purpose of inspecting the placement of the fill and for testing the in-place densities of the materials as they are compacted. None of these operations shall be performed without notifying the ENGINEER.

C. In-place density determinations shall be made by the Testing Agency at locations to be selected by the ENGINEER as typical of the fill being placed. Whenever in-place densities are found to be less than those specified for certain fill materials and for certain conditions, the ENGINEER may suggest immediate adjustments to the moisture content of the fill materials and/or additional rolling to produce the specified degree of density.

D. Copies of all tests and reports shall be submitted to the ENGINEER.

3.15 SPECIAL REQUIREMENTS

A. Sewage Pumping Station Facility

1. The CONTRACTOR shall excavate the sewage pumping station area to the bottom of the foundations to allow for inspection by the ENGINEER and/or a Geotechnical Engineer hired by the ENGINEER prior to installation of the building foundation.

2. All seams, solution channels and weak zones found shall be excavated and sealed with concrete as directed by the ENGINEER.

3. The CONTRACTOR shall notify the ENGINEER at least 72 hours in advance of the excavation for the building foundation so arrangements for inspections can be made.

4. The CONTRACTOR shall not proceed with the installation of the building foundation and/or wet well structure until the ENGINEER verifies the design as shown on the Drawings is acceptable. The ENGINEER will notify the CONTRACTOR immediately of any changes required.

END OF SECTION

SECTION 02225
TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Maintenance and protection of traffic

B. Cutting paved surfaces

C. Blasting

D. Trench excavation, backfill and compaction

E. Support of excavation

F. Pipe bedding requirements

G. Control and disposal of excavated material

H. Dewatering

I. Rough grading

J. Restoration of paved and unpaved surfaces

1.02 RELATED SECTIONS

A. Section 01400 - Quality Control
B. Section 02200 - Excavation and Earthwork
C. Section 02322 – Flowable Fill
D. Section 02575 - Paving and Resurfacing
E. Section 02720 – Storm Sewer Pipe
F. Section 02730 - Gravity Sanitary Sewer Pipe
G. Section 02731 - Sanitary Sewer Lateral Connections
H. Section 02923 - Landscape Grading
I. Section 02930 - Seeding
J. Section 02950 - Trees, Plants and Ground Cover
K. Section 03301 - Concrete for Utility Construction

1.03 REFERENCES

A. Pennsylvania Department of Transportation:

1. Publication 408 Specifications

2. Publication 213 – Work Zone Traffic Control

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

1. ASTM C33: Specifications for Concrete Aggregates

2. ASTM D698: Tests for Moisture-Density Relations of Soils

3. ASTM D2922: Test for Density of Soil and Soil Aggregate in Place by Nuclear Methods

1.04 QUALITY ASSURANCE

A. Testing Agency:

1. Compaction testing shall be performed by a Soils Testing Laboratory engaged and paid for by the CONTRACTOR and approved by the ENGINEER.

B. Compaction Testing:

1. Conduct compaction tests at locations as directed by the ENGINEER during backfilling operations.

2. Determine compaction in areas other than state highways and shoulders by the testing procedure contained in ASTM D698 or ASTM D2922.

1.05 SUBMITTALS

A. Certificates:

1. Submit certification attesting that the composition analysis of pipe bedding and select material stone backfill materials meet specification requirements.

2. Submit certified compaction testing results from the soils testing laboratory.

B. Compaction Equipment List:

1. Submit a list of all equipment to be utilized for compaction, including manufacturer's lift thickness limitations for prior approval of the ENGINEER.

1.06 JOB CONDITIONS

A. Classification of Excavation:

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

B. Compaction of Backfill:

1. The degree of compaction required at all locations is to follow PennDOT

requirements.

C. Control of Traffic:

1. Employ traffic control measures in accordance with Pennsylvania Department of Transportation Publication 213, "Work Zone Traffic Control", latest edition.

D. Protection of Existing Utilities and Structures:

1. 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 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. Utilities and other underground and above ground facilities which are not included within the provisions of Act 38, Underground Utilities Act, shall be recognized and avoided.

2. 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.

3. Immediately report to the Utility and the 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.

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

PART 2 PRODUCTS

2.01 PIPE BEDDING MATERIAL

A. Gravity Sanitary Sewer Pipe, Sanitary Sewer Laterals

1. As delineated in Sections 02730 and 02731 of these specifications and per the Standard Details.

B. Storm Sewer Pipe

1. As delineated in Section 02720 of these specifications and per the Standard Details.

C. Water Mains and Water Services

1. As delineated in Sections 02660 and 02661 of these specifications and per the Standard Details.

2.02 BACKFILL MATERIAL

A. Gravity Sanitary Sewer Pipe, Sanitary Sewer Laterals

1. As delineated in Sections 02730 and 02731 of these specifications and per the Standard Details.

B. Storm Sewer Pipe

1. As delineated in Section 02720 of these specifications and per the Standard Details.

C. Water Mains and Water Services

1. As delineated in Sections 02660 and 02661 of these specifications and per the Standard Details.

D. Utilities By Others

1. Utilities other than Borough (gas, electric, etc.). The following specifications shall address all backfill and compaction requirements mandated by the Borough for utilities owned and maintained "by others" whenever a utility pipe/conduit or other material is installed underground within the Borough's public right-of-way, the following backfill and compaction requirements shall be followed.

   a. Bedding: In accordance with the appropriate Utility specifications.

   b. Aggregate cover: In accordance with the appropriate Utility specifications.

   c. Remaining backfill to subgrade (within existing State highways, Borough roads, streets, alleys, parking lots, driveway access, shoulder areas within four feet (4') of edge of road, proposed widening to existing roads and any other area traversed by motorized vehicles):

      1) From top of specified utility cover material over pipe/conduit to proposed subgrade, use PennDOT 2A Aggregate stone placed in eight-inch (8") compacted lifts.

      2) NOTE: For lifts greater than eight inches (8"), written authorization must be received from the Engineer and copy of same shall remain on the project site and made available at all times.

   d. Remaining backfill to subgrade (in any area not described in 3. above).

      1) PennDOT 2A Aggregate stone up to one foot (1') over top of pipe/conduit full width of trench and placed in eight-inch (8") compacted lifts.

      2) From one foot (1') over top of pipe to proposed subgrade, suitable,

select fill having no rock greater than eight inches in diameter and as approved by the Engineer and placed in well-compacted eight-inch (8") lifts.

3) Utility crossing and other open excavations after stone aggregate and/or pavement base course installation:

In new developments, the above-referenced backfill and compaction specifications shall apply prior to placement and construction of the new stone aggregate subbase and/or bituminous pavement base course. However, for any utility trench excavated in the aggregate subbase and/or bituminous pavement base course, the entire trench backfill shall be:

e. PennDOT 2A Aggregate stone placed in eight inch (8") compacted lifts from top of utility up to subgrade; AND,

f. In kind replacement of the stone subbase and bituminous base course with a one foot (1') cutback from all edges of the trench on the bituminous base course.

E. Concrete for Thrust Blocks:

1. Concrete for thrust blocks shall be ready mixed concrete and shall not be mixed on site without the express permission of the ENGINEER. Concrete shall have a minimum strength of 3,000 PSI AT 28 DAYS.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Protect plant life, lawns, trees and other features remaining as a portion of final landscaping.

C. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Maintain and protect above and below grade utilities which are to remain.

3.02 MAINTENANCE AND PROTECTION OF TRAFFIC

A. Coordinate the Work to insure the least inconvenience to traffic and maintain traffic in one or more unobstructed lanes unless closing the roadway is authorized, in writing, by the Borough and the ENGINEER.

B. Maintain access to all streets and private drives.

C. The CONTRACTOR shall construct and maintain bridges over excavations as may be necessary for the safe accommodation of pedestrians or vehicles. The

bridge shall be extended a minimum of eighteen (18) inches on either side of the excavation and shall be tied into the existing cartway. The CONTRACTOR shall furnish and erect illuminated barricades at crossings of trenches, or along the trench, to protect the traveling public. Access to driveways shall be bridged across trenches. The CONTRACTOR shall not obstruct fire hydrants.

D. A straight and continuous passageway, at least three (3) feet in width, shall be clear from all obstruction on sidewalks and over crosswalks, where the Work to be performed does not lie under the sidewalk. Additional passageway, as may be directed by the ENGINEER, shall be maintained free from obstruction.

E. In narrow or congested streets or alleys, when so directed by the ENGINEER the CONTRACTOR shall complete the Work to a location designated by the ENGINEER before starting additional Work, in order to give access to garages and other places.

F. The CONTRACTOR shall, in all cases, so arrange the Work to cause the least inconvenience to property owners consistent with the proper execution of the Work, as determined by the ENGINEER.

G. 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.

H. Comply with state and local codes, permits and regulations.

3.03 CUTTING PAVED SURFACES

A. Where installation of pipelines, miscellaneous structures, and appurtenances necessitate 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.

B. Protect edges of cut pavement during excavation to prevent raveling or breaking; square edges prior to pavement replacement.

C. The requirement for neat line cuts, in other than state highways, may be waived if the final paving restoration indicates overlay beyond the trench width.

3.04 BLASTING

A. Blasting will be permitted upon the written approval of the ENGINEER, provided the municipal ordinances permit blasting, except in areas where the proximity of structures, underground facilities, or public safety preclude the use of explosives. Nothing in this section shall relieve the CONTRACTOR of his responsibilities for damages to persons or property, nor shall it result in any responsibility to the OWNER or the ENGINEER.

B. Blasting work shall be supervised and directly controlled by licensed and experienced personnel and performed in conformance with applicable Federal, State and local codes.

C. Only small amounts of explosives shall be kept at any one place and shall be kept under lock. The key shall be entrusted only to a responsible person. Caps and detonators shall not be kept in the same place as explosives. No explosives bunkers will be allowed.

3.05 TRENCH EXCAVATION

A. Depth of Excavation:

1. Pressure Pipelines:

a. Excavate trenches to the minimum depth for placement of pipe bedding material necessary and to provide 4'-0" from the top of the pipe to the finished ground elevation, except where specific depths are otherwise shown on the drawings.

2. Gravity Pipelines:

a. 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.

3. 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 or pipe sills can be placed. If no concrete cradle or pipe sills are to be installed, refill the trench to required pipeline subgrade with pipe trench subgrade stabilization material (AASHTO No. 1 crushed aggregate unless otherwise specified) and proceed with pipe bedding, pipe laying procedures.

4. Where rock is encountered in the trench bottom, remove the rock to the depths as shown on Standard Details and backfill to the required pipeline grade with bedding material or concrete as shown.

5. Where the CONTRACTOR, by error or intent, excavates beyond the minimum required depth, backfill the trench to the required pipeline grade with pipe bedding material at CONTRACTOR cost.

B. Width of Excavation:

1. Excavate trenches, including laterals, to a width necessary for placement and jointing of the pipe, and for placing and compacting pipe bedding and trench backfill around the pipe, but not less than 16" plus the pipe outside diameter. See Standard Details for trench width limits.

2. Shape trench walls completely vertical from trench bottom to at least 2' above the top of the pipe.

3. 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.

C. Length of Open Trench:

1. Do not advance trenching operations more than two hundred (200) feet ahead of completed pipeline, except as specified in a State Highway Occupancy Permit.

2. Trench excavation shall be fully completed, except for the forming of the trench sub-grade, at least twenty (20) feet in advance of the pipe placement, and shall be kept free from obstructions; except that at the close of the workday, or at the discontinuance of WORK, the pipe laying may be completed to within five (5) feet of the end of the opened trench. The amount of pipe laid in advance of backfilling shall not exceed one hundred (100) feet. In State Highways, all trenches in the cartway must be closed and not more than twenty (20) feet of trench may remain open in shoulder areas at the close of the workday or discontinuance of WORK. If any permit imposes different restrictions, comply with the permit.

3. The ENGINEER may, at any time, require the backfilling of open trenches over completed pipelines; and the CONTRACTOR shall have no claim for compensation even if, to accomplish said backfilling, excavation or other WORK at any place must be temporarily discontinued.

4. If WORK is discontinued on any trench, except by order of the ENGINEER, and the excavation remains open for an unreasonable length of time, in the opinion of the ENGINEER, the CONTRACTOR shall backfill such trench, if so directed by the ENGINEER.

5. Open trenches shall be covered with steel plating at the end of each workday. In the alternative, the trench shall be backfilled and reopened on the following workday.

3.06 PIPE LAID IN EMBANKMENTS

A. When pipe is to be installed in fill, the embankment shall be constructed to at least one (1) foot above the proposed top of the pipe. The embankment shall then be excavated to the proper form and grade, in accordance with these specifications, and the pipe installed. The embankment shall then be constructed to not less than four (4) feet above the top of the pipe.

3.07 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.

B. 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 CONTRACTOR in any other manner, shall be repaired at the CONTRACTOR's expense.

C. Withdraw shoring, bracing, and sheeting as backfilling proceeds unless otherwise directed by the ENGINEER.

3.08 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 stop 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. Control sedimentation and erosion.

D. In areas where pipelines parallel or cross streams, ensure that no material slides, is washed into, or dumped into the stream course. Remove cofferdams immediately upon completion of pipeline construction.

E. When it is necessary to haul soft or wet material over streets, the CONTRACTOR shall provide suitably tight and diapered vehicles, of a pattern approved by the ENGINEER for this purpose.

3.09 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. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.

D. Comply with Federal and State requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.

3.10 PIPE LAYING

A. Provide required pipe bedding placed in accordance with the Drawings as specified.

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

3.11 THRUST RESTRAINT

A. Provide pressure pipe with concrete thrust blocking and use restrained joint fittings at all bends, tees, valves, and changes in direction, in accordance with the Drawings. All thrust blocking concrete shall be ready mix concrete. Concrete mixed at the job site is not permitted to be used.

3.12 BACKFILLING TRENCHES

A. After pipe installation and inspection, backfill trenches from trench pipe bedding 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 specific compaction around and under the haunches of the pipe. Backfill and compact the remainder of the trench with specified backfill material.

B. Compaction and Lift Thickness:

1. Only vibratory compaction equipment approved by the ENGINEER and listed below shall be utilized.

   a. Vibratory drum rollers utilizing cleated or sheepsfoot style drums, i.e. RAMEX style.

   b. Hydraulic plate soil compactors (Head Shakers), i.e. Tramac Compactors

   c. If existing conditions warrant, other soil compaction equipment may be used when approved by the ENGINEER.

   The maximum allowable lift thickness shall be eight (8) inches using the vibratory compaction equipment. When conditions require compaction different from the vibratory equipment set forth in 3.12.B.1. above, the maximum allowable lift shall be six (6) inches. If the specified compaction is not obtained, the CONTRACTOR shall, at his own expense, remove, replace, and retest as many times as is required to obtain the specified compaction.

2. Lift thickness limitations specified for state highways, shoulders, embankments, or special conditions described for any project shall govern over the maximum allowable value of eight (8) inches per lift.

C. Unsuitable Backfill Material:

1. Where the 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 aggregate material stone backfill or suitable foreign backfill material, consistent with

the Specifications and Drawings.

3.13 DISPOSAL OF EXCAVATED MATERIAL

A. Excavated material remaining after completion of backfilling shall remain the property of the CONTRACTOR, be removed from the construction area, and be legally disposed.

3.14 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.

C. Rough grade areas to be topsoiled and seeded to 4" below indicated finish contours.

3.15 TEMPORARY RESTORATION OF PAVED SURFACES

A. All paved surfaces shall be temporarily repaved in accordance with Section 02575 - Paving and Restoration and the Drawings.

3.16 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 02930 - Seeding.

END OF SECTION

SECTION 02270
EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work required by regulations to prevent soil erosion and sedimentation.

1.02 REGULATORY REQUIREMENTS

A. The erosion and sedimentation control measures are subject to inspection by State, County, and local regulatory agencies. The CONTRACTOR shall be fully responsible for constructing and maintaining the erosion and sedimentation control measures to the extent that they are, at all times, acceptable to the regulatory agencies. The CONTRACTOR shall be liable for payment of any fines or legal costs that the OWNER may incur as a result of the CONTRACTOR's failure to properly construct and maintain the erosion and sedimentation control measures.

1.03 REFERENCES

A. PennDOT Specifications, Publication 408.

PART 2 PRODUCTS

2.01 MATERIALS

A. Rock for rip rap and ditch lining: PennDOT Section 850.

B. Coarse aggregates: PennDOT Section 703.2.

C. Silt fence: PennDOT Section 865.2.

D. Geotextile fabric for rip rap and ditch lining: PennDOT Section 735, Class 2, Type A.

E. Seed, fertilizer, mulch, and erosion blankets: Section 02930 of these Specifications.

F. Selected material surfacing: PennDOT Section 703.3.

G. Sand: PennDOT Section 703.1, cement concrete sand, Type A.

H. Synthetic Ditch Lining Material: Mirafi Miramat.

PART 3 EXECUTION

3.01 CONSTRUCTION SEQUENCE

A. Install all erosion and sedimentation control measures prior to start of clearing and earthwork operations.

B. Conduct construction operations in accordance with the following general sequence:

1. Construction of erosion and sedimentation control measures including ditches and swales, filter fabric fences, stabilized construction roads, and sedimentation basins.

2. Clearing, removal of debris, and stockpiling of soil materials.

3. Excavation and embankment construction.

4. Construction of building, structures, pipelines, and other items required by the Contract Documents.

5. Backfilling, final grading, paving, seeding, and other ground stabilization.

6. Removal of temporary erosion and sedimentation control measures.

3.02 EXECUTION

A. Stabilize all temporary construction roads and laydown areas with Selected Material Surfacing.

B. Construct perimeter swales and ditches to intercept runoff and route it around excavations, stockpiles, and areas of exposed soil. Line swales and ditches with a synthetic ditch lining material.

C. Install filter fabric fences.

D. Construct a sedimentation basin to intercept runoff and to treat water pumped from excavations prior to discharging this water to natural drainage courses.

E. Place excavated material on the high side of the excavation, whenever possible, and confine the material so that it will not obstruct the normal flow in drainage courses.

F. Construct soil stockpiles so that side slopes are no steeper than 2:1. Where stockpiled materials will not be used within a 14-day period after the stockpile is completed, protect the material from erosion by means of jute netting, straw bales, excelsior blankets, or other erosion-resistant material.

G. Stabilize exposed soil by seeding or with rip rap within 14 days after completion of grading. Seed in accordance with Section 02930.

H. At the end of each workday, any and all sediment tracked onto or conveyed by other means onto Borough or State roadways, shall be removed. Removal may be completed through either the use of machinery or hand tools, but shall never be washed off the roadway with water.

I. The CONTRACTOR shall be responsible for the proper construction, stabilization and maintenance of all erosion and sedimentation pollution controls and related items.

J. Should any measure installed by the CONTRACTOR be incapable of either adequately removing sediment from on-site flows prior to discharge from the site or stabilizing the surfaces involved, additional measures shall be immediately implemented by the CONTRACTOR to eliminate all such problems.

K. If a sinkhole develops during construction, the CONTRACTOR shall immediately contact the Borough and the ENGINEER.

L. Should unforeseen erosive conditions develop during construction, the CONTRACTOR shall take action to remedy such conditions and to prevent damage to adjacent properties as a result of increased runoff and/or sediment displacement. Stockpiles of wood chips, hay bales, crushed stone, and other mulches shall be held in readiness to deal immediately with emergency problems of erosion.

M. The CONTRACTOR is advised to become thoroughly familiar with the provisions of Appendix 64, Erosion Control Rules and Regulations, Title 25, Part 1, Department of Environmental Protection, Sub-Part C, Protection of Natural Resources, Article III, Water Resources, Chapter 102, Erosion Control.

3.03 RESTORATION

A. After completion of construction, remove all temporary erosion and sedimentation control devices. Restore areas in which these devices were located to the original condition or to the condition called for by the Contract Documents.

END OF SECTION

SECTION 02322
FLOWABLE FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flowable fill for:

1. Utility bedding.

2. Utility backfill.

3. Filling abandoned utilities.

1.02 RELATED SECTIONS

A. Section 02200: Excavation and Earthwork
B. Section 02225: Trenching, Backfilling and Compacting
C. Section 02601: Manholes
D. Section 02603: Precast Utility Structures
E. Section 02720: Storm Sewer Pipe
F. Section 02730: Gravity Sanitary Sewer Pipe
G. Section 02731: Sanitary Sewer Lateral Connections

1.03 REFERENCES

A. ASTM C33 – Standard Specification for Concrete Aggregates.

B. ASTM C94/C94M – Standard Specification for Ready-Mixed Concrete.

C. ASTM C150 – Standard Specification for Portland Cement.

D. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

E. ASTM C403/C403M – Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.

F. ASTM C494/C494M – Standard Specification for Chemical Admixtures for Concrete.

G. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

H. ASTM C1017/C1017M – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

I. ASTM C1040 – Standard Test Methods for Density of Unhardened and Hardened Concrete in Place by Nuclear Methods.

J. ASTM D558 – Standard Test Methods for Moisture-Density Relations of Soil-Cement Mixtures.

K. ASTM D4832 – Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Materials Source: Submit name of flowable fill materials suppliers.

C. Mix Design:

1. Submit flowable fill mix design for each specified strength. Submit separate mix designs when admixtures are required for the following:

a. Flowable fill work during hot and cold weather.

b. Air entrained flowable fill work.

2. Identify design mix ingredients, proportions, properties, admixtures, and tests.

3. Submit test results to certify flowable fill mix design properties meet or exceed specified requirements.

D. Delivery Tickets:

1. Submit duplicate delivery tickets indicating actual materials delivered to Project site.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with PennDOT Publication 408 Specifications, latest edition.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install flowable fill during inclement weather or when ambient temperature is less than 40 degrees F.

1.07 FIELD MEASUREMENTS

A. Verify field measurements before installing flowable fill to establish quantities required to complete the Work.

PART 2 PRODUCTS

2.01 FLOWABLE FILL

A. Furnish materials in accordance with PennDOT Publication 408 Specifications, latest edition.

B. Types of flowable fill:

1. Type A and Type B: Excavatable Flowable Fill – lean cement concrete fill used where future excavation may be required such as fill for utility trenches, pipe trenches, bridge abutments and around box and arch culverts.

2. Type C: Non-Excavatable Flowable Fill – lean cement concrete fill used where future excavation is not anticipated such as replacing unsuitable soils below structural foundations; filling abandoned conduits, tunnels and mines; and backfilling around pipe culverts where extra strength is required.

3. Type D: Construction in areas requiring low-density backfill material such as abutments over highly deformable soils, backfilling retaining walls, filling vaults, and backfilling on top of buried structures.

2.02 MATERIALS

A. Portland Cement: ASTM C150, Type I – Normal; or Type II – Moderate.

B. Fine Aggregates: ASTM C33.

C. Water: Clean and not detrimental to concrete.

2.03 ADMIXTURES

A. Furnish materials in accordance with PennDOT Publication 408 Specifications, latest edition.

B. Air Entrainment: ASTM C260.

C. Water Reducing Admixture: Type A conforming to ASTM C494.

D. Use of additional admixtures must be approved in writing by the ENGINEER.

2.04 MIX DESIGN

A. Mix and deliver flowable fill in accordance with ASTM C94 and meeting the following characteristics:

1. Type A Flowable Fill

a.	Compressive Strength (28 Day)	125 psi (maximum)
b.	Slump:	7" (minimum)
c.	Minimum Cement:	100 lbs./CY

2. Type B Flowable Fill

a.	Compressive Strength (28 Day)	125 psi (maximum)
b.	Slump:	7" (minimum)
c.	Minimum Cement:	50 lbs./CY

3. Type C Flowable Fill

a.	Compressive Strength (28 Day)	800 psi (minimum)
b.	Slump:	7" (minimum)
c.	Minimum Cement:	150-200 lbs./CY

4. Type D Flowable Fill

a.	Compressive Strength (28 Day)	90-400 psi
b.	Slump:	7" (minimum)
c.	Minimum Cement:	300-700 lbs./CY

B. Provide water content in design mix to produce self-leveling, flowable fill material at time of placement.

C. Design mix air entrainment and unit mass are for laboratory design mix and source quality control only.

2.05 SOURCE QUALITY CONTROL

A. Test properties of flowable fill design mix and certify results for the following:

1. Design mix proportions by weight of each material.

2. Aggregate: ASTM C33 for material properties and gradation.

3. Properties of plastic flowable fill design mix including:

a. Temperature.
b. Slump.
c. Air entrainment.
d. Wet unit mass.
e. Yield.
f. Cement factor.

4. Properties of hardened flowable fill design mix including:

a. Compressive strength at 7 days and 28 days. Report compressive strength of each specimen and average specimen compressive strength.
b. Unit mass for each specimen and average specimen unit mass at time of compressive strength testing.

B. Prepare delivery tickets containing the following information:

1. Project Designation.

2. Date.

3. Time.

4. Class and Quantity of flowable fill.

5. Actual batch proportions.

6. Free moisture content of aggregate.

7. Quantity of water withheld.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility installation is complete and tested before placing flowable fill.

B. Verify excavation is dry.

3.02 PREPARATION

A. Support and restrain utilities to prevent movement and flotation during installation of flowable fill.

B. Protect structures and utilities from damage caused by hydraulic pressure of flowable fill before fill hardens.

C. Protect utilities to prevent intrusion of flowable fill.

3.03 INSTALLATION – FILL, BEDDING, AND BACKFILL

A. Place flowable fill by chute, pumping or other methods approved by the ENGINEER.

1. When required, place flowable fill under water using tremie procedure.

2. Do not place flowable fill through flowing water.

B. Place flowable fill in lifts to prevent lateral pressures from exceeding structural capacity of structures and utilities.

C. Place flowable fill evenly on both sides of utilities to maintain alignment.

D. Place flowable fill to elevations indicated on Drawings without vibration or other means of compaction.

3.04 INSTALLATION – FILLING ABANDONED UTILITIES

A. Verify pipes and conduits are not clogged and are sufficiently empty to permit gravity installation of flowable fill for entire length indicated to be filled.

B. Seal lower end of pipes and conduits by method to contain flowable fill and to vent trapped air caused by filling operations.

C. Place flowable fill using method to ensure there are no voids.

1. Fill pipes and conduits from high end.

2. Fill manholes, tanks, and other structures from grade level access points.

D. After filling pipes and conduits seal both ends.

3.05 FIELD QUALITY CONTROL

A. Perform inspection and testing in accordance with ASTM C94/C94M.

1. Take samples for tests for every 50 cubic yards of flowable fill, or fraction thereof, installed each day.

2. Sample, prepare and test four compressive strength test cylinders in accordance with ASTM D4832. Test one specimen at 7 days and two at 28 days.

3. Measure temperature at point of delivery when samples are prepared.

B. Perform in-place density tests using nuclear test device, in accordance with ASTM C1040.

C. Defective Flowable Fill: Fill failing to meet the following test requirements Test Requirements:

1. Minimum temperature at point of delivery.

2. Compressive strength requirements for each type of fill.

3.06 CLEANING

A. Remove spilled and excess flowable fill from Project site.

B. Restore facilities and site areas damaged or contaminated by flowable fill installation to existing condition before installation.

END OF SECTION

SECTION 02570
CURBS, SIDEWALKS, HANDICAPPED RAMPS AND DRIVEWAYS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete curb.

B. Concrete sidewalks.

C. Handicapped ramps.

D. Driveways.

1.02 RELATED SECTIONS

A. Section 02200: Excavation and Earthwork

B. Section 02575: Paving and Resurfacing

C. Section 02930: Seeding

1.03 REFERENCES

A. American Concrete Institute:

1. ACI 301 – Specifications for Structural Concrete.

2. ACI 304 – Guide for Measuring, Mixing, Transporting, and Placing Concrete.

B. ASTM International:

1. ASTM A185 – Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

2. ASTM A497 – Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.

3. ASTM A615/A615M – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

4. ASTM C33 – Standard Specification for Concrete Aggregates.

5. ASTM C94/C94M – Standard Specification for ready-mix concrete.

6. ASTM C150 – Standard Specification for Portland Cement.

7. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

8. ASTM C494/C494M – Standard Specification for Chemical Admixtures for Concrete.

1.04 PERFORMANCE REQUIREMENTS

A. In accordance with PennDOT Specifications, Publication 408, Latest Edition.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with PennDOT Specifications, Publication 408, Latest Edition, Sections 501.3 and 506.3.

B. Obtain ready mixed concrete from the same PennDOT approved single source supplier throughout the entire project.

1.06 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum five (5) years verifiable experience.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS.

A. Concrete Materials: In accordance with PennDOT Specifications, Publication 408, Latest Edition, Section 704.1(b).

B. Pedestrian-Warning Device (Truncated Domes) for ADA Ramps: Armor-Tile Tactile System, or approved equal, Brick Red.

2.02 QUALITY CONTROL AND TESTS

A. Submit proposed mix design for each type concrete to Engineer for review prior to commencement of work.

B. Tests on cement, aggregates, and mixes may be performed at the Borough's discretion to ensure conformance with specified requirements.

C. When directed by the Engineer, take test sample cylinders in accordance with PennDOT Specifications, Publication 408, Latest Edition, Section 704.1(d) and related sections.

PART 3 EXECUTION

3.01 CURBS, SIDEWALKS, HANDICAPPED RAMPS AND DRIVEWAYS

A. All sidewalk areas shall be graded and all sidewalks, curbs, curb ramps, driveway entrances and front or rear retaining walls shall be constructed,

reconstructed or repaired in conformance with the hereinafter details and specifications adopted by Council only on the grades and lines as shown on the topographical survey and revisions thereto of the Borough, and furnished by the Borough Engineer, and in accordance with the following specifications.

B. The top surfaces of sidewalks, curbs, ADA curb ramps and driveway entrances shall receive a floated, slip resistant finish, and the finish tolerance shall be a true plane within one-quarter inch (1/4") in ten feet (10').

C. Curing of all concrete shall be in accordance with PennDOT Publication 408, latest edition, §501, §630 and §676.

D. No concrete shall be placed on a stone subbase that is frozen or sitting over a frozen subgrade.

E. Any and all WORK in State Highways shall be subject to review by PennDOT and have proof of approval with the Borough prior to starting the WORK.

F. The Public Works Director may reject any concrete sidewalks, curbs, curb ramps and driveway entrances which do not conform to the requirements of this Part or the generally-accepted standards of the American Concrete Institute or PennDOT. Rejection can include a full replacement of the non-conforming work.

G. The outside edge of all front retaining walls, defined as those located along any street, shall be on or in back of the right-of-way line as shown on the topographical survey and revisions thereto of the Borough of Wyomissing and the outside edge of all rear retaining walls shall be on or in back of the alley line as shown on the topographical survey and revisions thereto of the Borough of Wyomissing, and shall be constructed in accordance with good engineering practice of such height, thickness and materials as shall be approved by the Public Works Director. Any retaining wall within or outside of the right-of-way line shall be in accordance with the Pennsylvania Uniform Construction Code (UCC). When a retaining walls presently existing in violation of this Part is to be replaced or partially replaced, it must be replaced in its entirety in conformity with the provisions of this Part and the Borough Zoning Ordinance [Chapter 27], as amended from time to time.

3.02 CONCRETE CURB

A. All separate curbs shall be seven inches wide (7") across the top, shall be eight inches (8") wide, seven inches (7") below the top of curb at gutter elevation, and shall extend for a width of eight inches (8") downward to a point twenty-four inches (24") from the top of the finished curb.

B. Materials for construction of concrete curbing shall be as follows: all concrete curbing shall be constructed on four inches (4") of compacted AASHTO No.57 or PennDOT 2B stone. The concrete shall have three thousand five hundred pounds per square inch (3,500 psi) compressive strength when cured for twenty-eight (28) days with an air entrainment equivalent of five percent (5%) plus or minus one percent (+/-1%). No concrete shall be poured in freezing conditions. Expansion joints shall consist of one-half inch (1/2") premolded, nonextruding,

bitumastic material to be used, for the entire depth of the curb, and where the sidewalk meets the outside face of curbing or wall, at a distance of thirty feet (30') with scored joints every fifteen feet (15'). For slip-form curb 4,000 psi minimum compressive strength is required with expansion joints to be installed every fifty feet (50') with scored joints every ten feet (10').

C. If appropriate, the contractor may request permission to construct curbing using slip-form methods. Such request shall be submitted to the Borough, in writing, outlining the proposed details of the construction.

D. Where tree root conflict exists in the curb line, with approval of the Borough's Public Works Manager, a metal plate as shown in the Standard Details may be installed in lieu of concrete. The tree plate shall be in accordance with the Standard Detail.

3.03 CONCRETE SIDEWALK

A. All sidewalk areas shall conform to curb grades except that the area shall have a one-quarter inch (1/4") ascending pitch per foot measured from the outside curb face to the right-of-way line of the street.

B. All drains, rainwater conductors or roof drains shall be installed under the sidewalk and shall have a maximum size of four inches (4") inside diameter.

1. Materials for drains shall be Schedule 40 polyvinyl chloride (PVC) pipe.

2. Installation of said drains shall be in such a manner that the invert of the drain shall be one inch (1") above the invert of the gutter flow line.

3. Over top of each drain pipe that passes through the curb, two (2) number three (#3) rebars, one foot (1') long and having a fifteen degree (15°) bend in the middle, shall be installed with end pointing down and in such a manner to be equidistant from the drain to the top of curb and also equidistant from the face of curb and the rear of curb.

4. All drain pipe installed under the sidewalk shall be at a ninety degree (90°) angle to the sidewalk. If the top of the drain pipe does not have a minimum of three inches (3") of stone subbase prior to the concrete sidewalk, a scored joint shall be installed directly over the pipe. The scored joint shall also meet the spacing requirements of this Part.

C. All sidewalks shall be four feet, six inches (4' 6") in width; provided, however, that notwithstanding anything to the contrary contained in this Part, all sidewalks and curbs shall conform as to size with the majority type of then existing sidewalks and curb in the same block.

D. When there is sidewalk/tree root conflict, and when approved by the Borough, the width of the sidewalk may be narrowed to accommodate the flare of the tree root. Any tree root larger than two inches (2") in diameter that needs to be cut must be approved by the Borough before being cut.

E. All sidewalks shall be constructed with six inch by six inch (6" x 6") wire mesh installed two inches (2") below the surface of the sidewalk or with synthetic fiber reinforcement, a minimum thickness of four inches (4") of three thousand five hundred pounds per square inch (3,500 psi.) concrete after twenty-eight (28) days curing time with air retaining equivalent to five percent (5%) plus or minus one percent (+/-1%), with the exception of areas being used as driveways which shall have a minimum thickness of six inches (6"). All sidewalks shall have a six inch (6") base of clean AASHTO No. 57 or PennDOT No. 2B stone. Expansion joints shall consist of a one-half inch (1/2") preformed, nonextruding, resilient bituminous joint fill to be placed the full depth of the sidewalk every twenty-five feet (25') and scored joints shall be placed every five feet (5'). Sawcutting sidewalk for scored joints is prohibited.

F. Areas of sidewalks that fall within the limits of a business, commercial or industrial use driveway shall have a minimum thickness of eight inches (8") and shall have six inch by six inch (6" x 6") wire mesh installed four inches (4") below the surface of the sidewalk or with synthetic fiber reinforcement to handle the anticipated loading requirements.

G. Synthetic fiber reinforcement used as an admixture in concrete may be used as a substitute in lieu of wire mesh reinforcement in sidewalk or driveway aprons, upon approval of the Public Works Director. The synthetic fiber reinforcement shall meet the following specifications:

1. Materials

a. Fiber Reinforcement: Provide Grace MicroFiber concrete admixture by Grace Construction Products, or an approved equal, complying with the following requirements:

(1) Fibers: ½" or ¾" (13mm or 40mm) polypropylene fibers, maximum 3 denier, complying with ASTM C 1116, Type III, Par. 4.1.3 and applicable building code requirements.
(2) Fibers Per Pound: Not less than 50 million individual fibers.
(3) Fibers shall be supplied in cellulose Concrete Ready Bags®, or approved equal, which disperse during mixing.

2. Concrete Mix

a. Application Rate: 1 pound per cubic yard (600 grams per cubic meter) of concrete unless recommended otherwise by the manufacturer. For uniform distribution, mix in truck for a minimum of 20 minutes after fiber addition. Add fibers at the batch plant to ensure proper mixing.

3.04 HANDICAPPED RAMPS

A. Curb ramps shall be provided wherever an accessible route crosses a curb. These locations shall include, but are not limited to, street intersections, alley

intersections, public or private drive intersections and points of termination of pedestrian accessible routes at other locations.

B. Accessible routes shall include, but not be limited to, sidewalks, walks, paths, parking access aisles and crosswalks, and shall be a continuous unobstructed path connecting all accessible elements.

C. Ramps shall be separated from curb and sidewalks with one-half inch (1/2") preformed, nonextruding, resilient bituminous joint fill. Curbing and sidewalk sections must be poured separately for all ADA ramps. Monolithic pours of combined curb and sidewalk are not permitted.

D. Curb ramps shall comply with the Americans with Disabilities Act Public Right-of-Way Guidelines (PROWAG), the ADA Accessibility Guidelines (ADAAG) and PennDOT Standard Drawings for Construction RC-67M, latest edition, excepting materials and depths of the Borough facilities as specified in the Standard Specifications.

E. The cross-slope of the curb ramp, sidewalks and landing area shall be no greater than 1:50, or 2.00%.

F. The pedestrian warming device shall be placed on the curb ramp so that the truncated domes pattern is aligned parallel to the direction of the pedestrian travel.

G. Pedestrian warming device shall be twenty-four inches (24") minimum in length in the direction of the pedestrian travel and across the full width of the ramp.

H. Pedestrian warning devices shall be made of a polymer composite material with embedment flanges and anchors on its underside. Installation must be in accordance with manufacturer's specifications. The color must be brick red. Specifications for pedestrian warning devices are subject to review and approval by the Borough Engineer.

I. Modify curb ramp details to adapt dimensions to existing curb heights where the curb is less than the standard eight inch (8") reveal.

J. Restoration of all adjacent areas shall be to a condition greater or equal to the pre-existing condition and in accordance with all other applicable sections of the Standard Specifications.

K. Any cheekwall to be installed must be of the same concrete as the sidewalk, have an equivalent stone subbase, and extend a minimum of eight inches (8") beneath the surface of the adjacent sidewalk in addition to the required reveal.

L. Concrete material, stone and depths shall be in accordance with the Handicapped Ramp Standard CSO17.

M. Any ramp not in full compliance with the handicapped ramp standards shall obtain approval form the Borough of Wyomissing prior to any construction activities.

N. All curb ramps shall be in accordance with the applicable Standard Details.

3.05 DRIVEWAYS

A. All driveway entrances shall: have a minimum curb radius equal to the required planting strip width or a minimum curb radius of two feet (2'); have the outside edge raised one and one-half inches (1 1/2") above the flowline of the gutter; have a straight slope therefrom to the prescribed outside edge of sidewalk and have a sidewalk surface of the same grade and width prescribed for sidewalks. No single driveway entrance for one-car garage shall be constructed with a frontage exceeding twelve feet (12') measured along the building line. In lieu of driveway entrance having curb radii as part of its construction, a depressed curb driveway entrance may be used as set forth in the Standard Details.

B. No single driveway entrance for a garage for two (2) or more cars shall be constructed with a frontage or width exceeding sixteen feet (16') measured along the right-of-way line, except upon specific approval by Borough Council. Such specific approval shall be given only when it is not contrary to the public interest and when owing to special conditions, unnecessary hardship would result. The width of any single business, commercial or industrial driveway entrance shall not exceed thirty-five feet (35') in width and shall be subject to the approval of Borough Council.

C. Driveway entrances shall in no way impede the flow of stormwater runoff in the cartway area of the streets.

D. All driveways shall be constructed as follows:

1. The outside edge at the curb line raised one and one-half inches (1 1/2") above the flow line of the gutter.

2. All driveways located within the rights-of-way of public streets shall have a minimum of six inch (6") depth of AASHTO No. 57 or PennDOT No. 2B.

3. All concrete used on driveways within the rights-of-way of public streets shall be constructed with six inch by six inch (6" x 6") wire mesh installed three inches (3") below the surface of the sidewalk or with synthetic fiber reinforcement, a minimum thickness of six inches (6") with an ultimate strength of three thousand five hundred pounds per square inch (3,500 psi) at twenty-eight (28) days and containing five percent (5%) plus or minus one percent (+/-1%) air by volume.

4. All driveways shall have a finish equivalent to that of the adjoining sidewalk, while the finish for curb radius and depressed curb shall be the same as adjoining curbing.

END OF SECTION

SECTION 02575
PAVING AND RESURFACING

PART 1 STREET EXCAVATION, OBSTRUCTION, GRADING AND PAVING

1.01 RELATED SECTIONS

A. Section 02200: Excavation and Earthwork

B. Section 02225: Trenching, Backfilling and Compacting

C. Section 02580: Pavement Markings

1.02 GENERAL

A. The CONTRACTOR shall maintain the surface of all trenches and shall repair all depressions, settlements, washouts or other potential hazards, as determined by the ENGINEER, until such time as the CONTRACTOR is notified by the ENGINEER in writing that the trench surfaces are satisfactory for permanent repaving or restoration.

B. The CONTRACTOR shall replace all guide rails or fences, sidewalks, signs, curbs and gutters, driveways, or other items as directed by the ENGINEER, which have been damaged or removed in the course of the WORK. They shall conform in size and shape, and be equal in quality of material and workmanship to the original structures prior to being disturbed.

C. All materials and procedures shall be as described herein and in accordance with the Pennsylvania Department of Transportation (PennDOT) Publication 408 Specifications, latest edition.

D. Any and all WORK in State Highways shall be subject to review by PennDOT and have proof of approval with the Borough prior to starting the WORK.

1.03 TEMPORARY REPAVING

A. Trenches in paved areas shall be cut to a neat edge using an asphalt/concrete saw.

B. Temporary paving shall be placed at the end of each working day before opening to traffic.

C. If the opening cannot be opened to traffic at the end of the working day, approval will need to be granted by the Public Works Manager. If approval is granted, street openings shall be completely barricaded and protected. Excavations left open or incompletely repaired after dark shall be marked by PennDOT approved flashing lights. Where work is interrupted, the person(s) responsible for the opening shall secure and cover the excavation with an appropriate metal plate. All required traffic control shall be provided by the permittee in accordance with PennDOT's Publication 213, latest edition. Any person opening the street is subject to all liability associated with claims for injury or damage resulting

therefrom.

D. All excavations within Borough right-of-way shall be backfilled with PennDOT 2A aggregate, compacted in six-inch (6") lifts, then apply cold patch at a depth no less than two inches (2") or Superpave HMA binder course, PG 64-22, 19mm mix material at a depth no less than two and one-half inches (2.5") to the opening and compacted to the level of the abutting surface. This temporary restoration may be in place no longer than three (3) months. If due to traffic, weather, or other conditions, this temporary material is displaced and the road surface becomes uneven, the permittee must add additional material to keep the surface smooth. Permanent restoration must be placed in accordance with Borough standards no later than the expiration of such three (3) month period or two (2) weeks after the permittee is given notice by the Public Works Manager, whichever occurs first.

E. Unpaved Municipal Streets or Shoulders: Trenches shall be temporarily restored by placing and compacting eight (8") inches of PennDOT 2A Aggregate at the surface.

F. Restoration at Appurtenances: The top of every manhole, valve box or other access to the facility shall be of the same elevation as the finished and restored surface in which it is located. The surface surrounding manholes, valve boxes or other located in shoulders shall be paved in such a manner as to prevent washouts. The top of every manhole, valve box or other shall be sealed with the type and class of material specified for the surface course with a minimum band width of one foot (1').

1.04 PERMANENT REPAVING

A. General. The contractor shall perform all excavation, protection, backfilling and maintenance necessary for completion of work. The use of excavation machinery will be permitted, except in places where operation of same will cause damage to trees, buildings or existing structures above or below ground; in that case, hand method shall be employed. Excavated material must be removed from the site if reuse is not intended or piled so as not to encroach on private property, endanger the work, obstruct sidewalks or roadways, nor interfere with proper drainage.

B. Excavation and Protection of Subgrade. This work shall include the excavating and/or filling the existing surface of the roadway area to the elevation required for preparing the subgrade. The bottom of the excavation and/or the top of the fill between the outer limits of the roadway when completed shall be known as the "subgrade" and shall conform to the lines, grades and cross-sections as specified. The preparation of the subgrade shall be as follows and in accordance with PennDOT, Publication 408, latest revisions, §210.

C. Excavation. This work shall consist of removing all existing paving, concrete gutters, rock, base, soil and unclassified material within the limits of work as specified on the drawings, to the required depth necessary for preparing the subgrade. Unsuitable and surplus materials shall be considered unclassified and disposed of by the contractor beyond the limits of the project. Excavation shall be

in accordance with PennDOT Publication 408, latest revision, §203, §204 and §205.

D. Unstable Subgrade. When the material encountered at subgrade is determined to be unstable by the Borough, it shall be removed to a minimum depth of twelve inches (12") below subgrade. Class 4 Type B geotextile fabric shall then be placed over the earth in accordance with PennDOT Publication 408, §212. PennDOT 2A aggregate will then be placed over the geotextile fabric up to subgrade level and compacted in accordance with PennDOT Publication 408, §703 and §350. The area depths of unyielding material to be removed will be determined by the Public Works Manager and may exceed the previously described criteria if deemed necessary. Pipe underdrain and pavement base drain shall be installed in accordance with PennDOT Form 408, §610 where directed by the Public Work Manager in order to drain springs or other wet areas. [Ord. 1191]

E. Unyielding Subgrade. When any unyielding material such as rock is encountered at subgrade, it shall be removed and then backfilled to the proper subgrade with PennDOT 2A aggregate and compacted.

F. Preparation.

1. After the existing surface has been brought to the required subgrade elevation, a minimum depth of six inches (6") of PennDOT 2A aggregate shall be installed and graded, shaped and thoroughly compacted to form a smooth, hard and uniform surface conforming to the established subgrade elevation and cross-section and compacted to the density requirements herein specified with equipment meeting the requirements of PennDOT Publication 408, latest revision.

2. The subgrade shall be compacted to not less than 100% of the determined dry weight density. Any portion of the subgrade which displays pronounced elasticity or deformation under construction equipment shall be excavated to a depth that, when replaced and recompacted at a moisture content not exceeding optimum, will have the required stability.

3. It shall be the responsibility of the contractor to protect and maintain the subgrade at all times. In no case shall vehicles be permitted to travel over the subgrade in a single track. The contractor shall promptly and satisfactorily reshape and recompact or remove and replace any unsatisfactory areas prior to the placement of the base course.

G. Paving: All paving shall be completed in accordance with the Standard Specifications and Pennsylvania Department of Transportation Specifications, Publication 408, latest edition, §400 and §500.

1. All streets shall be constructed with a minimum of five inches (5") compacted base course, Superpave Mixture, HMA, 25mm, PG64-22 placed on well prepared subgrade and one and one half-inch (1½") compacted wearing course using Superpave Mixture, HMA, 9.5mm,

PG64-22 concrete wearing course.

2. Streets paved with concrete shall be constructed with PennDOT Class AA concrete to a minimum depth equal to the existing. If the street subbase is concrete, the concrete shall be constructed with PennDOT Class AA concrete to a minimum depth equal to the existing concrete, compacted base course, Superpave Mixture, HMA, 25mm, PG64-22 shall be constructed at a depth equal to the bituminous base course material over the concrete and a one and one-half inch (1½") compacted wearing course using Superpave Mixture, HMA, 9.5mm, PG64-22 wearing course shall be the surface material constructed to match the surrounding area.

3. The ESAL and SRL values shall be determined by the traffic information for each street and approved by the Borough.

4. Apply bituminous tack coat to any existing bituminous surface, curb face, inlets, manholes, utility boxes and other structures abutting the paving material to be applied.

5. All longitudinal, transverse, curb joints, manhole, valve boxes and other structures shall be sealed with the type and class of material specified for the surface course for width of twelve inches (12"), six inches on each side of the joint with the exception of curb joints which shall be sealed a minimum of six inches from the joint on the bituminous surface and three inches on the face of the curb. Sealing of longitudinal and transverse joints is required only where new paving abuts existing paving.

6. All trench patch or partial excavations within any paved street shall have a one foot (1') cutback beyond the edge of the excavation of the base course or wearing course, whichever is applicable.

H. Unpaved Municipal Streets or Shoulders: Permanent restoration of unpaved municipal streets and shoulders shall be a minimum of eight inches (8") thick of PennDOT 2A Aggregate well rolled and compacted. Trench backfill shall be in accordance with applicable detail.

I. Paved Shoulders: Permanent restoration of paved shoulders shall be a PennDOT Type 1-SP paved shoulder. Trench backfill shall be in accordance with applicable detail.

1.05 ACCOMMODATION OF TRAFFIC

A. The work in all streets and highways shall be governed by the regulations of the governmental agency having jurisdiction, and the contractor shall comply with these requirements.

B. The contractor shall provide the Public Works Manager with his proposed work schedule at the preconstruction job conference so that Borough officials can keep affected residents advised of future work in their blocks. No work shall begin until three business days after the contractor has furnished a proposed work schedule. The schedule shall include the contractor's proposed traffic

control plan, with appropriate signage. The traffic construction plan shall be in accordance with PennDOT Publication 213.

C. The contractor shall provide the Borough Police with a minimum of one working day's written notice before any streets can be closed. All signage, traffic control measures, storage of materials and parking of equipment shall be coordinated with and approved by the Police Chief. All streets shall have at least one lane open during all nonworking hours.

D. Unless the Borough, in writing, shall authorize or order the complete or partial closing of a street, the contractor shall take such measures as may be necessary to keep the street or road open and safe for traffic. Otherwise, the roadway on at least one side of the trench shall be kept open at all times.

E. The CONTRACTOR shall maintain a neat and organized work area at all times in a manner to accommodate emergency response vehicles requiring access to the site (Fire, Police, Ambulance, etc.). Ramps shall be installed at any limit of work with a vertical elevation difference that would not allow such access.

PART 2 - NOT USED

PART 3 – NOT USED

END OF SECTION

SECTION 02580
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pavement marking.

1.02 RELATED SECTIONS

A. Section 02575: Paving and Resurfacing.

1.03 REFERENCES

A. Pennsylvania Department of Transportation Specifications, Publication 408.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with applicable sections of PennDOT specifications.

B. Obtain materials from same source throughout.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials to be used should meet the requirements of PennDOT specifications. CONTRACTOR will be responsible for furnishing all required materials.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that pavement surface is properly prepared.

B. Verify locations of pavement markings and signs.

END OF SECTION

SECTION 02601
MANHOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast Concrete Manholes
B. Concrete Manhole Bases
C. Manhole Steps
D. Manhole Covers and Frames
E. Manhole Inserts

1.02 RELATED SECTIONS

A. Section 02225: Trenching, Backfilling & Compacting
B. Section 02720: Storm Sewer Pipe
C. Section 02730: Gravity Sanitary Sewer Pipe
D. Section 02731: Sanitary Sewer Lateral Connections

1.03 REFERENCES

A. Pennsylvania Department of Transportation Publication 408 Specifications.

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

A48 Specifications for Gray Iron Castings
C32 Specification for Sewer and Manhole Brick
C139 Specifications for Concrete Masonry Units for Construction of Catch Basins and Manholes
C270 Specifications for Mortar for Unit Masonry
C443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
C478 Specifications for Precast Reinforced Concrete Manhole Sections
C913 Specification for Precast Concrete Water and Wastewater Structures
C923 Specification for Resilient Connections Between Reinforced Concrete Manhole Structures and Pipes
D638 Test Method for Tensile Properties of Plastics

D746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
D1248 Standard Specification for Polyethylene Plastics Molding and Extrusion Materials

1.04 SUBMITTALS

A. Certificates:

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

B. Shop Drawings:

1. Submit detail shop drawings of manhole sections, and precast bases if used. Drawings shall clearly describe the lifting hooks, lugs or techniques to be used.

2. Submit detail shop drawings of manhole frames and covers, including rubbings of inscription, if necessary.

3. Submit detail shop drawings of manhole steps.

4. Submit manufacturers' descriptive literature for the pipe to manhole flexible connections.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling:

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

2. During loading, transporting and unloading, exercise care to prevent damage to precast reinforced concrete manhole components and other products specified herein. Avoid shock or damage at all times.

3. Through-wall lifting holes are not permitted in precast reinforced concrete manhole component construction.

B. Storage:

1. Store precast reinforced concrete manhole components and other products specified herein in accordance with the manufacturer's recommendations to prevent joint damage and contamination.

PART 2 PRODUCTS

2.01 BASIC MATERIALS

A. Crushed Stone Subbase: AASHTO No. 57, Type C, Section 703.2, Publication 408 Specifications.

B. Rubber Adjustment Risers:

1. Acceptable Manufacturers:

a. GNR Technologies, Inc. – Infra Riser
b. Substitutions in accordance with Section 01600.

C. Masonry Mortar: ASTM C270, Type S

D. Joint Sealant Compound: FS SS-S-00210, preformed, flexible, self-adhering, cold-applied.

E. Rubber Gaskets: ASTM C443

F. Resilient Pipe-to-Manhole Connection: ASTM C923

1. Acceptable Manufacturers

a. A-LOK Products, Inc.

b. Substitutions in accordance with Section 01600

2.02 FABRICATED PRODUCTS

A. Precast Concrete Manhole Sections: ASTM C478

1. 5.5% ± 1% air-entrained cement concrete.

2. Eccentric cone or flat slab top sections; minimum 24" access opening unless otherwise indicated.

3. Precast riser sections of length to suit.

4. Precast flanged bases of a design similar to the precast riser sections. The flange shall be monolithically poured with the base section.

5. Exterior Bitumastic Coating.

6. Manhole steps shall be factory installed in manhole components, prealigned vertically, spaced on equal centers, and located the minimum distance from ends of risers and top sections as indicated on the Drawings.

7. Through-wall lifting holes shall not be permitted in manhole component construction. Lifting keys or lugs shall be factory-installed in manhole components.

B. Manhole Steps

1. Polypropylene or fiberglass coated steel with suitable protective coating on portions embedded in concrete.

a. Acceptable Manufacturers:

1) M.A. Industries, Inc. - Stock No. PS-1
2) Alcoa - Aluminum Alloy Part No. 30105
3) Utility Products, Inc. - Perma-Step 100-2
4) Substitutions in accordance with Section 01600.

C. Manhole Frames and Covers

1. Design for H-20 loading when located in streets or traffic areas.

2. Castings shall be true to pattern in form and thickness, free from cracks, gas holes, flaws, excessive shrinkage, sound, and cleaned by means of sand blasting.

3. ASTM A 48, Class 35B.

4. Machine grind and finish bearing areas.

5. Manhole frame shall have a minimum 24" diameter opening.

6. Cast utility line use in two (2) inch high raised letters and OWNER's name as directed by the ENGINEER.

7. Self seal o-ring gasket with pick holes located at edge of manhole cover. Pickholes shall not extend completely through the cover.

8. Acceptable Manufacturers

   a. Neenah Foundry Company - Cat. No. R-1642-C or R-6050-C
   b. East Jordan Iron Works, Inc. – Cat. No. 1045
   c. Substitutions in accordance with Section 01600

D. Manhole Inserts

1. Manufactured from corrosion proof material suitable for atmospheres and conditions commonly found in wastewater collection systems.

2. Made from a "durable" High Density Polyethylene Copolymer material that meets ASTM Specification Designation D-1248 Class A, Category 5, Type III.

   This material shall have superior stress crack resistance, combined with a high impact strength and rigidity.

3. Minimum impact brittleness temperature of -105° F in accordance with ASTM D 746-70.

4. Softening temperature shall be 254° F, meeting all requirements of ASTM D 1525-70.

5. Minimum tensile strength of 3700 psi, and an elongation factor of 800%, meeting all requirements of ASTM D 638-71A.

6. The thickness of the insert shall be a uniform 1/8".

7. Insert to be provided with two 3/16" holes installed 180° apart, exactly 1" from the top of the insert, to allow for constant ventilation.

8. The insert shall have a closed cell neoprene gasket with adhesive backing, installed upon the insert rim by the manufacturer.

9. The insert shall be manufactured to fit the manhole frame rim upon which the manhole cover rests.

10. Insert shall have a corrosion resistant nylon strap installed for easy removal and reinstallation.

11. After installation, the unit shall not allow more than 5 gallons of inflow per 24 hours.

12. Acceptable Manufacturers:

    a. Parson Environmental Products, Inc.
    b. Substitutions in accordance with Section 01600.

E. Manhole Rehabilitation

See Section 02605 of these Specifications and the Standard Details.

2.03 ACCESS ROAD

A. An access road may be required to provide safe access to the manholes for maintenance purposes.

B. Access road shall have a maximum slope of 10%.

C. Access road shall consist of a PennDOT Class 4 geotextile material covered by 12-inch thick AASHTO No. 3 crushed stone.

D. Access road shall be a minimum of 12 feet wide.

PART 3 EXECUTION

3.01 EXCAVATION

A. Perform excavation to the line and grade shown on the Contract Drawings and as specified in Section 02225.

B. Location and depth of manholes as shown on the Drawings.

3.02 CONSTRUCTION

A. Construct watertight manholes of precast concrete sections and of the type shown on the Contract Drawings.

B. Construct drop connections of the required type as shown on the Drawings. Use precast drop sections. Do not encase drop connections in concrete.

C. Install a minimum of 6" of AASHTO No. 57 crushed stone subbase.

D. Provide cast-in-place concrete or precast concrete bases.

1. Construct cast-in-place bases as shown on the Drawings.

a. Cast-in-place bases shall be constructed with a special form for a joint to match the manhole cylinder sections.

2. Install precast bases as shown on the Drawings.

a. Set the precast base on a crushed stone subbase.

b. Provide a sealed, flexible resilient connection between pipe and precast base section. Grout interior of manhole around pipe connection.

E. Form flow channels in manhole bases as shown on the Drawings. Slope channels uniformly from influent invert to effluent invert; minimum 1" drop. 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. Seal joints between precast concrete manhole sections with preformed rubber gaskets or joint sealant compound.

1. Place joint sealant compound on lower section to be squeezed by the weight of the upper section.

2. Place rubber gasket in groove formed in spigot end. Equalize gasket tension.

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

I. Use rubber adjustment riser rings and/or precast manhole grade rings to achieve elevation shown for frame and cover. Do not adjust elevation more than 1 ft. with risers. For grade adjustments of 3" or less, use only the rubber risers. For grade adjustments of more than 3", use 3" rubber riser rings, completing the remainder of the grade adjustment with precast concrete riser rings. In no case shall more than 3" of rubber risers be used.

J. Install manhole frames and covers.

1. Set top of frames at finished grade elevation or other elevation shown on the drawing.

2. Anchor manhole covers installed in unpaved areas.

3. Seal joint between manhole frame and manhole with joint sealant compound.

K. 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.

L. When tying into an existing manhole where no opening exists, the CONTRACTOR shall drill a hole in the precast section in a circular pattern, remove the "core" of the pattern, grout in place a resilient pipe to manhole connection coupling and insert the pipe into the coupling.

3.03 BACKFILLING

A. Backfill only after examination of the manhole by the ENGINEER.

B. Perform backfilling as specified in Section 02225.

3.04 MEASUREMENT AND PAYMENT (Applicable to Projects contracted by the Borough and for preparation of municipal escrow quantities when applicable)

A. Manholes will be paid for at the unit price per vertical foot, as shown in the proposal, including steps, excavations and backfill.

B. Measurement of manholes will be taken vertically, at the center of manhole from the manhole invert to the bottom of the manhole frame.

C. Drop connections will be paid at the unit price per vertical foot, as shown in the proposal, which will include concrete encasement.

D. Manhole bases shall be paid for at the unit price for each shown in the proposal including all concrete encasement for all sewer piping.

E. Manhole frame and covers shall be at the unit price for each as shown in the proposal.

F. Manhole inserts shall be at the unit price for each as shown in the proposal.

G. Payment for manholes in place but not tested in accordance with the Specifications will be allowed up to 50 percent of the UNIT PRICE bid for each item as set forth in the Schedule of Prices.

3.05 TESTING

A. All manholes shall be pneumatically (vacuum) or hydrostatically pressure tested in accordance with the following:

1. Hydrostatic Test Procedure

   a. Hydrostatic testing shall be accomplished by filling the manhole with water to within one (1) foot of the proposed top elevation of the manhole. After 30 minutes, the drop shall not exceed 1/4 inch.

2. Pneumatic (Vacuum) Test Procedure

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

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

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

      Four foot diameter - 60 seconds.
      Five foot diameter - 75 seconds.
      Six foot diameter - 90 seconds.

END OF SECTION

SECTION 02603
PRECAST UTILITY STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast Concrete Vaults
B. Inlets, Endwalls, Manholes and Junction Boxes
C. Manhole Steps
D. Manhole Covers and Frames
E. Inlet Grates
F. Access Doors
G. Aluminum Ladders

1.02 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 02200 - Excavation and Earthwork

C. Section 02225 - Trenching, Backfilling & Compacting

D. Section 02575 - Paving and Resurfacing

E. Section 02601 - Manholes

F. Section 02720 – Storm Sewer Pipe

G. Section 02730 - Gravity Sanitary Sewer Pipe

H. Section 02731 - Sanitary Sewer Lateral Connections

I. Section 03301 - Concrete for Utility Construction

J. Section 03603 - Non-Shrink Grout

1.03 REFERENCES

A. Pennsylvania Department of Transportation Publication 408 Specifications.

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

A48	Specification for Gray Iron Castings
C32	Specification for Sewer and Manhole Brick
C270	Specifications for Mortar for Unit Masonry
C857	Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
C858	Specifications for Underground Precast Concrete Utility Structures
C891	Installation of Underground Precast Concrete Utility Structures

C913	Specification for Precast Concrete Water and Wastewater Structures
C923	Specification for Resilient Connections Between Reinforced Concrete Manhole Structures and Pipes

1.04 SUBMITTALS

A. Certificates:

1. Submit five (5) copies of certifications from material suppliers attesting that materials meet or exceed specification requirements.

B. Shop Drawings:

1. Submit detail shop drawings of precast utility structures.

2. Submit detail shop drawings of access doors.

3. Submit detail shop drawings of manhole frames and covers, including rubbings of inscription, if necessary.

4. Submit detail shop drawings of manhole steps.

5. Submit manufacturers' descriptive literature for flexible connections to the utility structure.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling:

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

2. During loading, transporting and unloading, exercise care to prevent damage to precast reinforced concrete utility structure components and other products specified herein. Avoid shock or damage at all times.

3. Through-wall lifting holes are not permitted in precast reinforced concrete utility structure component construction.

B. Storage:

1. Store precast reinforced concrete utility structure components and other products specified herein in accordance with the manufacturer's recommendations to prevent joint damage and contamination.

PART 2 PRODUCTS

2.01 BASIC MATERIALS

A. Crushed Stone Subbase: AASHTO No. 57, Type C, Section 703.2, Publication

408 Specifications. Minimum 6" required under base.

B. Rubber Adjustment Risers:

1. Acceptable Manufacturers

a. GNR Technologies, Inc. – Infra Riser
b. Substitutions in accordance with Section 01600.

C. Masonry Mortar: ASTM C270, Type S.

D. Joint Sealant Compound: FS SS-S-00210, preformed, flexible, self-adhering, cold-applied.

E. Rubber Gaskets: ASTM C443.

F. Resilient Pipe Connection: ASTM C923.

1. Acceptable Manufacturers:

a. A-LOK Products, Inc.
b. Substitutions in accordance with Section 01600.

2.02 PRECAST CONCRETE UTILITY STRUCTURES:

A. ASTM C858

B. 5.5% ± 1% air-entrained cement concrete.

C. Steel reinforcement shall be epoxy coated.

D. Concrete shall be a minimum of 4,000 psi.

E. Exterior bitumastic coating - 2 coats.

F. Precast flanged base. The flange shall be monolithically poured with the base section.

G. Manhole steps shall be factory installed in precast concrete utility structure components, prealigned vertically, spaced on equal centers, and located the minimum distance from the top of the structure as shown on the Drawings.

H. Through-wall lifting holes shall not be permitted in precast concrete utility structure construction. Lifting keys or lugs shall be factory-installed in structure components.

2.03 INLETS, ENDWALLS, MANHOLES AND JUNCTION BOXES

A. All storm sewer structures (unless approved by the Borough) shall be precast reinforced concrete.

B. All precast concrete storm sewer structures shall be supplied by a pre-approved PennDOT supplier.

C. All precast concrete storm sewer structures shall comply with PennDOT Publication 408 Specifications.

D. All manholes, inlets and junction boxes four feet (4') or deeper (from top of grate) shall have manhole steps installed.

2.04 MANHOLE STEPS

A. Polypropylene or fiberglass coated steel with suitable protective coating on portions embedded in concrete.

1. Acceptable Manufacturers:

a. M.A. Industries, Inc. - Stock No. PS-1
b. Alcoa Aluminum Alloy Part No. 30105
c. Utility Products, Inc. - Perma-Step 100-2
d. Substitutions in accordance with Section 01600.

B. Aluminum with suitable protective coating on portions embedded in concrete.

2.05 MANHOLE FRAMES AND COVERS

A. Design for H-20 loading when located in streets or traffic areas.

B. Castings shall be true to pattern in form and thickness, free from cracks, gas holes, flaws, excessive shrinkage, sound and cleaned by means of sand blasting.

C. ASTM A 48, Class 35B.

D. Machine grind and finish bearing areas.

E. Manhole frame shall have a minimum 24" diameter opening.

F. Cast utility line use in two (2) inch high raised letters at the direction of the ENGINEER.

G. Self-seal o-ring gasket with pick hole located at manhole cover edge. Pickholes shall not extend completely through the cover.

H. Acceptable Manufacturers

1. Neenah Foundry Co. - Cat. No. R-1642

2. East Jordan Iron Works, Inc. – Cat. No. 1045

3. Substitutions in accordance with Section 01600.

I. In general, valve pits and similar utility structures shall be required to be equipped with Access Doors as described in Section 2.07, following:

2.06 INLET GRATES

A. Design for H-20 loading when located in streets or traffic areas.

B. All grates shall be bicycle safe unless otherwise approved by the ENGINEER.

2.07 ACCESS DOORS

A. Door shall be ¼" aluminum diamond plate designed for H-20 loading requirements.

B. Channel frame shall be ¼" with a minimum cross section of 7 sq. in.

C. A continuous gasket shall be mechanically attached to the frame to create a dirt and debris barrier for the channel frame.

D. Door shall be equipped with stainless steel compression springs for easy opening; a hold-open arm with a release handle; stainless steel slam lock with nylon threaded cover plug and removable turn/lift handle; and stainless steel hinges and pins.

E. A 1-1/2" drainage coupling with a drain pipe discharging to the surface shall be provided for draining the channel frame.

F. Factory finish with bituminous coating on exterior surfaces in contact with concrete.

G. Manufacturer shall guarantee against defects in materials and workmanship for a period of ten (10) years.

H. Acceptable Manufacturers:

a. The BILCO Company
b. U.S.F. Fabrication, Inc.
c. Substitutions in accordance with Section 01600.

2.08 ALUMINUM LADDERS

A. Ladders shall be constructed entirely of aluminum. Construction shall conform to OSHA/ANSI A14.3 standards for fixed wall ladders.

B. A ladder safety extension shall be provided for each ladder. The safety extension shall be constructed entirely of aluminum and stainless steel. An aluminum housing shall mount to the ladder by means of stainless steel channel clamps secured to the ladder rungs with stainless steel "U" bolts. An aluminum telescoping post shall extend 37" above the top of the housing and lock into position with a stainless steel pin.

1. Acceptable Manufacturers

a. The BILCO Company
b. Halliday Products, Inc.
c. Substitutions in accordance with Section 01600.

C. Provide all clip angles, brackets, bolts and other fastenings required to fasten ladders to adjacent construction.

2.09 ACCESS ROAD

A. An access road may be required to provide safe access to the utility structures for maintenance purposes.

B. Access road shall have a maximum slope of 10%.

C. Access road shall consist of a PennDOT Class 4 geotextile material covered by 12-inch thick AASHTO No. 3 crushed stone.

D. Access road shall be a minimum of 12 feet wide.

PART 3 EXECUTION

3.01 EXCAVATION

A. Perform excavation to the line and grade shown on the Contract Drawings.

B. Location and depth of utility structures as shown on the Drawings.

3.02 CONSTRUCTION

A. Construct utility structures of precast concrete.

B. Install a minimum of 6" of crushed stone subbase.

C. Install precast utility structures as shown on the Drawings.

1. Set the precast utility structure on 6" minimum crushed stone subbase.

2. Provide a sealed, flexible resilient connection between pipe and precast utility structure.

D. Seal joints, if any, between precast concrete utility structure segments with preformed rubber gaskets or joint sealant compound.

1. Place joint sealant compound on both ledges of the lower section to be squeezed by the weight of the upper section.

2. Place rubber gasket in groove formed in spigot end. Equalize gasket tension.

E. Install utility structure sections with steps in proper vertical alignment.

F. Install concrete pipe supports as shown on Drawings.

G. All pipe connections into endwalls, inlets and junction boxes shall be professionally sealed using masonry "pop-corn" brick with non-shrink mortar. The outside joint shall be properly parged with the mortar mix and allowed to set prior to completing backfill. No red brick or field stone may be used.

H. When inlets are to be tied into new or existing curb, the inlet shall have an opening on the two foot (2') end of the structure to accommodate a six inch (6") plastic under drain pipe. The invert of the opening shall be at least twenty-eight inches (28") from top of curb. The six-inch (6") underdrain pipe shall extend out from the inlet and under the subbase for the curb. The end of the underdrain pipe (beneath the curb) shall be capped with 1/8" mesh screening or other plug approved by the ENGINEER.

I. All precast inlet tops (C, M and S) shall be set to finished grade elevation by use of reinforced concrete riser blocks.

J. All precast structures shall be backfilled with 2A aggregate placed in well compacted eight-inch (8") lifts using a gas powered jumping jack. No other means of compaction is acceptable unless approved by the ENGINEER.

K. Use solid precast concrete manhole grade rings to achieve elevation shown for frame and cover. Do not adjust elevation more than 1 ft. with precast rings. Elevation adjustments of more than one foot shall be achieved by using a precast utility structure section.

L. Install manhole frames and covers or access door with precast cap as required.

1. Set top of frames at finished grade elevation or other elevation shown on the drawing. Bolt down frames.

2. Anchor manhole covers installed in unpaved areas with bolts or other mechanisms as required by the specified users.

3. Seal joint between manhole frame and manhole with joint sealant compound.

4. Install access door, cast in cap, per manufacturer's recommendation.

3.03 BACKFILLING

A. Backfill only after examination of the structure by the ENGINEER.

B. Perform backfilling as specified in Section 02225.

END OF SECTION

SECTION 02605
MANHOLE REPAIR AND REHABILITATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of surfaces.

B. Replacement and repointing of masonry units.

C. Repair of damaged surfaces.

D. Structural enhancement of manholes.

1.02 RELATED SECTIONS

A. Section 03602 - Nonshrink Grout.

1.03 REFERENCES

A. American Society for Testing Materials (ASTM)

C32 - Specification for Sewer and Manhole Brick

C19 - Specifications for Concrete Masonry Units for Construction of Catch Basins and Manholes

C270 - Specifications for Mortar for Unit Masonry

C404 - Aggregates for Masonry Grout

C882 - Bond Strength of Epoxy Resin System Used with Concrete

B. American Concrete Institute (ACI)

1.04 SUBMITTALS

A. Certificates

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

B. Product Data

Indicate product standards, physical and chemical characteristics, technical specifications, limitations and general recommendations regarding each material. Submit instruction sheets prepared by material manufacturer which describe the correct method(s) of product application.

1.05 QUALITY ASSURANCE

Perform the required work as recommended by the manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products under provisions of Section 01600.

B. Comply with manufacturers instructions for storage, shelf life limitations and handling.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. Materials: The materials used shall be designed, manufactured, and intended for sewer manhole rehabilitation and the specific application in which they are used. The materials shall have a proven history of performance in sewer manhole rehabilitation. The materials shall be delivered to the job site in original unopened packages and clearly labeled with the manufacturer's identification and printed instructions. All material shall be stored and handled in accordance with recommendations of the manufacturer and the American Concrete Institute (ACI).

B. Stopping active leaks in concrete and masonry manholes shall be accomplished using the following materials:

1. A premixed fast-setting, volume-stable waterproof cement plug consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents. It shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder or gas-forming agents, or promote the corrosion of steel with which it may come in contact. Set time shall be approximately 1 minute. Ten-minute compressive strength shall be approximately 500 psi.

2. A siliconate-based liquid accelerator, field mixed with neat portland cement. The set time shall be approximately 1 minute.

3. Acceptable products are Preco-Plug, Parson Quick Plug, or Sauereisen H_2O Pruf No. F-180.

C. Patching, repointing, filling, and repairing nonleaking holes, cracks, and spalls in concrete and masonry manholes:

1. A premixed nonshrink cement-based patching material consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents, which has been formulated for vertical or overhead use. It shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder, or gas-forming agents or promote the corrosion of steel. Set time (ASTM C-191) shall be less than 30 minutes. One-hour compressive strength (ASTM C-109) shall be a minimum of 200 psi and

the ultimate compressive strength (ASTM C-109) shall be a minimum of 3000 psi. Bond strengths (ASTM C-882 Modified) shall be a minimum of 1700 psi.

2. Acceptable products are Preco-Plug, Parson Multi-Patch, or Sauereisen Underlayment No. F-120.

D. Manhole Cone Repair

For lining repairs of the transition from the cone to the manhole frame.

1. Apply in accordance with manufacturer's specifications.
2. Acceptable products are Parsonpoxy FP, or approved equal.

E. Lining of Manhole Walls and Cones:

For manhole wall rehabilitation, provide a permanent impermeable, high strength monolithic lining to the interior manhole walls.

1. Epoxy and silica mix to provide a mortar mix of trowelable consistency.

2. Polymer, hardener and powder mix of trowelable consistency.

3. Minimum compressive strength, ASTM C-579, shall be 4000 psi.

4. Acceptable products are Preco Fosroc Epoxy Liner, Sauereisen Corrosion-Clad Polymer Lining No. 210, or Parson MH Liner.

F. Sealing of Manhole Frame:

For manhole frame sealing, provide a sealant, applied to the frame exterior after excavating the material surrounding the frame and hydroblasting the frame and top of manhole cone.

1. A flexible epoxy material shall be provided and applied to the exterior of the cone top and manhole frame, thoroughly coating this entire exposed area and joint between the frame and top of cone with a minimum of 10 mils of the sealant material.

2. Acceptable products are Parsonpoxy FG or Preco Infil-Strip in combination with Fosroc Epoxy Liner.

G. Structural Repair

For combined structural integrity and corrosion prevention applications.

1. Apply in accordance with manufacturer's specifications.
2. Acceptable products are Parson Composite Liner System, or approved equal.

H. Water

Water shall be clean and potable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of repair or installation means acceptance of existing structural surfaces.

3.02 PREPARATION

A. All loose brick, mortar, unsound concrete and other materials must be completely removed.

B. Clean all concrete and masonry surfaces using a high-pressure hydroblast water spray (minimum 700 psi). Any manufacturer's product proposing the use of acid or caustic wash preparation of surfaces requires the review and acceptance by the ENGINEER.

3.03 REPAIR OF INFILTRATION

A. If infiltration is encountered, the CONTRACTOR shall repair prior to application of coatings.

B. Infiltration shall be stopped by chemical grout sealing or plugging said points of entry, using materials described in 2.01 B. of this Section 02605.

C. If necessary, CONTRACTOR shall channel infiltration through "bleed" pipes installed at the bottom of the manhole. All necessary "bleed" pipes shall be plugged when other work is finished.

D. All cleaning shall meet manufacturers requirement for application of patches and coverings.

3.04 PATCHING

A. All loose material shall be removed from the area to be patched or repointed exposing a sound subbase.

B. Holes or voids around steps, joints or pipes, spall areas, and cavities caused by missing or broken brick shall be patched and missing mortar repointed using a non-shrink patching mortar, as described in 2.01. C. of this Section 02605.

C. Cracks not subject to movement and greater than 1/6 inch in width shall be routed out to a minimum width and depth of 1/2 inch and patched with non-shrink patching mortar.

3.05 MANHOLE LINING AND STRUCTURAL ENHANCEMENT

A. Cementitious Liner

1. This method uses a cementitious blend of binders, polymers or epoxys, aggregates, and other additives. After mixing, the material is trowel applied directly to the manhole surface in an application as described by the manufacturer of the product. Brush on or spray techniques will not be permitted.

2. Surface Preparation

   a. The entire surface shall be cleaned and all loose and protruding material shall be removed.
   b. Active infiltration through the manhole structure shall be repaired.
   c. All large voids shall be patched with a non-shrink cement based patching material, as described above.

3. Application

   a. The materials shall be mixed and applied in accordance with the manufacturer's written instructions using approved equipment. The material shall be trowel applied directly to the manhole surface. The material shall be troweled, not brushed or sprayed. The material shall completely cover the interior surface of the manhole with a minimum thickness of 1 inch.

3.06 MANHOLE FRAME SEALING

The manhole frame and chimney above the cone or corbel shall be excavated, hydroblasted and sealed to prevent leakage of water.

END OF SECTION

SECTION 02640
VALVES AND FIRE HYDRANTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Installation of Valves
B. Installation of Fire Hydrants

1.02 RELATED SECTIONS

A. Section 01300 - Submittals
B. Section 01600 - Material and Equipment
C. Section 02225 - Trenching, Backfilling & Compacting
D. Section 02601 - Manholes
E. Section 02603 - Precast Utility Structures
F. Section 02660 - Water Mains
G. Section 02661 - Water Service Connections
H. Section 02675 - Testing and Disinfecting Water Mains
I. Section 03301 - Concrete for Utility Construction

1.03 REFERENCES

A. American Water Works Association (AWWA):

C500 Gate Valves, 3" through 48", For Water and Other Liquids
C502 Dry-Barrel Fire Hydrants
C509 Resilient Seated Gate Valves
C510 Double Check Valve Backflow Preventer
C511 Reduced Pressure Principal Backflow Preventer
C600 Installation of Ductile Iron Water Mains and Appurtenances

1.04 SUBMITTALS

A. Certificates: In accordance with Section 01300 of these specifications, provide manufacturer's certification attesting that valves, hydrants, and accessories meet or exceed AWWA Standards and specification requirements.

B. Product Data: In accordance with Section 01300 of these specifications, provide manufacturer's latest published literature including illustrations, installation instructions, maintenance instructions and parts lists.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Prepare valves, hydrants and accessories for shipment according to AWWA Standards and:

1. Seal valve, hydrant and meter ends to prevent entry of foreign matter into product body.

2. Box, crate, completely enclose, and protect products from accumulations

of foreign matter.

B. Store products in areas protected from weather, moisture, or possible damage.

C. Do not store products directly on ground.

D. Handle products to prevent damage to interior or exterior surfaces.

PART 2 - PRODUCTS

2.01 GATE VALVES

A. Resilient Seated Gate Valves

1. Ductile iron body, bronze mounted conforming to AWWA C509.

a. Resilient seated.
b. Non-rising stem, O-ring stem seals.
c. 2" square operating nut; open counterclockwise.
d. Mechanical Joint end connection.
e. Holes at top and bottom of gate to permit water to flush through gate when operated.

B. Acceptable Manufacturers

1. American Flow Control

2. U.S. Pipe and Foundry Co.

3. Mueller Co.

C. Design Work Pressure

1. 250 psi for valves 12" or smaller.

2. 150 psi for valves 14" or larger.

2.02 VALVE BOXES

A. 10" valves and smaller:

1. Domestic cast iron, two-piece, screw type.

2. Bingham & Taylor Fig. No. 4905, or approved equal.

B. Valves larger than 10":

1. Domestic cast iron, two-piece, screw type.

2. Oval base.

3. Bingham & Taylor Fig. No. 4905, or approved equal.

C. Cast iron lid with the word (WATER) cast in.

2.03 COMBINATION AIR VALVES

A. Single body, double orifice type. Size as recommended by Manufacturer.

B. Cast iron body and cover; stainless steel float, orifice seat, linkage mechanism, mountings and trim. Buna-N orifice valve.

C. Valve orifice designed for maximum venting capacity under normal main pressure.

D. 150 psi minimum rated working pressure; hydrostatically tested to 2 times rated working pressure.

E. Acceptable Manufacturers

1. Ames 800C OSY
2. Val-Matic Valve & Manufacturing Co.
3. APCO Valve and Primer Corp.
4. Crispin

2.04 DOUBLE CHECK VALVE BACKFLOW PREVENTER

The Double Check Valve Assembly shall be used to control cross connections between potable water lines and substances that are objectionable to a public water supply but are not a health hazard.

A. Shall meet the requirements of AWWA C510.

B. Shall be constructed as follows:

1. Valve bodies and covers -

a. Bronze
b. Gray iron or ductile iron having a polymerized coating

2. Clapper and poppet facing rings - molded synthetic rubber.

3. Swing pin and guide stem - stainless steel or phosphor bronze.

4. Springs - stainless steel or phosphor bronze.

5. Seat rings or valve seats - stainless steel or bronze.

C. Shall have full ported test cocks for testing.

D. Be designed to maintain a minimum of one (1) PSI across the valve during

normal operation.

E. Acceptable Manufacturers

1. Ames 300C OSY

2. Watts Regulator Company - Series 007 or 770

3. Conbraco Industries - Series 40-100

4. Hersey Products - Model FDC or No. 2

2.05 REDUCED PRESSURE PRINCIPAL BACKFLOW PREVENTER

The Reduced Pressure Principle Backflow Preventor shall be used to provide maximum protection against backflow caused by back-pressure or back-siphonage from a cross connection between potable water lines and substances that are health hazards or high hazards to a public water supply.

A. Shall meet the requirements of AWWA C511.

B. Shall be constructed as follows:

1. Valve bodies and covers -

a. Bronze
b. Gray iron or ductile iron having a polymerized coating

2. Clapper and poppet facing rings - molded synthetic rubber.

3. Relief valve facing rings - molded synthetic rubber.

4. Swing pin and guide stem - stainless steel or phosphor bronze.

5. Springs - stainless steel or phosphor bronze.

6. Diaphragms - synthetic rubber with cotton or rayon cloth insert.

7. Seat rings or valve seats - stainless steel or bronze.

C. Shall have full ported test cocks for testing.

D. Be designed to maintain a minimum of two (2) PSI across the valve during normal operation.

E. Acceptable Manufacturers

1. Watts Regulator Company - Series 009 or 990

2. Conbraco Industries - Series 40-200

3. Hersey Products - Model FRPII or 6CM

2.06 REDUCED PRESSURE DETECTOR ASSEMBLY

The Reduced Pressure Detector Assembly shall be used to provide maximum protection against backflow caused by backpressure or back-siphonage from a cross connection between potable water and substances that are health hazards to a public water supply and at the same time to detect leakage or unauthorized use of water from a fire service or automatic sprinkler system.

A. Shall meet the requirements of AWWA C511.

B. Shall be constructed as follows:

1. Valve bodies and covers.

a. Bronze
b. Gray iron or ductile iron having a polymerized coating.

2. Springs - stainless steel or phosphor bronze.

3. Seat rings or valve seats - stainless steel or bronze.

4. Diaphragms - synthetic rubber with cotton or rayon cloth insert.

5. Valve discs - silicone rubber.

C. Shall have a maximum rated working pressure of 175 psi.

D. Shall have full ported test cocks for testing.

E. Acceptable Manufacturers

1. Watts Regulator Company - Series 990RPDA

2. Conbraco Industries - Series 40-700

3. Hersey Products - Model 6CM-RPDA

2.07 WATER PRESSURE REDUCING VALVE

A. Shall meet the requirements of ASSE 1003 and ANSI A112.26.2.

B. Shall be constructed as follows:

1. All bronze body; integral high capacity stainless steel strainer; stainless steel seat; high temperature resisting reinforced diaphragm for hot or cold water; and built-in by-pass.

C. 300 psi rated working pressure.

D. Adjustable pressure setting from 25 to 75 psi.

E. Acceptable Manufacturers:

1. Watts Regulator Company - Series 25AUB

2. Conbraco Industries - Series 36-100-01

3. Substitutions in accordance with Section 01600.

2.08 FIRE HYDRANTS

A. Dry-barrel break-away type conforming to AWWA C502.

1. Compression type.

2. Bury depth: Minimum 4'-0", or as indicated on the Drawings.

3. Inlet Connection: 6".

4. Valve Opening: 5-1/4".

5. Mechanical Joint end connections.

6. Double "O" ring seal plate with integral grease chamber.

7. Sealed oil reservoir.

8. Corrosion resistant bolts and nuts.

9. Connect at the ground line by a two-part safety flange.

10. One 4-1/2 inch pumper nozzle and two 2-1/2 inch Hose Nozzles.

a. Attach nozzle caps to the standpipe by separate kink proof chains.
b. Threads shall be Berks County Thread (unless otherwise noted).
c. Nozzle cap nuts and hydrant operating nut to be square.
d. Provide and install 5" Storz adapter for the 4 ½" pumper nozzle.

11. Shall open counterclockwise.

12. Below grade and internal ferrous surfaces shall have two (2) coats of black asphaltum.

13. Exposed surfaces above grade, including nozzle caps and bonnet, shall be given two (2) coats of a silver oil base paint.

14. Acceptable Manufacturers:

a. American Flow Control B-62-B

2.09 BLOW-OFFS

A. Furnish and install blow-offs where required in accordance with the Standard Detail.

B. The Aquarius One-O-One GHS 2" Slim Line Hidden Hydrant as manufactured by GIL Industries, Inc. and the Mueller No. A-410 Fabricated Hidden Type Flushing Hydrant will be considered as acceptable alternates at certain locations.

PART 3 - EXECUTION

3.01 GENERAL

A. Determine the exact location and size of valves and hydrants from the Drawings. The Standard Details represent typical conditions. Obtain all necessary clarification and directions from the OWNER or ENGINEER prior to the execution of Work.

B. Perform trench excavation, backfilling and compaction in accordance with Section 02225.

C. Install pipe and tubing in accordance with Section 02660 and the applicable Standard Details.

3.02 GATE VALVES

A. Install valves in conjunction with pipe laying. Set valves plumb.

B. Provide buried valves with valve boxes installed flush with finished grade and centered over the operating nuts.

3.03 COMBINATION AIR VALVES

A. Install combination air valves in valve vault.

B. Provide clamp where needed.

C. Set combination air valves plumb.

3.04 FIRE HYDRANTS

A. Install fire hydrants as shown on Standard Details. Provide support blocking and drainage gravel as shown.

1. Set hydrants plumb with steamer nozzle facing the curb.

2. Set hydrants with nozzles at least 12 inches above the ground and the

safety flange not more than 6 inches nor less than 2 inches above grade.

3. Do not block drain hole.

4. Provide steel restraints between hydrant and hydrant valve. Coat all restraint bars with bitumastic coating.

5. Hydrants to be painted silver, with nozzle cap color to be confirmed by Borough.

B. After hydrostatic testing flush hydrants and check for proper drainage.

END OF SECTION

SECTION 02660
WATER MAINS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Water Transmission Lines and Fittings
B. Water Distribution Lines and Fittings

1.02 RELATED SECTIONS

A. Section 02200 - Excavation and Earthwork
B. Section 02150 - Boring, Jacking and Tunneling
C. Section 02225 - Trenching, Backfilling & Compacting
D. Section 02575 - Paving and Resurfacing
E. Section 02601 - Manholes
F. Section 02603 - Precast Utility Structures
G. Section 02640 - Valves and Fire Hydrants
H. Section 02661 - Water Service Connections
I. Section 02675 - Testing and Disinfecting Water Mains
J. Section 03301 - Concrete for Utility Construction

1.03 REFERENCES

A. American Water Works Association (AWWA):

C104	Cement Mortar Lining for Cast Iron and Ductile Iron Pipe and Fittings for Water
C105	Polyethylene Encasement for Gray and Ductile Cast Iron Piping
C110	Gray Iron and Ductile Iron Fittings 3" Through 48"
C111	Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings
C115	Flanged Cast Iron and Ductile Iron Pipe with Threaded Flanges
C150	Thickness Design of Ductile Iron Pipe
C151	Ductile Iron Pipe for Water or other Liquids
C153	Ductile Iron Compact Fittings, 3" through 24" and 54" through 64", for Water Service
C600	Installation of Ductile Iron Water Mains and Appurtenances

1.04 SUBMITTALS

A. Manufacturers' Literature: In accordance with Section 01300 of these specifications, provide manufacturers' catalog information for each type of pipe, fittings, couplings, adapters, gaskets and assembly of joints for approval of the ENGINEER. Include manufacturers' recommendations for deflection in pipe joints.

B. Certificates: In accordance with Section 01300 of these specifications, provide

manufacturer's certifications for each type of pipe, fittings, gaskets, lubricants or other joint materials from the manufacturers attesting that each of these meets or exceeds specifications requirements.

C. Samples Or Shop Drawings: In accordance with Section 01300 of these specifications, provide shop drawings for joint assemblies and one sample of each type of jointing materials.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling:

1. Do not place materials on private property without written permission from the property Owner.

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

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

4. Use padded slings, hooks and tongs to prevent damage to the exterior surface or internal lining of the pipe.

B. Storage:

1. Pipe may be strung along alignment where approved by the ENGINEER.

2. Do not stack higher than Maximum Stacking Heights shown in AWWA C600 or as recommended by the pipe manufacturer.

3. Keep interior of pipe and fittings free from dirt or other foreign matter.

4. 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

2.01 PIPE, FITTINGS AND JOINTS

A. Ductile Iron (DI):

1. Ductile Iron Pipe: AWWA C150 and C151

a. Cement Mortar Lined inside in accordance with AWWA C104.
b. Outside Bituminous Seal Coat.
c. Minimum Class 52.
d. Push-on Joints conforming with AWWA C111. Provide gasket type joint restraint or retainer glands at all joints, if required.

2. Ductile Iron and Cast Iron Fittings: AWWA C110 and C153

a. Cement Mortar Lined inside in accordance with AWWA C104.
b. Outside Bituminous Seal Coat.

c. Mechanical Joint. Joint restraints are required.
d. Ductile iron fittings will be required except where the specific fitting is not manufactured as a ductile in a product.

3. Pipe Detection Appurtenances

a. Provide metallic wedges supplied by the pipe manufacturer at pipe joints to enhance underground pipe location.
b. Over non-metallic pipe, provide a 12 gauge, vinyl coated copper wire (1) foot over the pipe. Bring the wire to the ground surface at each valve box and fire hydrant location to permit clamp-on of detection/locating equipment. If no hydrants or valves exist along the pipe, the copper wire shall be brought to the surface and shall be marked by steel posts driven into the ground to provide a permanent location as shown on the plans for the project.

B. Other Materials as noted on Drawings.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavate trenches as specified in Section 02225. Provide at least 4'-0" of cover from the top of the pipe to the finished grade elevation except as noted on Drawings.

3.02 PIPE BEDDING

A. Provide bedding for pipelines as shown on Standard Details.

B. Assure that the pipe is supported on the lower quadrant for the entire length of the barrel.

3.03 PIPE LAYING

A. Clean and inspect each length of pipe or fitting before lowering into the trench. Do not lower pipe into the trench except that which is to be immediately installed.

B. Lay pipe to a uniform line with the barrel of the pipe resting solidly throughout its length. Excavate recesses to accommodate joints, fittings, and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.

C. Lay each section of pipe in such a manner as to form a close concentric joint with adjoining section and to avoid offsets.

D. Minimum cover over pipe shall be 4'-0".

E. On slopes greater than ten (10) percent pipe laying will proceed upgrade, and

slope anchors shall be installed in accordance with the Standard Details. Slope anchors will utilize epoxy coated reinforcing bars.

F. 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. Protect the lubricant container and applicator from dirt and foreign particles.

G. Check each pipe installed as to line and grade in place. Correct deviations immediately. Deflection of pipe joints in excess of maximum recommended by manufacturer will be cause for rejections.

H. Install fittings and valves as pipe laying progresses. Do not support the weight of fittings and valves from the pipe.

I. 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 trench water, earth, or other substances from entering the pipes or fittings.

J. Backfill concurrently with pipe laying to hold installed pipe in place. When pipe laying is terminated for any reason, provide at least 2 feet of backfill over all pipe except the last piece laid.

K. Joint Assembly:

1. Push-on Joints:

   a. Clean the inside of the bell and the outside of the spigot. Insert rubber gasket into the bell recess.
   b. Apply a thin film of gasket lubricant to either the inside of the gasket or the spigot end of the pipe, or both.
   c. 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.
   d. Provide Field-Lok gaskets or equivalent when directed.

2. Mechanical Joints:

   a. Wipe the socket and plain end. Apply a thin film of lubricant. Slip the gland and gasket over the plain end of the pipe. Apply lubricant to gasket.
   b. Insert the plain end of the pipe into the socket and seat the gasket evenly in the socket.
   c. Slide the gland into position, insert bolts, and finger-tighten nuts.
   d. Joint restraints shall be used.
   e. Bring bolts to uniform tightness. Tighten bolts 180-degree apart alternately. A torque wrench shall be used to tighten bolts to the manufacturer's requirement.

f. Coat all bolts and nuts with bitumastic paint after installation.

3. Coupled Joints:

a. In accordance with manufacturer's recommendations.

L. Detection Tape

1. Wherever non-metallic pipe is installed, detection tape is to be installed, above the pipe, twelve (12) to eighteen (18) inches below finished grade along the entire trench length. This is in addition to the copper wire required to be installed, as described in 2.01 of this Section.

2. Acceptable manufacturers.

a. Joseph G. Pollard Co. No. P-802
b. Allen Systems, Inc.

M. Corrosion Prevention Materials

1. Wherever pipe passes within five (5) lineal or radial feet of another cathodically-protected utility line, 8 mil low-density polyethylene tubing/wrap shall be furnished to prevent accelerated corrosion of the pipe.

2. Shall meet AWWA C105.

3.04 CUTTING

A. Cut pipe without damaging pipe or lining.

B. Grind cut ends and rough edges smooth. Bevel end for push-on joints.

3.05 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: Per manufacturer's recommendations.

3.06 THRUST RESTRAINT

A. Provide all valves, tees, bends, caps, and plugs with concrete thrust blocks and steel restraints as indicated on the Standard Details. Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks to contain the resultant force and so pipe and fitting joints will be accessible for repair. Only ready-mixed concrete shall be used for thrust blocks.

B. Furnish and install MEGALUG Mechanical joint restraints as manufactured by EBAA Iron Sales, Inc., or an approved equal, at all mechanical joint fittings as indicated on the Drawings. 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.

3.07 BLOW-OFFS

A. Install a blow-off on the dead ends of all water mains where shown on the Drawings.

B. Construct blow-offs as shown on Standard Detail, with discharge directed to the surface.

3.08 COMBINATION AIR VALVES

A. Install combination air valve at the high points of water mains where shown on the Drawings.

B. Install combination air valves including valve vault as shown on Standard Detail.

3.09 CAST-IN-PLACE CONCRETE CONSTRUCTION

All concrete shall be ready-mix in accordance with Section 03301 and the Standard Details and Drawings.

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 ENGINEER.

B. Stream Crossings:

1. Install water mains crossing streams as shown on the Drawing(s) for the project.

C. Highway and Railroad Crossings:

1. Install water mains crossing highways and railroads as shown on the Drawings for the project. Comply with Railroad Company, Pennsylvania Department of Transportation, and municipal permits included in the Specifications.

2. When casing pipe is indicated, install it as specified in Section 02150 - Boring, Jacking, Tunneling.

D. Bridge or Aerial Crossings:

1. For above the ground water mains attached to a bridge or other structural supports, furnish and install all supports, hangers and fastenings as shown on the Drawings.

2. Provide insulation and jacket as shown on Drawings for the project. Insulation shall be rigid, non-combustible, abrasion and moisture resistant. Jacket shall be capable of withstanding environmental conditions present at site.

3. Provide heat tracing as shown on Drawings. Provide all necessary equipment as recommended by manufacturer.

E. Wall Sleeves:

1. Provide pipes passing through concrete or masonry construction with sleeve or wall pipe fittings of type and size indicated.

2. Provide sleeves two pipe sizes larger than the water mains, unless otherwise specified or shown.

3.11 INTERRUPTION OF WATER SERVICE

A. During the course of the Work, it may be necessary or advantageous to temporarily interrupt service to a customer or group of customers. If the CONTRACTOR wishes to interrupt service, approval of the ENGINEER shall be obtained at least forty-eight (48) hours prior to such interruption of service; and it shall be the responsibility of the CONTRACTOR to notify all customers, whose service will be interrupted, at least twenty-four (24) hours prior to such interruption of service. In all instances, the duration of interruption of service shall be kept to a minimum.

3.12 TESTING

A. Test and disinfect water mains as specified in Section 02675.

3.13 PIPE INSULATION

A. Where water mains are constructed with distance of two (2) feet or less from storm sewer pipes or other openings which are exposed directly or indirectly to the ambient atmosphere, the water main shall be insulated on its exterior with foam pipe insulation material manufactured for this purpose.

B. Curved foam pipe insulation as manufactured by Corning, or approved equal, shall be supplied and installed.

END OF SECTION

SECTION 02661
WATER SERVICE CONNECTIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Tapping water mains by installation of corporation stops or other suitable fittings or couplings.

B. Connection of service pipe and fittings up to curb stops and meter boxes.

C. Installation of meter setting equipment.

1.02 RELATED SECTIONS

A. Section 01300 - Submittals
B. Section 01600 - Material and Equipment
C. Section 02225 - Trenching, Backfilling and Compacting
D. Section 02575 - Paving and Resurfacing
E. Section 02601 - Manholes
F. Section 02603 - Precast Utility Structures
G. Section 02640 - Valves and Fire Hydrants
H. Section 02660 - Water Mains
I. Section 02675 - Testing and Disinfecting Water Mains
J. Section 03301 - Concrete for Utility Construction

1.03 REFERENCES

A. American Water Works Association (AWWA)

C600	Standard for Installation of Ductile Iron Water Mains and Appurtenances
C800	Underground Service Line Valves and Fittings

B. American Society for Testing and Materials (ASTM)

B43	Specification for Seamless Red Brass Pipe, Standard Sizes
B62	Specification for Composition Bronze or Ounce Metal Castings
B88	Seamless Copper Water Tube
B584	Specification for Copper Alloy Sand Castings for General Applications
D2239	Standard Specification for Polyethylene (PE) Plastic Tubing - Iron Pipe Size
D3035	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter

1.04 SUBMITTALS

A. Manufacturer's Literature: In accordance with Section 01300 of these specifications, provide pages of manufacturer's catalog for each size and type of

Corporation Stop, Curb Stop, Curb Box, Meter Setting and pipe, fitting or coupling.

B. Shop Drawings or Samples: In accordance with Section 01300 of these specifications, provide shop drawings or samples of all products to be assembled by the CONTRACTOR at site for prior approval of the ENGINEER.

C. Certificates: In accordance with Section 01300 of these specifications, provide certificate for pipe, pipe fittings, joints, joint gaskets and lubricants and base materials from each manufacturer attesting that each of these meets or exceeds specification requirements.

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, and in a manner to keep products clean and in good condition until used.

PART 2 - PRODUCTS

2.01 PIPE OR TUBING AND FITTINGS

A. Copper Service Tubing

1. Conform with ASTM B.88, Type K, heavy wall, soft temper.

2. 3/4" minimum, 2" maximum in size.

2.02 CONNECTIONS

A. General:

1. Provide pipe joints and coupling materials suitable in size, design and material of pipe and service fittings with which it is used.

2.03 TAPPING ACCESSORIES

A. Tapping Sleeves:

1. Mechanical Joint, or as indicated on the Drawings

2. 200 psi working pressure

3. Outlet Flange: ANSI B16.1, Class 125

B. Tapping Valves:

1. AWWA C509, Resilient Seat Type

2. Inlet Flange, Class 125

3. Outlet Flange - Mechanical Joint

C. Acceptable Manufacturers

1. American Flow Control

2. U.S. Pipe and Foundry Co.

3. Smith Valve and Hydrant Division

4. Mueller Co.

D. Service Saddles

1. Stainless steel, single strap, nylon coated.

2. Products as manufactured by Smith-Blair, No. 315, or approved equal.

2.04 CORPORATION STOP ASSEMBLY

A. Corporation Stops - Compression:

1. Mueller Co. No. B-25008, or equal.

B. Service Clamps:

1. Mueller Co. H-16000 or H-13000 Series.

2. Single or Double Straps with matching hardware.

2.05 CURB STOP ASSEMBLY

A. Curb Stops - Compression:

1. Mueller Co. No. B-25209, or equal.

B. Curb Boxes and Covers:

1. Bingham & Taylor Figure No. 4901

2. Tyler Pipe, Series 6500, Figure 93-D, Screw-type Box

3. Approved equal.

2.06 BUILDING SERVICE LINES

A. All building service lines shall be constructed of the same material as described for service connections.

PART 3 - EXECUTION

3.01 PREPARATION

A. Establish location of curb stops and meter boxes for each service connection.

B. Excavate trench to the line and grade shown on the Drawings and as specified. Jack or bore service lines underneath paved highways where approved by the ENGINEER.

3.02 TAPPING WATER MAINS

A. Each connection for different kinds of water mains shall be tapped using suitable materials, equipment and methods approved by the ENGINEER.

B. Screw corporation stops directly into a tapped and threaded iron main at 10 or 2 o'clock positions on the main's circumference. Locate corporation stops at least 12" apart longitudinally and staggered. A double wrap of three (3) mil teflon tape shall be placed on each corporation stop. Where required, use a service saddle to construct the corporation connection.

C. Exercise care against crushing or any other damage to the water mains at the time of tapping or installing the service clamp or corporation stop.

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 ENGINEER.

3.03 SERVICE LINE AND FITTINGS

A. All service lines in excess of 2" shall be constructed of ductile iron pipe and installed in accordance with Section 02660.

B. 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.

C. Service tubing shall be loosely laid without kinking to the curb stop in a single length without the use of intermediate couplings.

D. Bed all service connections with six (6) inches of sand, and cover to a depth of 12 inches over top of the service line with sand. Do not use limestone products.

E. 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 approved by the ENGINEER.

F. 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.

G. 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.

H. Operate each corporation and curb stop before and after installation.

I. Set curb box centered and plumb over curb stop. Small diameter curb stop boxes are not permitted.

J. Consumer side of curb stop shall be suitable for copper tubing, unless otherwise instructed.

K. 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.

L. Provide concrete thrust blocking or restrained joints at all bends, tees and changes in direction.

M. Provide all pipes passing through concrete or masonry construction with Wall Sleeves of the type and size indicated.

N. Test and disinfect mains and service lines as specified in Section 02675.

O. All domestic service and fire service lines shall be equipped with backflow prevention devices. All domestic service lines shall be equipped with thermal expansion relief valves.

P. Non-metallic pipe shall have detection appurtenances in accordance with Section 02660.

3.04 BUILDING SERVICES

A. Shall be constructed with piping materials, bedding and cover material equal to service line and fittings from curb stop to water meter.

END OF SECTION

SECTION 02675
TESTING & DISINFECTING WATER MAINS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Testing Water Main Pipeline:

1. Hydrostatic pressure testing
2. Leakage testing

B. Disinfecting:

1. Bacteriological testing

1.02 RELATED SECTIONS

A. Section 02640: Valves and Fire Hydrants
B. Section 02660: Water Mains
C. Section 02661: Water Service Connections

1.03 REFERENCES

A. American Water Works Association (AWWA):

C600	Standard for Installation of Ductile Iron Water Mains and Appurtenances, Section 4
C651	Standard for Disinfecting Water Mains

1.04 QUALITY ASSURANCE

A. Testing Agency:

1. Bacteriological testing shall be performed by a testing laboratory engaged and paid for by the CONTRACTOR and approved by the ENGINEER.

B. Test Acceptance:

1. No test will be accepted until the results are below the specified maximum limits.

2. The CONTRACTOR shall, at his own expense, determine and correct the sources of leakage and retest until successful test results are achieved.

1.05 SUBMITTALS

A. Test Procedures: Submit a testing sequence schedule including a list of testing equipment to be used.

B. Certificates:

1. Submit, prior to starting testing, five (5) copies of certification attesting that the pressure gauges to be used have been calibrated and are accurate to the degree specified in Part 2, Products.

2. Submit five (5) copies of certification attesting that the chlorine form composition is as specified.

C. Test Reports: Submit two copies of laboratory test reports of each bacteriological test.

PART 2 - PRODUCTS

2.01 HYDROSTATIC TEST EQUIPMENT

A. Minimum Equipment Required

1. Hydro pump

2. Pressure hose

3. Test connections

4. Water meter

5. Pressure gauge, calibrated to 0.1 lbs./sq. in.

6. Pressure relief valve

2.02 DISINFECTING CHEMICALS

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

PART 3 - EXECUTION

3.01 PREPARATION

A. Backfill trenches in accordance with Section 02225.

B. Provide the water line under test with reaction thrust blocking. Hydrostatic testing shall not begin until the concrete thrust blocking has set, but not before a minimum of 7 days after pouring.

C. Provide pumps, piping, tanks, connections, polyurethane plugs, and appurtenances. The OWNER will provide the necessary water for one (1) fitting of the line(s) to be tested at no cost to the CONTRACTOR. Retest volumes, if required, will be charged to the CONTRACTOR.

3.02 TESTING WATER LINES

A. Hydrostatic Testing:

1. 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.

2. Conduct pressure tests for a period of not less than 60 minutes where pipes are exposed, or four (4) hours where pipes have been backfilled at a pressure of not less than 1.5 times the working pressure based upon the elevation of the lowest point in line under test corrected to the elevation of the test gauge, or 150 psi, whichever is more. Obtain test pressure from the ENGINEER.

3. Slowly fill the section to be tested with water, expelling air from the pipeline at the high points. Install corporation stops at high points if necessary. After all air is expelled, close air vents and corporation stops and raise the pressure to the specified test pressure.

4. Observe joints, fittings and valves under test. Remove and replace cracked pipe, joints, fittings, and valves showing visible leakage.

5. Retest as necessary.

B. Leakage Tests

1. After completion of successful pressure testing, conduct the leakage test for a 2-hour period at the test pressure indicated above. Maximum allowable leakage shall be ten (10) gallons per day per inch of pipe diameter per mile of pipe.

2. Expel air from the line under test, close the air vents and/or corporation stops and raise pressure to the specified test pressure. The leakage in the section under test is defined as the quantity of water supplied to maintain pressure within 5 psig of the specified test pressure during the entire testing period. Water pipe installation is deemed to have failed the leakage test if the leakage obtained is greater than that determined by the formula:

3. $$L = \frac{N \times D \times P^{1/2}}{7400}$$

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
7400 is a conversion factor constant

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

4. If test results indicate that the pipe laid 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.

3.03 DISINFECTION

A. General:

1. After completion of satisfactory pressure and leakage testing, disinfect the water pipelines 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. Bacteriologic tests

B. Preliminary Flushing:

1. Prior to disinfection, except when the tablet method is used, fill the line to eliminate air pockets and flush the line at a rate of flow of 2.5 feet per second to remove particulates. Refer to AWWA C651 for rate of flow to produce 2.5 fps in pipe of various sizes.

2. Dispose of flushing water in compliance with Federal, State and Local laws.

C. Chlorine Application:

1. Chlorine Form:

a. The chlorine form to be applied to the system shall be either chlorine gas solution, calcium hypochlorite or sodium hypochlorite. The ENGINEER's written approval of the chlorine form to be used is required.

b. Chemical Quantities

For each one hundred (100) feet of pipe, when gas or calcium hypochorite is used, or for each eighteen (18) foot section when tablets are used, the following quantities of chemicals should be applied for the respective pipe sizes noted:

Size, Inches	Lbs Cl_2 gas	No., Tablets $Ca(OCl)_2$
4	0.013	1
6	0.030	1
8	0.054	2
10	0.085	3
12	0.120	4
16	0.217	6

2. Continuous Feed Method:

   a. 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 AWWA C651 for quantity of granule to be used.

      WARNING: This procedure must not be used on solvent welded plastic pipe or in screwed joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.

   b. The continuous feed method consists of placing calcium hypochlorite granules in the main during construction, completely filling the main to remove air pockets, flushing 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.

   c. Feed water and chlorine to the line at a constant rate such that the water will have not less than 25 mg/L free chlorine.

      Chlorine application shall not cease until the entire line is filled with heavily chlorinated water.

   d. During chlorine application, take precautionary measures to prevent the concentrated treatment solution from flowing back into the existing distribution system and/or supply source.

3. Tablet Method:

   a. 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 AWWA C651 for quantity of granule to be used.

      WARNING: This procedure must not be used on solvent welded plastic pipe or in screwed joint steel pipe because of the danger of fire or explosion from the reaction of the

joint compounds with the calcium hypochlorite.

b. The tablet method consists of placing tablets in the water main as it is being installed and then filling the main with potable water when installation is completed.

NOTE: Since the preliminary flushing step must be eliminated, this method may be used only when scrupulous cleanliness has been exercised and only with approval of the ENGINEER. It shall not be used if trench water or foreign material has entered the main, or if the water temperature is below 41°F.

c. During construction, place sufficient number of 5 g calcium hypochlorite tablets in each section of pipe, in hydrants, hydrant branches, and other appurtenances to obtain a minimum of 25 mg/L available chlorine. Attach tablets to the crown of pipe sections with adhesive approved by USDA. Apply adhesive only to the broad side of the tablet next to the pipe surface. Refer to AWWA C651 for the proper number of 5g calcium hypochlorite tablets required.

d. When pipeline installation is completed, fill the main with water at a maximum velocity of one foot per second. This water shall remain in the pipe for at least 24-hours. Manipulate valves so that the chlorine solution does not flow back into the line supplying the water.

4. During the 24-hour treatment, operate all valves, curb stops, and hydrants in the section treated.

5. At the completion of the 24-hour treatment, the treated water in all portions of the main shall have a residual of not less than 5 mg/L free chlorine.

6. Repeat the disinfection process until the minimum available chlorine is present at the end of the treatment sequence. The tablet method cannot be used in these subsequent disinfections.

D. 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.

E. Bacteriological Testing:

1. After final flushing is completed and before the water main is placed in service, test the line for bacteriologic quality. Perform two tests 24-hours apart.

2. Collect a minimum of one sample at the end of each line 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 thiosulphate.

4. Sampling tap shall consist of corporation stop installed in the main with copper tube gooseneck assembly. No hose or fire hydrant shall be used to collect samples.

5. Provide bacteriological test reports to the OWNER and the ENGINEER. Failure to meet Federal, State and Local standard requirements will be cause for the CONTRACTOR to rechlorinate and retest the system.

3.04 COMBINED TESTING

Where approved in advance by the ENGINEER, the hydrostatic test, leakage test, and disinfection procedures may be coordinated so that the tests and disinfection procedures are concurrently accomplished.

END OF SECTION

SECTION 02720
STORM SEWER PIPE

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1. Storm sewer pipes.

1.02 RELATED SECTIONS

A. Section 02225: Trenching, Backfilling and Compacting

B. Section 02603: Precast Utility Structures

1.03 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO M294 – Specification for Corrugated Polyethylene Pipe, 305- to 915-mm (12 inches to 36 inches) diameter.

2. AASHTO T99 – Standard Specification for the Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb.) Rammer and a 305 mm (12 inches) Drop.

3. AASHTO T180 – Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10 lb.) Rammer and a 457-mm (18 inch) Drop.

B. ASTM International Referenced Standards:

1. ASTM C14 – Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.

2. ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

3. ASTM C443 – Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

4. ASTM C506 – Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe.

5. ASTM C507 – Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe.

6. ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft.-lbf/ft3 (600 kN-M/M3)).

7. ASTM D1557 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).

8. ASTM D2922 – Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear methods (Shallow Depth).

9. ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear methods (Shallow Depth).

10. ASTM D 3212, Standard Specification for joints for drain and sewer plastic pipe using flexible elastomeric joints.

11. ASTM F 4794, Elastomeric Seals (Gaskets) for joining plastic pipe.

12. ASTM F667, Standard Specification for large diameter corrugated polyethylene pipe and fittings.

13. PennDOT Standards, Publication 408, Latest Edition, Section 601.

1.04 SUBMITTALS

A. See Section 01330 – Submittal Procedures: Requirements for submittals.

B. Product Data: Submit shop drawings and catalog cut sheet data indicating pipe, pipe accessories and fittings and all manufactured pre-cast concrete storm sewer structures as specified in Section 02603: Precast Utility Structures.

C. Manufacturer's installation Instructions: Submit special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with PennDOT Specifications, Publication 408, Latest Edition, Section 601.

B. Reject materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, or acid solder.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling:

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

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

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

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

5. Any pipe or related appurtenances found to be damaged or not in accordance with requirements by the ENGINEER or Borough Public Works Manager may be rejected and must be replaced by the Contractor with acceptable materials at no additional cost to the BOROUGH.

B. Storage:

1. The Contractor is responsible for a storage location for the pipe and related appurtenances. Storage of materials on the site must be approved by the Borough Public Works Manager.

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

3. 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

All storm water piping within the street right-of-way shall be reinforced concrete pipe unless another material is approved by the Borough Public Works Manager. A written request for such shall be submitted.

2.01 REINFORCED CONCRETE PIPE (RCP)

A. Pipe and Fittings:

1. ASTM C14, Minimum Class III

2. ASTM C76, Minimum Class III

3. All preformed pipe joint gaskets shall be in accordance with Manufacturers' recommendations, meet ASTM C443 and shall be watertight.

2.02 HIGH DENSITY POLYETHYLENE THERMOPLASTIC PIPE (HDPE)

A. HDPE can only be used when prior approval is granted by the Borough Public Works Manager.

B. In accordance with PennDOT Specifications, Publication 408, Latest Edition, Section 601.2(a)6.a.1.

C. All HDPE pipe shall be ADS N-12 or approved equal with bell and spigot joints having rubberized gaskets providing "water-tight" joints meeting ASTM D3212.

D. All pipe shall be smooth bore on the inside of the pipe.

2.03 ACCESSORIES

A. Geotextile Fabric in accordance with PennDOT Publication 408 Specifications, latest edition.

B. Grout: In accordance with PennDOT Specifications, Publication 408, Latest Edition, Section 601.2(c).

C. Rubber Gaskets shall be in accordance with PennDOT Publication 408 Specifications, latest edition.

PART 3 EXECUTION

3.01 GENERAL

A. The contractor shall excavate, protect, backfill and maintain all trenches that may be necessary for completion of the work. All excavation shall be in open trenches, except where shown otherwise on the drawings, or as the Borough may authorize or direct. The use of excavation machinery will be permitted, except in places where operation of same will cause damage to trees, buildings or existing structures above or below ground; in that case, hand methods shall be employed. No tunneling, boring or forcing will be allowed without approval from the ENGINEER. Excavated material must be piled so as not to encroach on private property, endanger the work, obstruct sidewalks or roadways, nor interfere with proper drainage. The Contractor shall remove all excavated material from the site and dispose of said material.

B. The contractor shall perform all excavation of all unclassified material to the depths indicated on the drawings, as specified herein, or as directed by the ENGINEER. All excavated materials not required shall be removed and disposed by the Contractor.

C. The contractor shall maintain in place, and protect from direct or indirect damage, all pipes, conduits, poles, tracks, walls, buildings, other structures or property, and property corner markers in the vicinity of the work, whether above or below the surface of the ground. Any damage shall be addressed as necessary by the Contractor at no additional cost to the BOROUGH to return the item to its original condition or better.

D. Trees or tree roots in the rights-of-way shall not be cut down or excavated except by authorization or order of the Borough Public Works Manager.

3.02 PREPARATION

A. Perform trench excavation to the line and grade shown on the Contract Documents and as specified in Section 02225.

B. Unless otherwise indicated on the Drawings, provide for a minimum cover of 4-feet above the top of piping laid in trenches.

C. Provide pipe bedding as specified in Section 02225 for each type of pipe used. 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.

3.03 LAYING PIPE IN TRENCHES

A. Give a minimum of three (3) business days to the ENGINEER or Borough Public Works Manager in advance of pipe laying operations.

B. Sides of trenches shall be kept as nearly vertical as possible, and the trenches shall be excavated true to line so that a clear space twelve inches (12") in width is provided on each side of the pipe

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 bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings, and appurtenances.

F. Lay each section of pipe to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.

G. 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.

H. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. A deviation from the designed grade as shown on the Contract Documents, or deflection of pipe joints, will be causes for rejection.

I. Plug the lift hole in reinforced concrete pipe with a manufactured plastic plug. The use of field stone or mortar to plug the lift hole will not be acceptable.

J. Bedding: PennDOT 2A aggregate, minimum depth six inches (6").

K. Cover: PennDOT 2A aggregate from top of bedding to one foot (1') over the top of the pipe. Backfill shall be mechanically compacted using a jumping jack tamper from the bedding up to the spring line of pipe.

L. Any pipe that has its grade or joint disturbed after laying shall be taken up and re-laid. Any section of pipe already laid and found to be defective shall be taken up and replaced.

3.04 BACKFILLING TRENCHES

A. Backfill pipeline trenches only after examination of pipe laying by the ENGINEER

or Borough Public Works Manager.

B. Backfill and compact trenches as specified in Section 02225.

3.05 LENGTH OF OPEN TRENCH

A. The Borough shall have the right to limit the amount of trench opened in advance of pipe laying and the amount of pipe laid in advance of backfilling, but in no case shall more than 400 feet of trench be opened at any one place in advance of the completed pipe. The trench shall not be opened for a distance of more than 500 feet at any one time.

B. Trench excavation shall be fully completed, except for the forming of the trench subgrade, at least 20 feet in advance of the pipe placement, and shall be kept free from obstructions; except that at the close of the work day, or at the discontinuance of work, the pipe laying may be completed to within five feet of the end of the opened trench. The amount of pipe laid in advance of backfilling shall not exceed 200 feet.

C. The Borough may, at any time, require the backfilling of open trenches over completed pipelines, even though, to accomplish said backfilling, excavation or other work at any place must be temporarily discontinued.

D. If work is discontinued on any trench, except by order of the Borough, and the excavation remains open for an unreasonable length of time in the opinion of the Borough, the contractor shall backfill such trench, if so directed by the Borough.

E. If the opening cannot be opened to traffic at the end of the working day, approval will need to be granted by the Borough Public Works Manager. If approval is granted, street openings shall be completely barricaded and protected. Excavations left open or incompletely repaired after dark shall be marked by PennDOT approved flashing lights. Where work is interrupted, the person(s) responsible for the opening shall secure and cover the excavation with an appropriate metal plate. All required traffic control shall be provided by the permittee in accordance with PennDOT's Publication 213, latest edition. Any person opening the street is subject to all liability associated with claims for injury or damage resulting therefrom.

3.06 MANHOLE FRAMES

A. All covers shall have the words "STORM" cast in raised letters, which shall have a height of not less than two inches. All other requirements in accordance with Section 02603.

3.07 FIELD TEST OF PIPE

A. All pipes will be inspected by the ENGINEER prior to and after installation in the trench. Any defects in the pipe or joints shall be cause for replacement or repair as directed by the ENGINEER.

B. After backfilling of the trench, all sewers shall be "lamped" to determine uniformly

straight alignment between junction boxes, inlets or structures and to determine breaks, cracks or other faults.

END OF SECTION

SECTION 02730
GRAVITY SANITARY SEWER PIPE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gravity sanitary sewer pipelines

1.02 RELATED SECTIONS

A. Section 02225: Trenching, Backfilling & Compacting
B. Section 02601: Manholes
C. Section 02751: Sewer Pipeline Testing
D. Section 03602: Non-Shrink Grout

1.03 REFERENCES

A. American National Standards Institute (ANSI):

A21.4	Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings for Water and Other Liquids
A21.10	Gray-Iron and Ductile Iron Fittings, 3 in. through 48 in., for Water and Other Liquids
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
A21.53	Ductile-Iron Compact Fittings, 3" through 16" for Water and Other Liquids

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

A53	Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless
C14	Specification for Concrete Sewer, Storm Drain and Culvert Pipe
C76	Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C443	Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets
D2241	Specification for Polyvinyl Chloride (PVC) Plastic Pipe for (SDR-PR)
D3033	Specification for Type PSP Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
D3034	Specification for Type PMS Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
D3139	Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
D3212	Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F679 Specification for Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

C. Federal Specifications (FS):

HH-P-117 Packing, Jute, Twisted

D. American Water Works Association (AWWA):

C301 Pre-stressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids

1.04 SUBMITTALS

A. Certificates:

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

1.05 QUALITY ASSURANCE

Reject materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, or acid solder.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling:

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

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

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

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

B. Storage:

1. Pipe may be strung along alignment where approved by the ENGINEER.

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

3. 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:

1. ANSI A21.51, minimum thickness Class 52.

2. ANSI A21.51, minimum thickness Class 56 required at road crossing.

3. Inside and outside bituminous coating 1 mil thick or cement lined and bituminous seal coated.

B. Fittings:

1. Ductile-iron or gray-iron, ANSI A21.10 and ANSI A21.53.

2. Provide with standard lining as for ductile iron pipe.

C. Joints: ANSI A21.11

1. Joints for below grade piping may be either mechanical joint or push-on joint. Fittings shall be mechanical joint.

2. Joints for piping above grade shall be flanged ends, unless otherwise noted. Fittings shall be flanged ends.

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

2.02 REINFORCED CONCRETE PIPE

A. Pipe:

1. Shall conform with the requirements of ASTM C76.

B. Joints:

1. Single rubber ring gasket conforming to ASTM C443.

2. Cement mortar type, if approved by the ENGINEER.

2.03 POLYVINYL CHLORIDE (PVC) PIPE

A. Pipe:

1. ASTM D3034 or ASTM F679, SDR 35, Cell classification 12454-B

B. Fittings:

1. ASTM D3034 or ASTM F679, SDR 35.

2. Push on joint which is compatible with the pipe material.

C. Joints:

1. ASTM D3212, Integral bell with gasket seal.

2. ASTM F477, lock-in type rubber ring gasket coupling.

2.04 PRE-STRESSED CONCRETE CYLINDER PIPE

A. Pipe:

1. Shall conform with the requirements of AWWA C301.

2. The interior pipe surface shall be coated to a minimum of 16 mils dry film thickness on concrete and mortar surfaces and 8 mils dry film thickness on steel joint ring surfaces with a coal tar epoxy system recommended by the pipe manufacturer.

3. The exterior pipe surface shall receive two (2) coats of a coal tar epoxy system recommended by the pipe manufacturer.

B. Fitting:

1. Shall conform with the requirements of AWWA C301.

2. Provide with protective coatings to interior and exterior as for pipe.

C. Joints:

1. Steel bell and spigot joint rings conforming to the requirements of AWWA C301.

2. Single rubber ring gasket conforming to the requirements of AWWA C301.

3. Grout joint in accordance with the requirements of Section 03602 and in accordance with manufacturers recommendations.

2.05 STEEL CASING PIPE

A. Pipe:

1. ASTM A53; 35,000 psi minimum yield strength, asphalt coated.

2. Minimum wall thickness as shown on the Standard Details.

B. Joints:

1. Electric resistance welded.

2.06 ACCESS ROAD

A. An access road may be required to provide safe access to the sanitary sewer main for maintenance purposes.

B. Access road shall have a maximum slope of 10%.

C. Access road shall consist of a PennDOT Class 4 geotextile material covered by 12-inch thick AASHTO No. 3 crushed stone.

D. Access road shall be a minimum of 12 feet wide.

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 02225.

B. Unless otherwise indicated on the Drawings, provide for a minimum cover of 4-feet above the top of piping laid in trenches.

C. Provide pipe bedding as specified in Section 02225 for all gravity sewer 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 ample notice to the ENGINEER in advance of pipe laying operations.

B. Maintain no less than three batter boards or their equivalent between adjoining manholes during pipe laying operations, or 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 up-grade with the bell or groove pointing upstream.

E. Lay pipe to a true uniform line 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.

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 lines.

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 manufacturer. If fitting 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 pipe manufacturer.

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 line and 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 compacted backfill 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 workday, securely plug open ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.

3.03 CAST-IN-PLACE CONCRETE CONSTRUCTION

A. All concrete shall be ready-mix in accordance with Section 03300, the Standard Details and the Drawings.

3.04 CRADLES AND ENCASEMENT

A. Provide concrete cradles and encasement for pipeline where indicated on the Contract Drawings, or as directed by the ENGINEER.

3.05 THRUST RESTRAINT

A. Provide thrust blocking or restrained joints for pressure pipeline at all bends, tees, and changes in direction.

3.06 BACKFILLING TRENCHES

A. Backfill pipeline trenches only after examination of pipe laying by the ENGINEER.

B. Backfill trenches as indicated on Standard Details.

END OF SECTION

SECTION 02731
SANITARY SEWER LATERAL CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Connection of sanitary sewer laterals to municipal sewers.

1.02 RELATED SECTIONS

A. Section 01300 - Submittals.

B. Section 01400 - Quality Control.

C. Section 01600 - Material and Equipment.

D. Section 02225 - Trenching, Backfilling and Compacting.

E. Section 02575 - Paving and Resurfacing.

F. Section 02601 - Manholes.

G. Section 02603 - Precast Utility Structures.

H. Section 02730 - Gravity Sanitary Sewer Pipe.

I. Section 02751 - Sewer Pipeline Testing.

J. Section 03301 - Concrete for Utility Construction.

1.03 REFERENCES

A. American National Standards Institute (ANSI):

A21.4	Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings for Water and Other Liquids
A21.10	Gray-Iron and Ductile Iron Fittings, 3 in. through 48 in., for Water and Other Liquids
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
A21.53	Ductile-Iron Compact Fittings, 3" through 16" for Water and Other Liquids

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

A53	Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless
A74	Specification for Cast Iron Soil Pipe and Fittings
C14	Specification for Concrete Sewer, Storm Drain and Culvert Pipe
C76	Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C443	Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets
C564	Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
D1785	Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120
D2241	Specification for Polyvinyl Chloride (PVC) Plastic Pipe for (SDR-PR)
D3033	Specification for Type PSP Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
D3034	Specification for Type PMS Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
D3139	Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
D3212	Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
F477	Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
F679	Specification for Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

C. Federal Specifications (FS):

HH-P-117	Packing, Jute, Twisted

D. American Water Works Association (AWWA):

C301	Pre-stressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids

1.04 SUBMITTALS

A. Certificates:

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

1.05 QUALITY ASSURANCE

Reject materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, or acid solder.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling:

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

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

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

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

B. Storage:

1. Pipe may be strung along alignment where approved by the ENGINEER.

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

3. 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 CAST IRON SOIL PIPE

A. Pipe and Fittings: ASTM A74, Service Class

1. Hub and spigot or double hub.

B. Joints: Double-seal compression gaskets

1. Gaskets: Conforming to physical requirements of ASTM C564.

C. Building House Traps: ASTM A74, Service Class.

1. Cap boxes: Adjustable for height.

2. Cover Plates: Manufacturer's standard material.

3. Cover Plate Screws: Brass as provided by trap manufacturer.

2.02 POLYVINYL CHLORIDE (PVC) PIPE

A. Pipe:

1. ASTM D3034 or ASTM F679, SDR35, Cell Classification 12454-B.

B. Fittings:

1. ASTM D3034 or ASTM F679, SDR35.

2. Push on joint which is compatible with the pipe material.

C. Joints:

1. ASTM D3212, Integral bell with gasket seal.

2. ASTM F477, Lock-in type rubber ring gasket coupling.

2.03 DUCTILE IRON PIPE

A. Pipe:

1. ANSI A21.51, minimum thickness Class 52.

2. Inside and outside bituminous coating 1 mil thick or cement lined and bituminous.

B. Fittings:

1. Ductile-iron or gray-iron, ANSI A21.10 and ANSI A21.53.

2. Provide with standard lining as for ductile iron pipe.

C. Joints: ANSI A21.11

1. Joints for below grade piping may be either mechanical joint or push-on joint. Fittings shall be mechanical joint.

2. Joints for piping above grade shall be flanged ends, unless otherwise noted. Fittings shall be flanged ends.

D. Rubber Gaskets, Lubricants, Glands, Nuts and Bolts: ANSI A21.11.

PART 3 EXECUTION

3.01 PREPARATION

A. Perform trench excavation to the line and grade indicated on the Drawings and as specified in Section 02225.

B. Unless otherwise indicated on the Drawings, provide for a minimum cover of 4-feet above the top of piping laid in trenches.

C. Provide pipe bedding as specified in Section 02225 for all gravity sewer laterals. 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 SERVICE CONNECTION CONSTRUCTION

A. New Construction

1. Install tee-wye branch fittings of the same material and joint configuration as the gravity sewer at the point of branch connection.

2. Install tee-wye branch fittings at locations designated by the ENGINEER concurrent with gravity sanitary sewer pipe laying operations.

3. Securely plug the free end of the wye branch fittings to prevent trench water, earth, or other substances from entering the sewer pipe or fittings.

B. Connection to Existing Main

1. Cut out and remove a section of the existing sanitary sewer main of sufficient length to accommodate a new tee-wye fitting, stub pieces of pipe and repair couplings as shown on Standard Detail S013.

2. Install a PVC (SDR 35) tee-wye fitting at the point of lateral connection.

3. Connect the stub pieces of pipe to the existing sewer main using either Fernco couplings with shear bands or GPK gaskets depending on material of existing sewer main.

3.03 INSTALLATION OF SEWER SERVICE LATERALS

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 pipe. Do not drop pipe.

C. Lay pipe proceeding up-grade with the bell or groove pointing upstream.

D. Lay pipe to a true uniform line 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 lines.

F. 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 manufacturer. If fitting 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.

G. Assemble joints in accordance with recommendations of the pipe manufacturer.

H. Disassemble and remake improperly assembled joints using a new gasket.

I. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. A deviation from the designed grade as shown on the contract drawings, or deflection of pipe joints, will be cause for rejection.

J. Place sufficient compacted backfill on each section of pipe, as it is laid, to hold firmly in place.

K. 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.

L. Keep trenches and excavations free of water during construction.

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

N. Install building house trap where indicated on the Borough's Standard Sanitary Sewer Details or at a location approved by the Borough.

3.04 CAST-IN-PLACE CONCRETE CONSTRUCTION

A. All concrete shall be ready-mix in accordance with Section 03300, the Standard Details and the Drawings.

3.05 CRADLES AND ENCASEMENT

A. Provide concrete cradles and encasement for pipeline where indicated on the Standard Details and Drawings, or as directed by the ENGINEER.

3.06 THRUST RESTRAINT

A. Provide thrust blocking or restrained joints for pressure pipeline at all bends, tees, and changes in direction.

3.07 BACKFILLING TRENCHES

A. Backfill pipeline trenches only after examination of pipe laying by the ENGINEER.

B. Backfill trenches as specified in Section 02225.

END OF SECTION

SECTION 02733

INTERNAL CLOSED CIRCUIT TELEVISION
INSPECTION OF SANITARY SEWERS

PART 1 GENERAL

1.01 DESCRIPTION

The Work of this Section includes:

A. Internal closed circuit television inspection of sanitary sewers.

B. Preparation and submission of inspection report.

C. Provision for testing and furnishing of photographs.

D. Provision for furnishing of color videos in a format acceptable to the BOROUGH and the Borough ENGINEER.

1.02 QUALITY ASSURANCE

The requirements of this Section are that:

A. A continuous footage meter reading shall be displayed and the meter shall be checked for accuracy to the satisfaction of the ENGINEER.

B. All color video recordings and photographs shall be clear, in focus and devoid of blemish.

PART 2 EXECUTION

2.01 TELEVISION EQUIPMENT

A. Closed Circuit TV Equipment: Select and use closed-circuit television equipment that will produce a color recording.

B. Pipe Inspection Camera: Produce a digital recording using a pan-and-tilt, radial viewing, pipe inspection camera that pans ± 275 degrees and rotates 360 degrees. Use a camera with an accurate footage counter that displays on the TV monitor the exact distance of the camera from the centerline of the starting manhole. Use a camera with camera height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being televised. Provide a lighting system that allows the features and condition of the pipe to be clearly seen. A reflector in front of the camera may be required to enhance lighting in large diameter pipe. The camera shall be operative in 100 percent humidity conditions. The camera, television, monitor and other components of the digital system shall be capable of producing a minimum 500-lone resolution colored digital picture. Picture quality and definition shall be to the satisfaction of the Engineer.

C. TV Studio: The TV studio is to be contained in an enclosed truck, trailer or van. It shall have room and seating for the operator, one Owner's representative, and at least one standing visitor with the doors closed. The studio shall have air conditioning and heating. Normal operation of all equipment, including the TV camera, monitor and winches is to be from a control panel in the studio.

D. Recording: Record all images digitally.

1. Image Capture – Capture color still shots of digital recordings for all defects encountered. Digitized picture images shall be stored and be exportable as JPEG formats.

2. Digital Video Capture – Full-time live digital and audio files shall be captured for each pipe segment and lateral inspected. The files shall be stored in industry standard MPEG format viewable from a DVD or external hard drive on an external personal computer that utilizes Microsoft Media Player, version 9.0 to view the recording. The MPEG video shall be ISO-MPEG Level 1 (MPEG-1) coding with a resolution of 352 pixels (x) 240 pixels (y) and an encoded frame rate of 29.97 frames per second. System shall perform an automatic disk image/file naming structure to allow saved video/data sections to be "burned" to DVDR format. It shall have the capability of "burning" a minimum of 120 minutes of recoding to the DVDR media. The digital recording shall be free of background and electrical noise as to produce an oral report that is clear and discernable. The digital recordings and inspection data shall be cross-referenced to allow instant access to any point of interest within the digital recording.

E. Enhanced Television should be WinCan, or approved equal. System shall link to GIS (Geographic Information Systems) Mapping.

2.02 TELEVISION INSPECTION

A. Televise the sewer line to document the condition of the line. Notify Owner 72 hours in advance of any TV inspection so that an Owner's representative may observe inspection operations. Provide a color recording of the inspection.

B. Inspections shall be from center of the starting manhole to the center of the ending manhole. Distances along the pipe should be measured from the center of the upstream manhole. Marking on cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Measurement meters shall be accurate to two-tenths of one foot over the entire length of the sewer line section being inspected. Prior to recording the location of defects and service connections, slack in the cable of the television inspection camera shall be taken up to ensure metering device is designating proper footage. Accuracy of the measurement meters shall be checked daily by use of a walking meter, roll-a-tape, or other suitable device.

C. Center the camera in the middle of the pipe.

D. Move the camera through the line (in the downstream direction whenever possible) at a uniform rate not-to-exceed 20 feet per minute.

E. Stop at every joint for three seconds and using a pan and tilt, view when appropriate, and stopping elsewhere when necessary to ensure proper documentation of the sewer's condition. Pan and tilt to observe and document areas of apparent deteriorated pipe surface.

F. Stop at every lateral connection. Center the camera so that the lighting and the pan and tilt view can be used to inspect as far into the lateral connection as possible. Record all defects found in the service connection. Observe top, bottom and sides of lateral connections. Where lateral flow is observed, observe flows from service connections for approximately two minutes to ascertain if the flow is sanitary or extraneous flow. The digital recording may be paused during observation. Record results of the flow observed on digital recording and inspection logs.

G. Use manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the server conditions to move the camera through the sewer line.

H. TV inspection recordings shall be continuous for each pipe segment.

I. CONTRACTOR is responsible for adjusting light levels, cleaning fouled or fogged lens, and allowing vapor to dissipate from camera lights in order to produce acceptable recordings.

2.03 FLOW CONTROL

A. Adequately control the flow in the section being televised. Plugging or bypassing of the flows may be used to accomplish this. Recordings made where the depth of wastewater flow shown below is exceeded will be rejected:

Pipe Diameter (Inches)	Depth of Flow (Percent of Pipe Diameter)
6-10	10
12-24	15
Over 24	20

B. Whenever flows in a sewer line are blocked, plugged, pumped, or bypassed, sufficient precautions must be taken to protect the sewer lines from damage that might be inflicted by excess sewer surcharging. Further precautions must be taken to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved. No overflows are permitted. CONTRACTOR is responsible for all damages.

C. CONTRACTOR is responsible for all damages to CONTRACTOR-owned and operated equipment, and privately owned facilities caused by malfunctioning plugs, pumps or other CONTRACTOR-owned or operated equipment. In the event of a failure or malfunction of CONTRACTOR equipment, CONTRACTOR is

responsible for all work necessary to restore facilities to pre-contract condition including, but not limited to, excavation and restoration of sewer lines and roadways required to retrieve malfunctioning cameras, plugs and hoses.

D. The CONTRACTOR should anticipate that portions of the sanitary sewer will be bowed or bellied and as a result the camera will be submerged. Wherever the camera encounters a submerged condition, or where the wastewater flow depth exceeds the maximum allowable, reduce the flow depth to an acceptable level by performing the survey TV inspection during minimum flow hours, or by pulling a camera with a swab, high-velocity jet nozzle or other acceptable dewatering device. Recordings made while floating the camera are not acceptable.

E. If it is determined that a sewer segment requires by-pass pumping, by-pass pumping will be performed.

2.04 PASSAGE OF TV CAMERA

A. If during TV inspection of a pipe segment, the camera is unable to pass an obstruction even though flow is unobstructed, televise the pipe segment from the opposite direction in order to obtain a complete recording of the line. CONTRACTOR shall also measure the distance between the manholes (centerline to centerline) with a tape or wheel to accurately determine the total length of the manhole segment.

2.05 INSPECTION DELIVERABLES

A. Written Inspection Logs: Provide printed location records to clearly identify the location of each defect, or lateral connection, in relation to adjacent manholes, using a standard stationing system, zeroed on the upstream manhole. Record all information requested using proper NASSCO PACP defect codes. The reports shall include at least the minimum amount of information required by PACP, including required PACP header information. Color still shot images of all defects encountered shall be included with each pipe segment.

B. Electronic Inspection Logs: Provide a Microsoft Excel 2400 compatible electronic file for each pipe segment. All defects and observations coded shall be logged in the file using the following PACP code fields: Distance, Group/Description, Modifier/Severity, Continuous Defect, SWL Value, Inches Value, Percent, Joint, At/From Location, and To Location. Each observation/defect code entry shall have the accompanying PACP Header Fields 7, 8, 20, 21, 23, 25, 26, 27, 28, 29, 33, 34, 36, 36a, 38, and 39.

C. Digital Inspection Recordings

1. Provide digital inspection recordings. Inspection recordings must be viewable on a standard 16" computer monitor.

2. Recording shall be of a quality sufficient to evaluate the condition of the sewer, the sewer service connections, and verify cleaning. If the quality is not sufficient, CONTRACTOR shall re-televise the sewer segment and provide a new recording and report at no additional compensation.

Camera distortions, inadequate lighting, dirty lens, or blurred/hazy pictures will be cause for rejection.

3. Only pipe segments from the same project shall be included on a given DVD. Multiple projects may be included, on a given hard drive, but the files must be organized in individual project folders. TV inspection recordings shall not be edited. Each pipe segment must be its own electronic file. Electronic recording file must allow snap scrolling to allow easy and quick access of the entire recording.

4. Each DVD/hard drive must have a file index whose name contains the pipe segment reference number.

5. CONTRACTOR shall maintain a master copy of all recordings and Inspection Reports submitted for two years after delivery of inspection reports and recordings.

6. Label each DVD/hard drive with the following information:

   a. File Number
   b. CONTRACTOR's Name
   c. Project Name
   d. Contract Number
   e. Inspection Type: Post Cleaning, Repair

END OF SECTION

SECTION 02734
TESTING AND REPAIR OF SANITARY SEWERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing of Joints

B. Sealing of Joints

C. Cleaning of Sewers

D. Chemical Grouting

1.02 QUALITY ASSURANCE

A. The CONTRACTOR shall have a minimum of five (5) years experience in the repair of sanitary sewers as specified herein.

1.03 SUBMITTALS

A. In accordance with Section 01300 of these Specifications, submit product data for the chemical grout to be used.

PART 2 PRODUCTS

2.01 CHEMICAL SEALING (GROUTING) MATERIALS

A. Intent

The intent of this section is to define the properties that a sealing material must have to perform effectively in the intended application and under expected field conditions. The intended application is remotely sealing sewer pipe joints with a sealing packer (see SEALING OF JOINTS). The materials described herein also have application in the manual access sealing of sewer pipes and manholes (see SEWER MANHOLE SEALING).

Generic chemical sealing materials currently used are listed with the basic properties, performance standards, and mix ratios which are known to give acceptable performance.

It is recognized that new and improved chemical sealing materials will become available from time to time. Sources, manufacturer, and product names of chemical sealing materials will thus change from time to time and therefore specific sources, manufacturers, and product names are not given.

It should be understood that all of the generically classified chemical sealing materials can achieve desired long-lasting results when used in the proper application and when properly applied. The knowledge and skill of the applicator have a greater effect on achieving the desired results than the specific sealing

material applied.

In every case, mixing and handling of chemical sealing materials shall be in accordance with the manufacturer's recommendations.

B. General

All chemical sealing materials used in the performance of the work specified must have the following characteristics:

1. While being injected, the chemical sealant must be able to react/perform in the presence of water (groundwater).

2. The cured material must withstand submerges in water without degradation.

3. The resultant sealant (grout) formation must prevent the passage of water (infiltration) through the sewer pipe joint.

4. The sealant material, after curing, must be flexible as opposed to brittle.

5. In place, the sealant formation should be able to withstand freeze/thaw and wet/dry cycles without adversely affecting the seal. Note: This primarily applies to storm sewers which are shallow and sometimes dry.

6. The sealant formation must not be biodegradable.

7. The cured sealant should be chemically stable and resistant to the mild concentrations of acids, alkalis, and organics found in normal sewage.

8. Packaging of component materials must be compatible with field storage and handling requirements. Packaging must provide for worker safety and minimize spillage during handling.

9. Mixing of the component materials must be compatible with field operations and not require precise measurements of the ingredients by field personnel.

10. Cleanup must be done without inordinate use of flammable or hazardous chemicals.

11. Residual sealing materials must be easily removable from the sewer line to prevent reduction or blockage of the sewage flow.

12. In September, 1980, the APWA published "Assessment of Sewer Sealants" under EPA Grant No. R806567-01 (Office of R & D, U.S. EPA, Cincinnati, OH 45268). This report describes performance attributes for a sewer sealant, many of which are listed above.

C. Chemical Sealing Materials

The following is a generic listing of chemical sealing materials currently in use and the basic requirements, properties and characteristics of each:

1. Acrylamide base gel sealing material:

   a. A minimum of 10% acrylamide base material by weight in the total sealant mix. A higher concentration (%) of acrylamide base material may be used to increase strength or offset dilution during injection.

   b. The ability to tolerate some dilution and react in moving water during injection.

   c. A viscosity of approximately 2 centipoise which can be increased with additives.

   d. A constant viscosity during the reaction period.

   e. A controllable reaction time from 10 seconds to 1 hour.

   f. A reaction (curing)which produces a homogeneous, chemically stable, nonbiodegradable, firm, flexible gel.

   g. The ability to increase mix viscosity, density and gel strength by the use of additives.

2. Acrylic base gel chemical sealing material:

   a. A minimum of 10% acrylic base material by volume in the total sealant mix. A high concentration (%) of acrylic base material may be used to increase strength or offset dilution during injection.

   b. The ability to tolerate some dilution and react in moving water during injection.

   c. A viscosity of approximately 2 centipoise which can be increased with additives.

   d. A constant viscosity during the reaction period.

   e. A controllable reaction time from 5 seconds to 6 hours.

   f. A reaction (curing) which produces a homogeneous, chemically stable, nonbiodegradable, flexible gel.

   g. The ability to increase mix viscosity, density and gel strength by the use of additives.

3. Urethane base gel chemical sealing material:

a. 1 part urethane prepolymer thoroughly mixed with between 5 and 10 parts of water by weight. The recommended mix ratio is 1 part urethane prepolymer to 8 parts of water (11% prepolymer).

b. A liquid prepolymer having a solid content of 77% to 83%, specific gravity of 1.04 (8.65 Pounds per gallons) and a flash point of 20°F.

c. A liquid prepolymer having a viscosity of 600 to 1200 centipoise at 70°F that can be pumped through 500 feet of ½-inch hose with a 1000 psi head at a flow rate of 1 ounce per second.

d. The water used to react the prepolymer should have a pH of 5 to 9.

e. A cure time of 80 seconds at 40°F, 55 seconds at 60°F, and 30 seconds at 80°F when 1 part prepolymer is reacted with 8 parts of water only. Higher water ratios give longer cure times.

f. A cure time that can be reduced to 10 seconds for water temperatures of 40°F to 80°F when 1 part prepolymer is reacted with 8 parts of water containing a sufficient amount of gel control agent additive.

g. A relatively rapid viscosity increase of the prepolymer/water mix. Viscosity increases from about 10 to 60 centipoise in the first minute for 1 to 8 prepolymer/water ratio at 50°F.

h. A reaction (curing) which produces a chemically stable and nonbiodegradable, tough, flexible gel.

i. The ability to increase mix viscosity, density, gel strength and resistance to shrinkage by the use of additives to the water.

D. FIELD TESTS

The CONTRACTOR shall be responsible for providing all test instrumentation and all tests necessary to assure proper work results. The CONTRACTOR is responsible to provide proper documentation to show that the instrumentation is within the prescribed limits. Prior to the start of WORK each day, the OWNER may also require the CONTRACTOR to demonstrate that the instrumentation is within the necessary limits by utilizing a test section pipe.

PART 3 EXECUTION

3.01 TESTING OF JOINTS

Each sewer line shall be tested to determine if leakage exists. Joint testing shall be accomplished by isolating the joint with the joint testing device which is pulled through the pipeline. The joint testing device shall be constructed so that an air tight seal can be made by inflating the end sections of the device, leaving the center section isolated with full access to the joint to be tested. The company center core section of the testing device shall be hollow so that nominal flow in the pipeline can pass through the device during the testing procedure, with a minimum of backage in the section of the pipeline upstream from the testing device.

If the flow in the pipeline is greater than the flow capable of passing through the testing device, the ENGINEER may direct that the section of pipeline under test be isolated by the use of bypass pumping. In this case, a portable sewage pump shall be installed which can lift the volume of flow encountered from the upstream manhole, through a temporary, flexible pipeline laid above grade to the downstream manhole. Payment for pumping equipment, plugs and bypass piping shall be at the UNIT PRICE per hour as shown in the PROPOSAL.

After the joint testing device is positioned, a positive pressure shall be applied to the joint. In order to prevent damage to the pipe, the pressure shall be kept to a minimum.

Air or water may be used for pressurizing the void area between the end seals of the testing device. If air is used, a period of not less than two (2) minutes shall be allowed for the pressure to stabilize, during which time additional air may be added to the void. If water is used, the test may begin immediately. After the stabilization period, if necessary, the pressure shall be monitored by means of an electronic or hydraulic measuring system with the meter located above ground in the television studio. The pressure meter device shall accurately show, calibrated in pounds per square inch gauge (p.s.i.g.) to the nearest one-tenth (1/10) of one (1) pound and shall respond to and record, any change in void pressure instantly. The meter shall have a range between zero (0) and fifteen (15) p.s.i.g. The joints shall be air tested with a pressure of five (5) pounds per square inch (p.s.i.). In areas of shallow pipe placement, the ENGINEER may order the pressure reduced to four (4) p.s.i. Test pressures which are greater than or less than the specified pressures will not be permitted. All pressure measurements shall be made at the void area. If air is used for testing of joints, and there is no drop in pressure for fifteen (15) seconds after the stabilization period has elapsed, during which time no air will be added, the joint shall be deemed to be acceptable. If there is a drop in pressure fifteen (15) seconds after the stabilization period, during which time no air will be added, such shall be noted and monitored until the pressure is less than two (2) p.s.i.g. or until the ENGINEER directs that the testing be terminated for that joint. During this time the pressure shall be recorded every fifteen (15) seconds.

If water is used for testing of joints, and there is an increase in pressure beyond twelve (12) p.s.i.g., the joint shall be deemed to be acceptable. If that pressure cannot be maintained, such shall be noted and monitored until the ENGINEER directs that the testing be terminated for the joint.

Based upon the results of the testing, the ENGINEER may direct that a joint be sealed. This WORK shall be performed as described in Article 3.03.

3.02 SEALING OF JOINTS

Chemical grouting of sewer joints shall be accomplished by forcing sealing materials into and through the joints of the sewer. The testing device shall be capable of applying this chemical while positioned to perform the pressure testing described in Article 3.02.

Chemical agents shall be pumped into the void through instant reading, controlled flow meters and then through a dual hose system. The pumping shall be at pressure greater than groundwater pressures. The pumping, metering and testing device shall be integrated so that proportions and quantities of chemicals, and pressures for materials and sealing can be instantly regulated in accordance with the size of the leak percentage of voids being filled, temperature, surrounding soils condition and the rate of flow of the sealing solution in relation to the back pressures.

Upon completion of the grouting, the necessary curing time shall be allowed and then the joints shall be tested in accordance with Article 3.02. Should the joint still fail that test, additional grout shall be injected into the joint as described above.

3.03 CLEANING OF SEWERS

The CONTRACTOR will clean all sewer lines where the Work is proposed. If additional cleaning is required, the OWNER and/or ENGINEER may direct the CONTRACTOR to additionally clean the sewer lines in accordance with the Specifications as described herein.

Where required, the CONTRACTOR shall provide all equipment necessary for the bucketing, brushing and flushing of the sewers, in a manner acceptable to the ENGINEER, prior to the chemical grouting services. All dirt, debris, roots and other material removed from the sewers shall be removed, at the expense of the CONTRACTOR, to a site approved by the ENGINEER.

Where it is determined, through a visual inspection by the ENGINEER, that only small deposits of debris exist within the sewer line, light cleaning methods may be used to remove these deposits. The use of equipment such as balls, scooters, high pressure water jetting equipment, brushes and/or swabs will be permitted with the prior approval of the ENGINEER.

Where it is determined by the ENGINEER that large deposits of debris or root growth exist within the sewer lines, heavy equipment may be used so as to facilitate the removal of such deposits. The use of bucket machines, scrapers and augers may be utilized in this heavy-duty cleaning. When bucket machines and buckets are used, a properly sized flexible cable shall be used so that breakage will not occur, loosing the cleaning equipment within the sewer lines.

3.04 SEWER MANHOLE PATCHING AND SEALING

A. Sewer Manhole Patching

1. All loose material shall be removed from the area to be patched or repointed exposing a sound subbase.

2. Holes or voids around steps, joints of pipes, spall areas, and cavities caused by missing or broken brick shall be patched and missing mortar repointed using a non-shrink patching mortar.

3. Cracks not subject to movement and greater than 1/6 inch in width shall be routed out to a minimum width and depth of ½ inch and patched with non-shrink patching mortar.

B. Sewer Manhole Sealing

1. Cementitious Liner

a. This method uses a cementitious blend of binders, polymers or epoxys, aggregates, and other additives. After mixing, the material is trowel applied directly to the manhole surface in an application as described by the manufacturer of the product. Brush on or spray techniques will not be permitted.

b. Surface Preparation

(1) The entire surface shall be cleaned and all loose and protruding material shall be removed.
(2) Active infiltration through the manhole structure shall be repaired.
(3) All large voids shall be patched with a non-shrink cement based patching material, as described above.

c. Application

(1) The materials shall be mixed and applied in accordance with the manufacturer's written instructions using approved equipment. The material shall be trowel applied directly to the manhole surface. The material shall be troweled, not brushed or sprayed. The material shall completely cover the interior surface of the manhole with a minimum thickness of 1 inch.

3.05 MANHOLE FRAMING SEALING

The manhole frame and chimney above the cone or corbels shall be excavated, hydroblasted and sealed to prevent leakage of water.

3.06 GROUTING REPORT

Upon completion of the chemical grouting services, a report shall be presented to the OWNER showing exact locations of repairs which have been made and the amount of chemical grout used at each repair.

3.07 TRAFFIC CONTROL AND ELIMINATION OF CONGESTION

The CONTRACTOR shall be responsible for all traffic control and warning devices and personnel required to direct, channelize and otherwise control traffic at the WORK site. The CONTRACTOR shall comply with all requirements of the local police department and PennDOT related to traffic control at no cost to the OWNER.

3.08 PROTECTION OF PROPERTY

When pipe sections exist within unpaved rights-of-way, the CONTRACTOR shall exercise caution in conduct of the WORK. It shall be the CONTRACTOR'S responsibility, after approval by the ENGINEER, to cut any tree limbs to permit entry of vehicles onto or through the rights-of-way. The CONTRACTOR shall return any disturbed rights-of-way to the condition of the rights-of-way prior to conduct of the WORK.

END OF SECTION

SECTION 02751
SEWER PIPELINE TESTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing Gravity Sewer Pipelines:

1. Low-pressure air test

2. Infiltration test

3. Exfiltration test

4. Deflection test

B. Testing Sewer Force Mains

1. Hydrostatic pressure test

2. Leakage test

1.02 RELATED SECTIONS

A. Section 02730: Sanitary Sewer Pipe

1.03 QUALITY ASSURANCE

A. Test Acceptance:

1. No test will be accepted until the results are below the specified maximum limits.

2. The CONTRACTOR shall, at his own expense, determine and correct the causes of test failure and retest until successful test results are achieved.

1.04 SUBMITTALS

A. Testing procedures

B. List of test equipment

C. Testing sequence schedule

D. Provisions for disposal of flushing and test water

E. Certificate of test gauge calibration: Submit, prior to testing, five (5) copies of certificate attesting that the pressure gauges to be used have been calibrated and are accurate to the degree specified in Part 2, Products.

F. Deflection mandrel drawings and calculations

1.05 JOB CONDITIONS

A. Do not allow personnel in manholes during 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

2.01 AIR TEST EQUIPMENT

A. Minimum Equipment Required

1. Air compressor
2. Air supply line
3. Shut-off valve
4. Pressure regulator
5. Pressure relief valve
6. Stop watch
7. Plugs
8. Pressure gauge, calibrated to 0.1 lbs/sq. in.

2.02 INFILTRATION TEST EQUIPMENT

A. Minimum Equipment Required

1. Weirs

2.03 HYDROSTATIC TEST EQUIPMENT

A. Minimum Equipment Required

1. Hydro pump
2. Pressure hose
3. Test connections

4. Water meter

5. Pressure gauge, calibrated to 0.1 lbs./sq. in.

6. Pressure relief valve

2.04 DEFLECTION TEST EQUIPMENT

A. Minimum Equipment Required

1. Go, No-Go Mandrels

2. Pull/Retrieval Ropes

PART 3 EXECUTION

3.01 PREPARATION

A. Backfill trenches in accordance with Section 02225.

B. Provide pressure pipeline with concrete thrust blocking. Hydrostatic testing shall not begin until the concrete thrust blocking has set, but not before a minimum of 7 days after pouring.

C. Flush pipeline to remove debris. Collect and dispose of flushing water and debris.

D. Lamping:

1. After flushing and cleaning, lamp gravity pipeline in the presence of the ENGINEER to determine uniformly straight alignment between manholes.

2. Assist the ENGINEER in the lamping operation by shining a light at one end of each pipeline section between manholes. The ENGINEER will observe the light at the other end. Pipeline that has not been installed with uniform line and grade will be rejected. Remove and re-lay rejected pipeline sections. Re-clean and lamp until pipeline section achieves a uniform line and grade to the satisfaction of the ENGINEER.

E. Plug outlets, wye-branches and laterals. Brace plugs to offset thrust.

3.02 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 piezometric tube. 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:

Low Pressure Air Test - Test Times

Nominal Pipe Size	T (Time) Min/100 Ft.	Nominal Pipe Size	T (Time) Min/100 Ft.
4	.3	21	3.0
6	.7	24	3.6
8	1.2	27	4.2
10	1.5	30	4.8
12	1.8	33	5.4
15	2.1	36	6.0
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 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.

B. Testing Pipe Over 36" Diameter:

1. Pipe over 36" diameter shall be subjected to a visual interior inspection.

C. Infiltration Test:

1. Use only when gravity pipeline is submerged in ground water. Obtain prior approval of the ENGINEER.

2. Plug all laterals and the upstream manhole. Measure the infiltration flow with a "V" notch weir set in the sewer at the downstream manhole.

3. Maximum Allowable Infiltration: 200-gallons per inch of pipe diameter per mile of sewer per day for any one section under test, including the allowances for leakage from manholes.

D. Exfiltration Test:

1. Obtain prior approval of the ENGINEER.

2. Plug all laterals and the lower manhole with a plug suited for this purpose. Fill the sanitary sewer section with water to a head of at least one (1) foot above the top of the sewer pipe in the upper manhole. Measure and time the drop in water level in the upper manhole to calculate the actual rate of exfiltration.

3. Maximum Allowable Exfiltration: 100 gallons per inch of pipe diameter per mile of pipe per day. When the difference in sewer elevations between the upper and lower manholes exceeds ten (10) feet, the CONTRACTOR will be allowed additional exfiltration, as may be determined by the ENGINEER.

E. Deflection Test:

1. A deflection test shall be performed on all PVC sanitary sewer piping at least 30 days, but no longer than 12 months, after the pipe has been backfilled.

2. Mandrells shall be sized at 95% of the original vertical internal pipe diameter. Mandrell shall be pulled through pipe section manually. Mechanical pulling devices for mandrells shall not be used.

3. Maximum Allowable Deflection: 5% of the original internal pipe diameter.

3.03 TESTING FORCE MAINS

A. Hydrostatic Testing:

1. After a force main or section thereof is constructed, backfilled, and successfully cleaned, perform a hydrostatic Line Acceptance Test as follows:

a. Seal force main at downstream end with a suitable pipe plug.

b. Fill force main with clear water.

c. Raise hydrostatic pressure to 150 psi or 50 percent above normal working pressure, whichever is greater (measured at the low point of the particular section of the main being tested).

d. A preliminary test period for the removal or absorption of air from the lines before measuring the leakage will be permitted.

e. Maintain test pressure for a period of not less than 4 hours.

f. Repair and Retest: When force main or sections of force main fails to meet test requirements specified previously, determine source or sources of leakage and repair or replace defective material, and if a result of improper workmanship, correct such. Conduct such additional tests required to demonstrate that force main meets specified test requirements.

B. Leakage Tests:

1. After completion of successful pressure testing, conduct the leakage test for a 2-hour period at the test pressure indicated above. Maximum allowable leakage shall be ten (10) gallons per day per inch of pipe diameter per mile of pipe.

2. Expel air from the line under test, close the air vents and raise pressure to the specified test pressure. The leakage in the section under test is defined as the quantity of water supplied to maintain pressure within 5 psig of the specified test pressure during the entire testing period. Force main installation is deemed to have failed the leakage test if the leakage obtained is greater than that determined by the formula:

$$L = \frac{N \times D \times P^{1/2}}{7400}$$

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
7400 is a conversion factor constant

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

4. If test results indicate that the force main laid has leakage greater than specified, locate and repair the defective joints, fittings, or pipe and retest until leakage is within allowable limits. Repair visible leaks regardless of the amount of leakage.

5. The CONTRACTOR may elect to make a leakage test prior to backfilling the trenches, for his own purposes; however, the leakage tests of the force mains or sections thereof for acceptance, shall be conducted after the backfilling of the trenches has been completed.

END OF SECTION

SECTION 02923
LANDSCAPE GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Final grade topsoil for finish landscaping.

1.02 RELATED SECTIONS

A. Section 01400 - Quality Control

B. Section 02200 - Excavation and Earthwork

C. Section 02225 - Trenching, Backfilling and Compacting

D. Section 02575 - Paving and Resurfacing

E. Section 02930 - Seeding

F. Section 02950 - Trees, Plants and Ground Cover

PART 2 PRODUCTS

2.01 MATERIAL

A. Topsoil:

1. Existing excavated topsoil stockpiled on site.

2. Imported friable loam; reasonably free of subsoil, roots, grass, excess amount of weeds, stone limited to 1 inch maximum size, foreign matter; pH of 5.5 to 7.5 containing a minimum of 4 percent and maximum of 25 percent organic matter.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify fill material to be reused, is acceptable.

B. Verify site and trench backfilling has been completed and inspected.

C. Verify subsoil base has been contoured and compacted.

D. Beginning work of this section means acceptance of existing conditions.

3.02 SUBSOIL PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches and stones in excess of 1/2 inch in size. Remove subsoil contaminated with petroleum products.

C. Scarify subgrade to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment is used for hauling and spreading topsoil and has compacted subsoil.

3.03 PLACING TOPSOIL

A. Place topsoil in areas where seeding and planting is required.

B. Use topsoil in relatively dry state. Place during dry weather and on unfrozen subgrade.

C. Frozen topsoil shall not be spread.

D. Fine grade topsoil eliminating rough or low areas. Maintain profiles and contour of subgrade.

E. Remove roots, weeds and foreign material while spreading.

F. Manually spread topsoil close to trees, plants, fences and buildings.

G. Lightly compact placed topsoil.

H. Remove surplus subsoil and topsoil from site.

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

3.04 TOLERANCES

A. Top of Topsoil: Plus or minus 1/2 inch.

3.05 SCHEDULE OF LOCATIONS

A. Compacted topsoil thickness.

1. Seeded Grass: 4 inches
2. Landscaped Areas: 12 inches

3.06 PROTECTION

A. Protect landscaping and other features remaining as final work.

B. Protect existing structures, fences, sidewalks, utilities, paving and curbs.

END OF SECTION

SECTION 02930
SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fertilizing.

B. Seeding, Hydroseeding.

C. Mulching.

D. Maintenance.

1.02 RELATED SECTIONS

A. Section 02200 - Excavation and Earthwork: Rough grading of site.

B. Section 02225 - Trenching, Backfilling and Compacting: Rough grading over cut.

C. Section 02923 - Landscape Grading: Preparation of subsoil and placement of topsoil.

D. Section 02950 - Trees, Plants and Ground Cover

1.03 REFERENCES

A. FS 0-F-241 - Fertilizers, Mixed, Commercial.

1.04 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.05 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer composition and herbicide composition.

1.06 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weights, date of packaging, and location of packaging.

1.07 TESTS

A. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

1.08 MAINTENANCE DATA

A. Submit maintenance data for continuing Owner maintenance.

B. Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01600.

B. Store and protect products under provisions of Section 01600.

C. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

D. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.10 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

PART 2 PRODUCTS

2.01 ACCEPTABLE SEED

A. All seed used shall be labeled in accordance with the U.S. Department of Agricultural Rules and Regulations under the Federal Seed Act in effect at the time of purchase. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. Seed shall not be more than two (2) years old and shall be retested for germination rate no more than ninety (90) days prior to use.

B. Inert matter shall not exceed 15%. Blue Tag Certified Seed shall be supplied wherever possible.

2.02 SEED MIXTURE

	% by Weight	Minimum % Purity	Minimum % Germination	Max % Weed Seed
A. Lawn Seed				
Kentucky Bluegrass (2 or more varieties - none greater than 25% of total)	50	90	80	0.20
Pennfine Perennial Rye Grass	20	95	90	0.15
Pennlawn Red Fescue	30	98	85	0.25
B. Special Areas - swales, pond embankments, levees, diversion channels, and occasional water flow areas.				
Kentucky 31 Tall Fescue	80	98	85	0.25
Pennfine Perennial Rye Grass	20	95	90	0.15

2.03 SOIL MATERIALS

A. Topsoil

1. Excavated from site and free of weeds.

2. Imported

2.04 ACCESSORIES

A. Mulching Material: Hay or straw, free from weeds, foreign matter detrimental to plant life, and dry. Chopped cornstalks are not acceptable.

B. Hydrated lime or agricultural grade limestone.

C. Fertilizer: FS O-F-241, Type recommended for grass, with fifty percent of the elements derived from organic sources; to the following proportions.

1. Nitrogen 0 percent, phosphoric acid 20 percent, soluble potash 20 percent.

2. Nitrogen 10 percent, phosphoric acid 10 percent, soluble potash 10 percent.

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

E. Erosion Fabric: Jute matting, open weave.

F. Stakes: Softwood lumber, chisel pointed.

G. Twine: Inorganic fiber.

H. Netting.

I. Synthetic binders.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that prepared soil base is ready to receive the work of this Section.

B. Beginning of installation means acceptance of existing site conditions.

3.02 PREPARATION OF SUBSOIL

A. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove subsoil contaminated with petroleum products.

B. Scarify subgrade to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.03 PLACING TOPSOIL

A. Place topsoil in areas where seeding is scheduled.

B. Use topsoil in relatively dry state. Place during dry weather and on unfrozen ground.

C. Frozen topsoil shall not be spread.

D. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade.

E. Remove stone, roots, grass, weeds, debris, and foreign material while spreading.

F. Manually spread topsoil around trees, plants, building and fences to prevent damage.

G. Lightly compact placed topsoil.

H. Remove surplus subsoil and topsoil from site.

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

J. Compacted topsoil thickness for seeded grass areas shall be 4 inches and for landscaped areas shall be 12 inches.

3.04 FERTILIZING

A. After spreading and raking the topsoil, and prior to rolling, the following shall be spread and mixed thoroughly into the upper three (3) to four (4) inches of topsoil:

1. Hydrated lime or Agricultural grade limestone - 150 lbs. per 1,000 sq. ft. or at a rate suggested from the results of a soil test.

2. 0-20-20 Fertilizer - at a rate of 25 lbs. per 1,000 sq. ft.

B. Lightly water to aid the dissipation of fertilizer.

C. Immediately before seeding, the following shall be spread and mixed thoroughly into the upper one (1) inch of topsoil:

1. 10-10-10 Fertilizer - at a rate of 25 lbs. per 1,000 sq. ft.

D. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

3.05 SEEDING

A. Apply seed at a rate as indicated below evenly in two intersecting directions. Rake in lightly. Do not seed area in excess of that which can be mulched on same day.

1. Lawn Seed: 2.5 lbs. per 1,000 sq. ft.

2. Special Areas: 2.0 lbs. per 1,000 sq. ft.

B. Planting Season:

1. April 15th to June 1st

2. August 15th to October 1st

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

D. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

E. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.06 HYDROSEEDING

A. Apply seeded slurry at a rate as indicated below evenly in two intersecting directions, with a hydraulic seeded. Do not hydroseed area in excess of that which can be mulched on same day.

1. Lawn Seed - 2.5 lbs. per 1,000 sq. ft.

2. Special Areas - 2.0 lbs. per 1,000 sq. ft.

B. Immediately following seeding, apply mulch to a thickness of 1/8. Maintain clear of shrubs and trees.

C. Wood cellulose fiber, applied at a rate of 35 lbs. per 1,000 square feet, may be applied as an integral part of the slurry in lieu of straw mulching. Synthetic mulch binder, such as Curasol, DCA-70, Terra-tack, or an approved equal shall be used per manufacturer's instructions to anchor the mulch.

D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.07 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery.

B. Mulch shall be kept moist by watering to prevent blowing away, or shall be mechanically anchored by one of the methods listed below:

1. Synthetic binders - such as Curasol, DCA-70, Petroset, or Terra-Tack applied as recommended by the manufacturer.

2. Netting - lightweight biodegradable paper, plastic or cotton netting placed over mulch and anchored per manufacturer's specifications.

3. Peg and twine - Drive 8 inch wooden pegs at 4 foot intervals in all directions. Secure mulch to soil by stretching twine between pegs in a criss-cross pattern. Twine to be secured by twisting two or more turns around each peg.

C. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

D. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

E. Secure outside edges and overlaps at 36 inch intervals with stakes.

F. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

G. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges

minimum 6 inches.

3.08 TEMPORARY SEEDING

A. Disturbed areas where construction activity has or will cease for more than 20 days shall be stabilized.

B. Fertilizing:

1. Spread and mix the following into the topsoil.

a. Agricultural grade limestone - at a rate of 100 lbs. per 1,000 sq. ft.
b. 10-10-10 Fertilizer - at a rate of 10 lbs per 1,000 sq. ft.

C. Seeding

1. Annual rye grass seed meeting requirements of this section.

2. Apply at the rate of 4 lbs. per 1,000 sq. ft.

3.09 MAINTENANCE

The CONTRACTOR is responsible to:

A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas which show bare spots.

H. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

SECTION 02938
SODDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fertilizing.

B. Sod installation.

C. Maintenance.

1.02 RELATED SECTIONS

A. Section 02200 - Excavation and Earthwork: Backfilling and rough grading.

B. Section 02225 - Trenching, Backfilling and Compacting: Rough grading over cut.

C. Section 02923 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the Work of this Section.

D. Section 02930 - Seeding.

E. Section 02950 - Trees, Plants, and Ground Cover.

1.03 REFERENCES

A. ASPA (American Sod Producers Association) - Guideline Specifications to Sodding.

B. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.04 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.05 QUALITY ASSURANCE

A. Sod: Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.

B. Submit sod certification for grass species and location of sod source.

1.06 QUALIFICATIONS

A. Sod Producer: Company specializing in sod production and harvesting with

minimum five years experience.

B. Installer: Company approved by the sod producer.

1.07 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01600.

B. Store, protect and handle products at site under provisions of Section 01600.

C. Deliver sod on pallets. Protect exposed roots from dehydration.

D. Do not deliver more sod than can be laid within 24 hours.

1.09 MAINTENANCE SERVICE

A. Maintain sodded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for two cuttings.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sod: ASPA approved, field grown; cultivated grass sod; Kentucky bluegrass, with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq. ft.

B. Fertilizer: FS O-F-241, Type I, Grade A; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil to the following proportions; nitrogen 10 percent, phosphoric acid 10 percent, soluble potash 10 percent.

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

2.02 ACCESSORIES

A. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.

B. Wire Mesh: Interwoven hexagonal metal wire mesh of 24 inch size.

2.03 HARVESTING SOD

A. Machine cut sod and load on pallets in accordance with ASPA Guidelines.

B. Cut sod in area not exceeding 1 sq. yd. with minimum 1/2 inch and maximum 1

inch topsoil base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to installation of sod.

C. Apply fertilizer no more than 48 hours before laying sod.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.03 LAYING SOD

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod immediately after delivery to site to prevent deterioration.

C. Lay sod tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.

D. Lay smooth. Align with adjoining grass areas.

E. Place top elevation of sod 1/2 inch below adjoining edging.

F. On slopes 6 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.

G. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.

H. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding 100 lbs.

3.04 MAINTENANCE

The CONTRACTOR is responsible to:

A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove irregularities.

F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

G. Immediately replace sod in areas which show deterioration or bare spots.

H. Protect sodded area with warning signs during maintenance period.

END OF SECTION

SECTION 02950
TREES, PLANTS, AND GROUND COVER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Mulch.

C. Maintenance.

1.02 RELATED SECTIONS

A. Section 02200 - Excavation and Earthwork: Rough grading of site.

B. Section 02225 - Trenching, Backfilling and Compacting: Rough grading over trench cut.

C. Section 02923 - Landscape Grading: Preparation of subsoil and placement of topsoil.

D. Section 02930 - Seeding.

1.03 REFERENCES

A. ANSI Z60.1 - Nursery Stock.

1.04 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

B. Plants: Living trees, plants, and ground cover specified in this Section, and described in ANSI Z60.1.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit instructions for continuing Owner maintenance under provisions of Section 01700.

1.06 QUALITY ASSURANCE

A. Nursery: Company specializing in growing and cultivating the plants specified in this Section with minimum three years experience.

B. Installer: Company specializing in installing and planting the plants specified in

this Section with minimum three years experience.

1.07 REGULATORY REQUIREMENTS

A. Comply with regulatory requirements for fertilizer composition.

B. Plant Materials: Described by ASTM Z60.1; free of disease or hazardous insects.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver stone and protect products at site under provisions of Section 01600.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Protect plants until planted.

D. Deliver plant life materials immediately prior to placement. Keep plants moist.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install plant life when ambient temperatures may drop below 35 degrees F or above 90 degrees F.

B. Do not install plants when wind velocity exceeds 30 mph.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with installation of underground utilities, piping and seeding.

1.11 WARRANTY

A. Provide a warranty on work of this Section for a minimum one year including one continuous growing season. Commence warranty on date identified in the Certificate of Substantial Completion.

B. Warranty: Include coverage of plants from death or unhealthy conditions.

C. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

1.12 MAINTENANCE SERVICE

A. Maintain plant life until plants are well established and exhibit a vigorous growing condition.

B. Maintenance to include:

1. Cultivation and weeding plant beds and tree pits.

2. Application of herbicides for weed control in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.

3. Application of pesticides in accordance with manufacturer's instructions. Remedy damage from use of pesticides.

4. Irrigating sufficient to saturate root system.

5. Trimming and pruning, including removal of clippings and dead or broken branches, and treatment of pruned areas or other wounds.

6. Disease control.

7. Maintaining wrapping, guys, and stakes. Repair or replace accessories when required.

PART 2 PRODUCTS

2.01 GROUND COVER

A. On all slopes greater than 3:1, non-mowed areas and as indicated on Drawings.

B. Plants:

1. Vinca Minor (Periwinkle)

a. Plant at 6" center to center both ways.

2. Penngift Crown Vetch

a. Inoculate in accordance with manufacturer's directions for broadcasting.
b. Inoculate at four (4) times manufacturer's rate for hydroseeding. If fertilizer is combined with inoculant in slurry, after 1 hour add a new supply of inoculant.
c. Apply at 2 lbs. per 1000 sq. ft.

2.02 SOIL MATERIALS

A. Topsoil: Excavated from site or imported as required.

2.03 MULCH MATERIALS

A. Mulching Material: ground bark, free of growth or germination inhibiting ingredients.

2.04 SOURCE QUALITY CONTROL

A. Provide certification of inspection for ENGINEER confirming approval of plants

supplied.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared subsoil is ready to receive work of this Section.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds, and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoil to a depth of where 3 inches plants are to be placed. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

D. Dig pits and beds larger than plant root system.

3.03 PLANTING

A. Place plants for best appearance.

B. Set plants vertically.

C. Remove non-biodegradable root containers.

D. Set plants in pits or beds, partly filled with prepared topsoil mixture.

E. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture. Maintain plant materials in vertical position.

F. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

3.04 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01400.

B. Plants will be rejected when ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

END OF SECTION

DIVISION 3 - CONCRETE WORK

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork, complete with shoring, bracing and anchorage.

B. Cast-in-place concrete.

C. Reinforcing steel, welded wire fabric, supports, spacers and accessories.

D. Waterstops.

E. Thrust blocks and miscellaneous structures.

F. Concrete Curing.

1.02 RELATED SECTIONS

A. Section 03301 - Concrete for utility construction.

B. Section 03602 - Non-Shrink Grout.

1.03 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ACI 305R - Hot Weather Concreting.

C. ACI 306R - Cold Weather Concreting.

D. ACI 308 - Standard Practice for Curing Concrete.

E. ACI 318 - Building Code Requirements for Reinforced Concrete.

F. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

G. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

H. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

I. ASTM A775 - Epoxy Coated Reinforcing Bars.

J. ASTM C33 - Concrete Aggregates.

K. ASTM C94 - Ready-Mixed Concrete.

L. ASTM C150 - Portland Cement.

M. ASTM C260 - Air-Entraining Admixtures for Concrete.

N. ASTM C309 - Liquid Membrane - Forming Compounds for Curing Concrete.

O. ASTM C494 - Chemical Admixtures for Concrete.

P. ASTM D 1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

Q. ASTM D2103 - Polyethylene Film and Sheeting.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Maintain copy of ACI 301 on site.

C. Obtain materials from same source throughout the Work.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable building code for area where project is located.

1.06 SUBMITTALS

A. Proposed concrete mix design for each class of concrete along with sufficient data to document the proportioning of the proposed concrete mix in accordance with ACI 301.

B. Proposed curing methods for hot and cold weather.

C. Submit product data for specified products under provisions of Section 01300.

D. Submit manufacturers' instructions under provisions of Section 01300.

1.07 FIELD TESTS

A. Testing and analysis of concrete shall be performed by an independent testing agency engaged and paid for by the CONTRACTOR and approved by the ENGINEER.

B. The OWNER reserves the right to require the CONTRACTOR to perform the following tests:

1. Concrete Cylinder Tests

2. Slump Tests

3. Air Entrainment Test

C. Testing firm shall take cylinders and perform slump and air entrainment tests in accordance with ACI 301.

D. Four (4) concrete test cylinders shall be taken for every twenty-five (25) or less cubic yards of concrete placed each day as directed by the ENGINEER.

E. Two (2) additional test cylinders shall be taken during cold weather and cured on site under same conditions as concrete they represent.

F. A minimum of one (1) slump test shall be taken for each set of test cylinders taken.

G. The CONTRACTOR will be responsible for all costs associated with concrete testing.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS (ACI 301 2.1)

A. Cement: ASTM C150, moderate, air entraining - Type IIA Portland type; gray color.

B. Fine and Coarse Aggregates: ASTM C33, subject to limitations of ACI 301 3.6.

C. Water: Clean and not detrimental to concrete.

D. No on-site mixing of concrete is allowed.

2.02 ADMIXTURES (ACI 301 2.2)

A. Add an air entraining agent conforming to ASTM C260 to obtain a total air content as required by Table 3.4.1 of ACI 301, except that a minimum total air content, of 4 percent by volume in all mix designs, unless noted otherwise. Coordinate use of air entraining agent for floors scheduled to receive a dry shake hardener with manufacturer of hardener.

B. A water reducing admixture conforming to ASTM C494 - Type A shall be used in all mix designs. The quantity to be added, the controlling temperature and the method of mixing shall conform with the manufacturers written recommendations.

C. Use of additional admixtures must be approved in writing by the ENGINEER.

D. No calcium chloride or other chloride containing admixture will be permitted.

2.03 STRENGTH (ACI 301 3.2)

A. Provide concrete mix in accordance with ASTM C94 and the following characteristics:

1. Compressive Strength (7 day) 2800 psi

Compressive Strength (28 day)	4000 psi
Maximum Water-Cement Ratio	0 .45
Minimum Cementitious Materials	564 lb/CY
Air Content	6%± 1%
Slump	2" to 3"

2. Admixtures should be added as indicated in Item 2:02 above.

2.04 REINFORCING STEEL (ACI 301 5.2)

A. Reinforcing Bars:

1. ASTM A615, including Supplementary Requirements S1, 60 ksi yield grade billet steel deformed bars.

2. Epoxy coated in conformance with ASTM A775.

B. Welded Steel Wire Fabric

1. Conforming to ANSI/ASTM A185.

2.05 WATERSTOPS (ACI 301 6.3)

A. Waterstops shall be of the type and size as indicated on the Drawings and shall be provided in the joints of all pits, tanks, troughs and foundation walls which are intended to be watertight.

B. The preformed plastic waterstop shall meet or exceed all requirements of Federal Specification SS-S-210A, Sealing Compound for Expansion Joints, and shall be suitable for the location and hydrostatic pressure involved, such as Synko-Flex Waterstop.

C. Waterstop materials shall be installed and joined in accordance with manufacturers printed instructions.

2.06 ACCESSORIES

A. Bonding Agent: Two component modified epoxy resin; such as Sikadur Hi-mod as manufactured by Sika Chemical Corporation; Fresh Concrete Bonder #2 as manufactured by E-poxy Industries or an approved equal.

B. Non-Shrink Grout: Premixed compound with non-metallic aggregate cement, water reducing and plasticizing agents; capable of a minimum compressive strength of 4,000 psi.

C. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete shall be non-toxic and suitable for contact with potable water.

PART 3 EXECUTION

3.01 GENERAL

A. Install concrete work in accordance with ACI 301 except as amended by this Section.

3.02 FORMWORK (ACI 301 4.2)

A. Verify lines, levels and measurements before proceeding with formwork.

B. Obtain ENGINEER'S review for use of earth forms. When using earth forms, hand-trim sides and bottoms, and remove loose dirt prior to placing concrete.

C. Chamfer external corners except where masonry overhangs concrete.

D. Construct formwork to maintain the tolerances as listed in Table 4.3.1 of ACI 301.

3.03 INSERTS, EMBEDDED ITEMS AND OPENINGS

A. Locate and cast in place all slots, sleeves, openings, recesses, chases, bolts, anchors or other inserts required by other trades. Sizes and locations of all inserts shall be coordinated with other trades and certified equipment drawings.

B. Install all waterstops as shown on the Drawings. Waterstops shall be continuous, with heat sealed joints, and shall be firmly anchored and wired to the reinforcing steel prior to placing concrete.

3.04 FORM SURFACES PREPARATION (ACI 301 4.4)

A. Apply form release agent on formwork in accordance with manufacturer's recommendations. Apply prior to placing reinforcing steel, anchoring devices and embedded parts. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent.

3.05 REINFORCING STEEL (ACI 301 5.1 to 5.5)

A. No welding of reinforcing steel will be permitted unless approved in writing by the ENGINEER.

B. No reinforcing steel embedded in hardened concrete shall be bent unless approved in writing by the ENGINEER.

C. The CONTRACTOR shall notify the ENGINEER after all reinforcing steel and accessories have been set and at least 24 hours prior to pouring concrete so that all reinforcing can be inspected and approved.

D. All bar supports, tie wires and accessories shall be epoxy coated.

E. Reinforcing bars shall not be field cut unless approved by the ENGINEER.

F. If approved, field cuts shall be treated with an approved repair material.

G. All areas where the coating is damaged during shipping, handling or placing shall be repaired using an approved repair compound.

3.06 CONSTRUCTION JOINTS (ACI 301 6.1 to 6.5)

A. Construction joints shall be located as shown on the Drawings; any additional joints or relocation of joints must be approved in writing by the ENGINEER prior to construction. All construction joints shall be doweled, keyed, and water stopped as shown on the Drawings.

B. Prior to placing the new concrete against the existing concrete in a construction joint, the existing concrete shall be thoroughly cleaned of all dirt, debris, laitance and loose mortar, and then thoroughly wetted with an epoxy bonding agent just prior to placing new concrete.

3.07 CONTROL OF MIXING WATER (ACI 301 7.5.2)

A. No additional water shall be added to the concrete after it arrives at the job site unless authorized by the ENGINEER or his authorized representative. If additional water is added, additional cement must be added to maintain the original water-cement ratio specified herein.

3.08 PLACING CONCRETE

A. Notify ENGINEER a minimum of 24 hours prior to commencement of concreting operations.

B. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.

C. Saw cut control joints at an optimum time after finishing. Use 3/16-inch thick blade, cutting 1/3 into depth of slab thickness.

D. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify ENGINEER upon discovery.

E. Provide pads for all equipment. Pads shall project 4" beyond all sides of the equipment and be 4" high unless indicated otherwise on the Drawings.

3.09 REMOVAL OF FORMS (ACI 301 4.5)

A. Do not remove forms, shores and bracing until concrete has gained sufficient strength to carry its own weight, construction loads, and design loads which are liable to be imposed upon it. Verify strength of concrete by compressive test results.

B. No reshoring of concrete will be permitted unless authorized in writing by the ENGINEER.

3.10 EXISTING WORK

A. Where new concrete is doweled to existing concrete, drill holes in existing concrete, insert steel dowels and pack with non-shrink grout.

B. Prepare previously placed concrete by cleaning with a steel brush and apply bonding agent in accordance with manufacturer's instructions.

3.11 REPAIR OF SURFACE DEFECTS (ACI 301 9.1)

A. Allow the ENGINEER to inspect concrete surfaces immediately upon removal of forms.

B. Modify or replace concrete not conforming to required lines, detail, elevations and tolerances.

C. Repair or replace concrete not properly placed resulting in excessive honeycombing and other defects. Do not patch, repair or replace exposed architectural concrete except upon express direction of the ENGINEER.

D. If strength tests fail to meet the requirements of ACI 301, Section 17.2, the OWNER/ENGINEER may require inplace and/or core tests in accordance with ACI 301, Section 17.3. Cost of all additional testing shall be paid by the CONTRACTOR.

3.12 SCHEDULE OF FORMED SURFACES

A. Smooth surface finish at concealed areas.

B. Smooth rubbed finish at exposed areas.

3.13 PROTECTION (ACI 301, Chapter 12)

A. Protect finished work under provisions of Section 01600.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete (at least 7 days, except for high early strength which requires 3 days).

D. Hot weather curing and cold weather curing procedures must be submitted by the CONTRACTOR for approval.

3.14 TEST FOR WATERTIGHTNESS

All concrete tanks and wet wells designed to hold water, sewage or some other liquid shall be tested for watertightness as follows. After the concrete tanks have been constructed and properly cured, for a length of time to be determined by the ENGINEER, and prior to any backfilling around the structures, the CONTRACTOR shall fill the tanks

to the levels as indicated on the Drawings. The water shall not be removed for a minimum of 48 hours unless otherwise instructed by the ENGINEER. The ENGINEER will check for evidence of leakage, and any areas which show evidence of leakage will be repaired at the direction of the ENGINEER. For the purposes of this Specification, watertightness shall be defined as the absence of any damp or wet areas with discernible flow. If repairs are necessary, the tank must be drained, the repairs made, and test repeated until satisfactory completion of the test.

The method and materials for repairs shall be approved by the ENGINEER prior to the start of any repair work. All leaks and defective areas shall be cut or chipped and patched. No feathered edges or surface patches will be allowed.

END OF SECTION

SECTION 03301
CONCRETE FOR UTILITY CONSTRUCTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cast-in-place concrete construction.

B. Reaction and support blocking.

C. Cradles and encasements.

1.02 RELATED SECTIONS

A. Section 02225 - Trenching, Backfilling & Compaction.
B. Section 02601 - Manholes.
C. Section 02603 - Precast Utility Structures.
D. Section 02605 - Manhole Repair and Rehabilitation.
E. Section 02720 – Storm Sewer Pipe
F. Section 02730 - Sanitary Sewer Pipe.
G. Section 03300 - Cast-in-Place Concrete

1.03 REFERENCES

A. Pennsylvania Department of Transportation:

Publication 408 Specifications

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

ASTM C31	Making and Curing Concrete Test Specimens in the Field
ASTM C39	Test for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C94	Ready-Mixed Concrete
ASTM C143	Slump of Portland Cement Concrete
ASTM C172	Sampling Fresh Concrete

C. American Concrete Institute (ACI) Specifications and Practices

1.04 SUBMITTALS

A. Certificates:

1. Submit certification from the concrete producer attesting that the cement concrete conforms to Section 704, Publication 408 Specifications for the class of concrete being used.

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

B. Shop Drawings:

1. Submit detailed shop drawings of reinforcing steel.

PART 2 PRODUCTS

2.01 CONCRETE

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

1. 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 Concrete Criteria specified below and the results of the specified tests.

B. Concrete Criteria:

All concrete shall be PennDOT Class A.

C. No on-site mixing of concrete is allowed.

2.02 REINFORCEMENT STEEL

A. Reinforcement Bars:

1. New billet-steel conforming to Section 709.1, Publication 408 Specifications.

2. Deformed, Grade 60.

B. Steel Wire Fabric:

1. Conforming to Section 709.3, Publication 408 Specifications.

PART 3 EXECUTION

3.01 CONSTRUCTION

A. Comply with Section 1001, Publication 408 Specifications for construction requirements including formwork, curing, protection and finishing of concrete.

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

C. Support pipe, fittings and appurtenances at the required elevation with concrete brick or concrete block. Do not use earth, rock, wood, or organic material as supports.

D. Construct manhole bases, reaction and support blocking, cradles, encasements, and miscellaneous mass concrete.

E. Construct cast-in-place vaults, inlets, endwalls, curbs, sidewalks and miscellaneous reinforced structures.

F. Provide spacers, chairs, bolsters, ties and other devices for properly placing, spacing, supporting and fastening reinforcement in place.

G. Place concrete utilizing all possible care to prevent displacement of pipe or fittings. Return displaced pipe or fittings to line and grade immediately.

H. Insure tie rods, nuts, bolts and flanges are free and clear of concrete.

I. Do not backfill structures until concrete has achieved its initial set, forms are removed, and concrete work is inspected by the ENGINEER.

J. Perform backfilling and compaction as specified.

K. Provide slope anchors on all pipe with slope in excess of ten (10) percent.

3.02 FIELD TESTS OF CONCRETE DURING CONSTRUCTION

The CONTRACTOR shall engage the services of an independent testing agency to perform concrete tests as directed by the ENGINEER as specified in Section 01400. The CONTRACTOR shall provide the necessary labor and materials to make cylinders.

A. Test each 50 cubic yards or fraction thereof of each class of concrete for compressive strength. Retain an independent testing laboratory to test cylinders.

1. Sample concrete in accordance with ASTM C172.

2. Prepare and cure four test cylinders in accordance with ASTM C31.

3. Test cylinders in accordance with ASTM C39.

B. If test cylinders fail to meet strength requirements, the ENGINEER may require additional core tests in accordance with ASTM C42 at the expense of the CONTRACTOR.

END OF SECTION

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CS015	Handicapped Ramp Standards – Type IV ADA Ramps
CS016	Handicapped Ramp Standards – Type 4-A ADA Ramps
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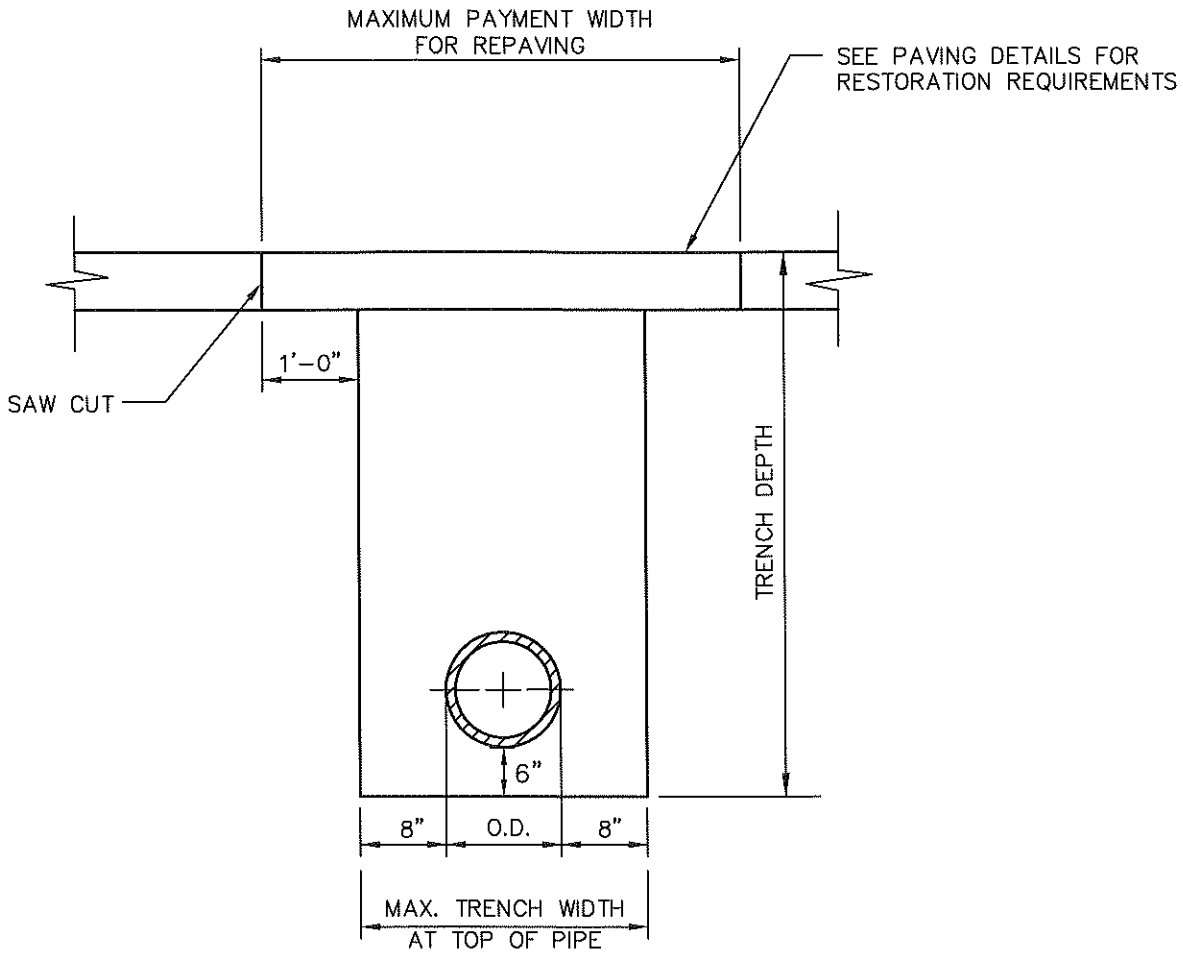


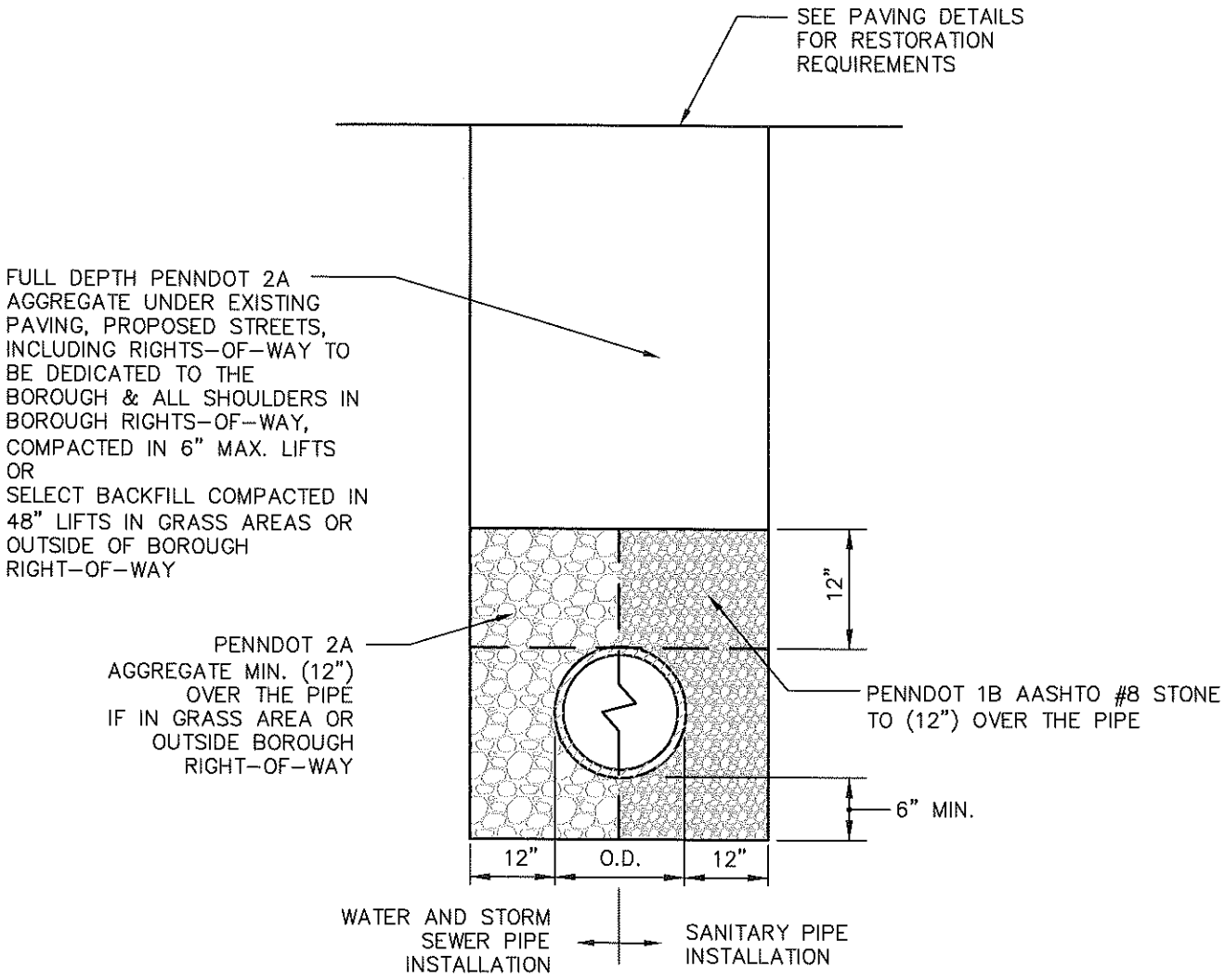
TRENCH DEPTH	MAXIMUM PAYMENT WIDTH-REPAVING
0' - 12'	O.D. + 3'-4"
12' - 18'	O.D. + 4'-4"
18' - 24'	O.D. + 5'-4"
24' - 30'	O.D. + 6'-4"

MAXIMUM TRENCH AND REPAVEMENT WIDTHS

NOTE: MOST CONSTRUCTION CONTRACTS PROVIDE FOR LUMP SUM PAYMENTS FOR ALL RESTORATION, AND NO PAY WIDTH WILL APPLY.

BOROUGH OF WYOMISSING

STANDARD DETAIL

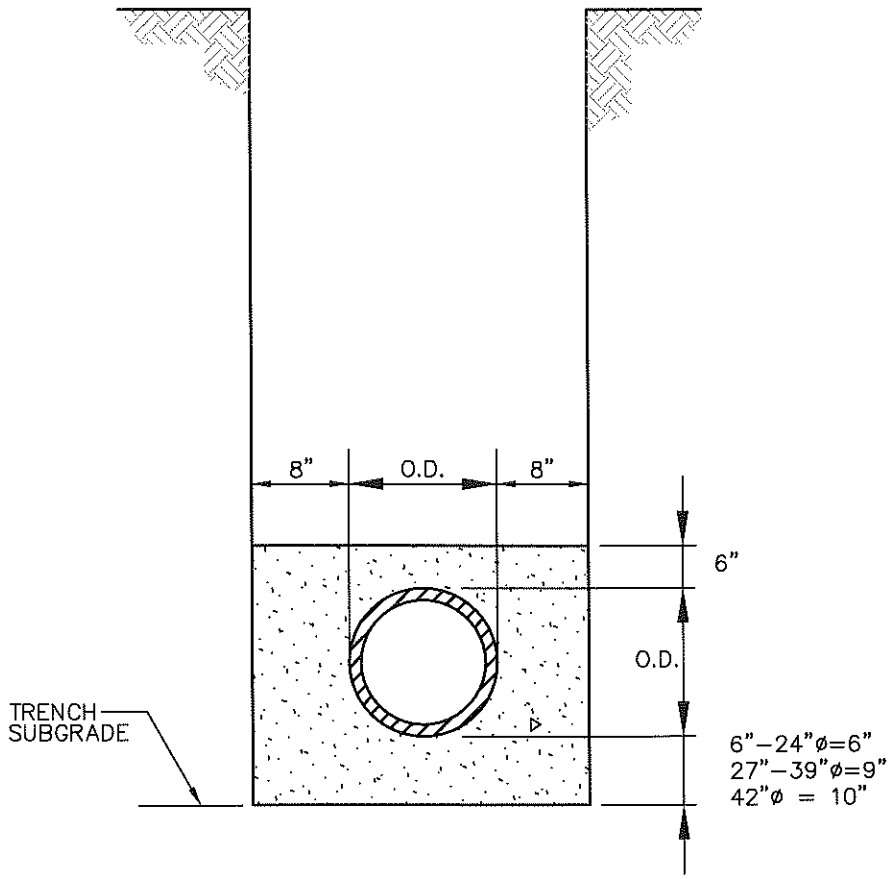


BEDDING AND BACKFILL DETAIL

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

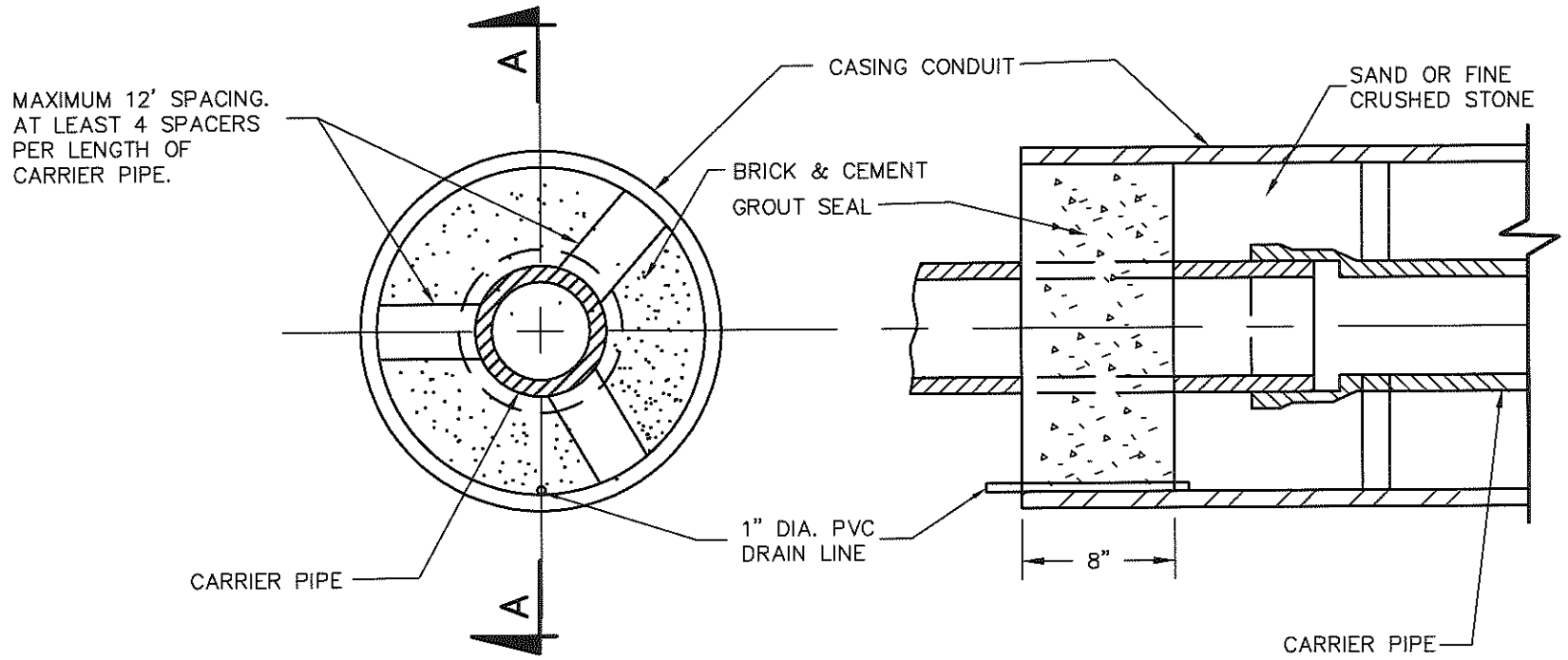


CONCRETE ENCASEMENT DETAIL

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL



END SECTION

SECTION A–A

SANITARY SEWER AND FORCE MAIN

CARRIER PIPE DIAMETER	MINIMUM STEEL CASING DIAMETER	MINIMUM CASING THICKNESS
LESS THAN 6"	12" OD	0.250"
6", 8", AND 10"	18" OD	0.312"
12" AND 14"	24" OD	0.375"
16" AND 18"	30" OD	0.500"
20" AND 24"	36" OD	0.500"

CARRIER PIPE AND CASING CONDUIT INSTALLATION DETAIL

NOTE: PREMANUFACTURED CASING SPACERS ARE REQUIRED EXCEPT IN SPECIAL CIRCUMSTANCES. REFER TO SPECIFICATIONS.

CASING SPACERS SHALL BE STAINLESS STEEL WITH NEOPRENE LINER AND POLYMER PLASTIC RUNNERS.

CONTRACTOR MAY INSTALL TUNNEL LINER PLATE, WITH APPROVAL OF THE ENGINEER, AS AN ACCEPTABLE CASING CONDUIT. REFER TO SPECIFICATIONS.

BOROUGH OF WYOMISSING

STANDARD DETAIL

11/13

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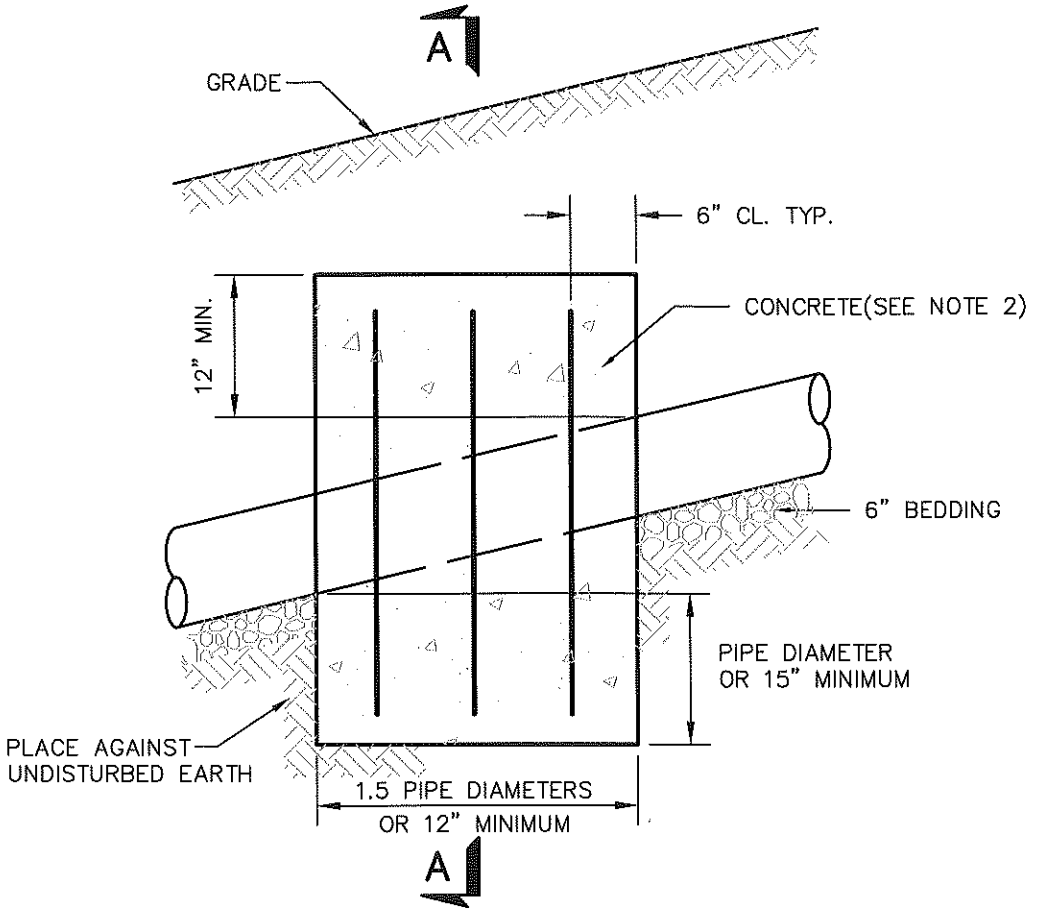
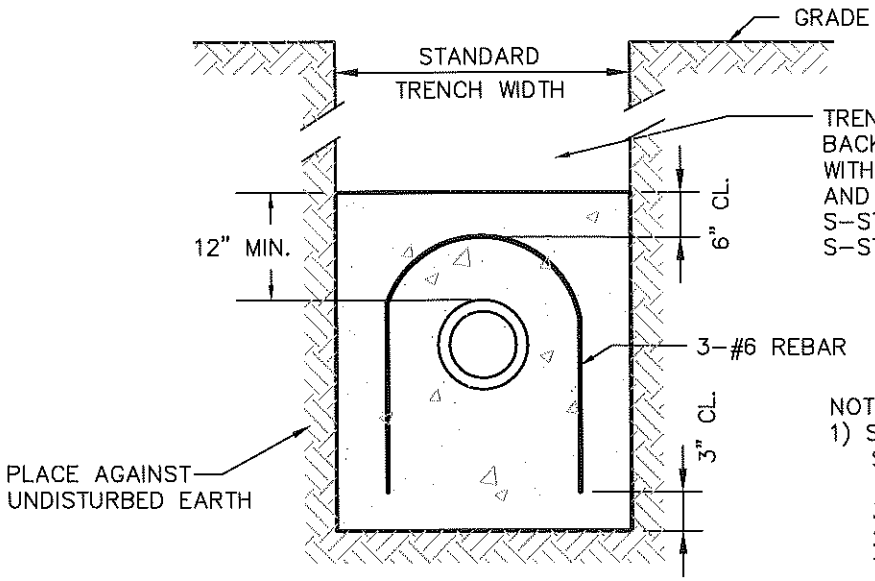


ELEVATION



SECTION A-A

NOTES:

1) SLOPE ANCHORS SHALL BE SPACED AS FOLLOWS:

   36' C-C FOR 10% TO 34% SLOPES
   24' C-C FOR 35% TO 49% SLOPES
   16' C-C FOR 50% OR GREATER SLOPES

2) CONCRETE TO BE CLASS A READY MIX PER PENNDOT SPECS.

STEEP SLOPE ANCHOR

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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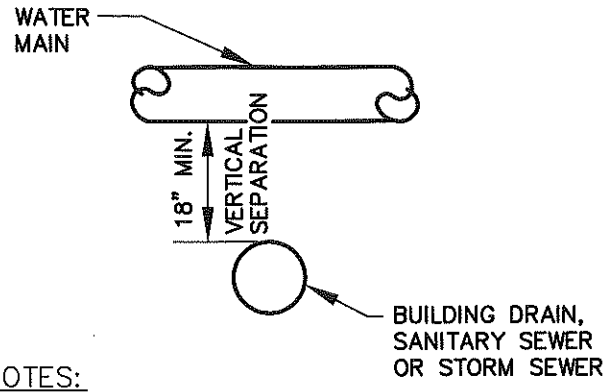
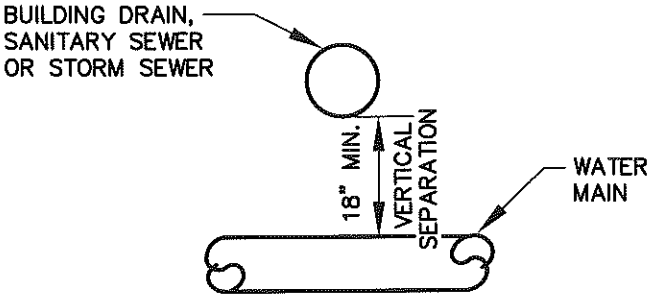


NOTES:

1. BOTH THE WATER MAIN AND SEWER LINE SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON, GALVANIZED STEEL OR PROTECTED STEEL PIPE HAVING MECHANICAL JOINTS.
2. THE LENGTH OF THE WATER LINE PIPE SHALL BE CENTERED AT THE POINT OF THE CROSSING SO THAT THE JOINTS ARE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.
3. THE SANITARY SEWER SHALL BE CONCRETE ENCASED FOR 10 FEET ON EITHER SIDE OF THE WATER CROSSING WHEN LESS THAN 18" VERTICAL SEPARATION IS MAINTAINED.

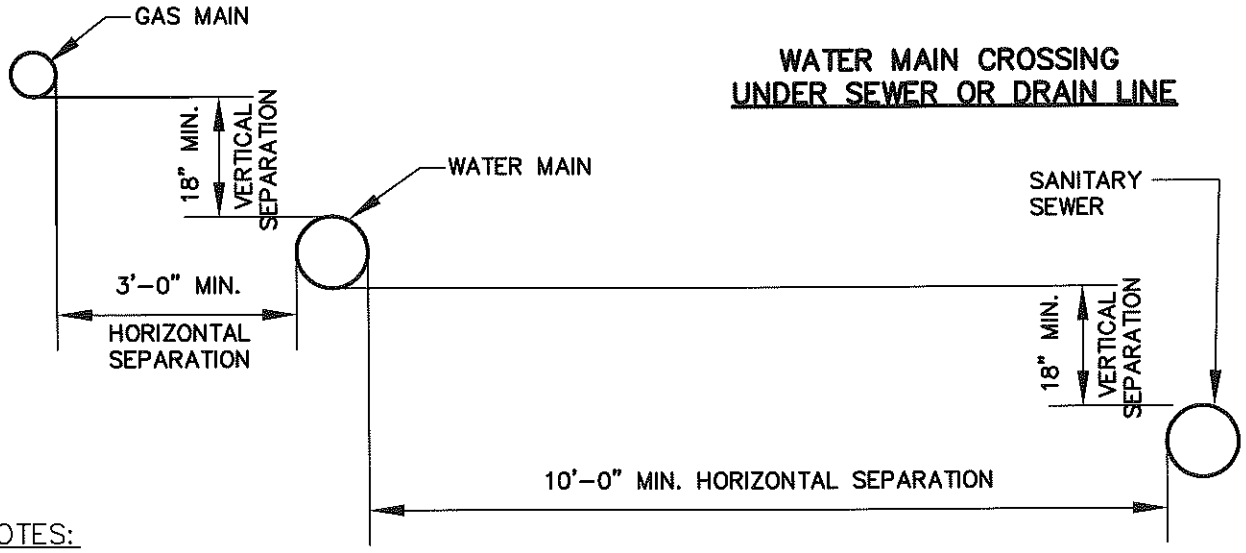
WATER MAIN CROSSING OVER SEWER OR DRAIN LINE



NOTES:

1. BOTH THE WATER MAIN AND SEWER LINE SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON, GALVANIZED STEEL OR PROTECTED STEEL PIPE HAVING MECHANICAL JOINTS.
2. THE SEWER SHALL HAVE ADEQUATE STRUCTURAL SUPPORT TO PREVENT EXCESSIVE DEFLECTION OF THE JOINTS AND THE SETTLING ON AND BREAKING OF THE WATER LINE.
3. THE LENGTH OF THE WATER LINE PIPE SHALL BE CENTERED AT THE POINT OF THE CROSSING SO THAT THE JOINTS ARE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.
4. THE WATER MAIN SHALL BE CONCRETE ENCASED FOR 10 FEET ON EITHER SIDE OF THE SEWER CROSSING WHEN LESS THAN 18" VERTICAL SEPARATION IS MAINTAINED.

WATER MAIN CROSSING UNDER SEWER OR DRAIN LINE



NOTES:

1. IF MINIMUM HORIZONTAL SEPARATION CANNOT BE MAINTAINED, THE WATER MAIN SHALL BE CONSTRUCTED SO AS TO MAINTAIN MINIMUM VERTICAL SEPARATION.

UTILITY LINE SEPARATION DETAIL

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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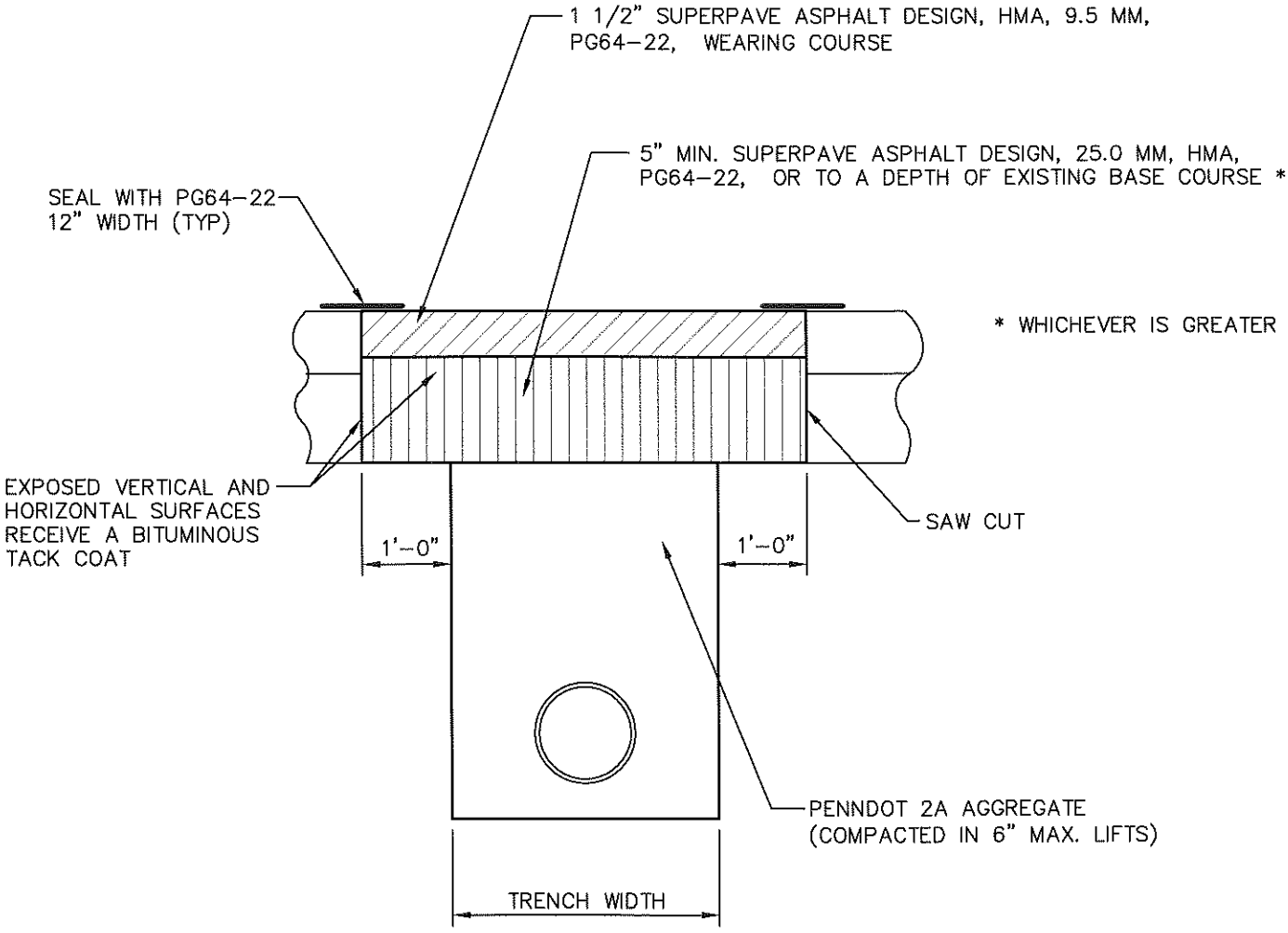

FLEXIBLE PAVEMENT PERMANENT TRENCH RESTORATION

NO SCALE

NOTE:
THE ESAL AND SRL VALUE SHALL BE DETERMINED BY THE TRAFFIC INFORMATION FOR EACH STREET AND APPROVED BY THE BOROUGH.

BOROUGH OF WYOMISSING

STANDARD DETAIL

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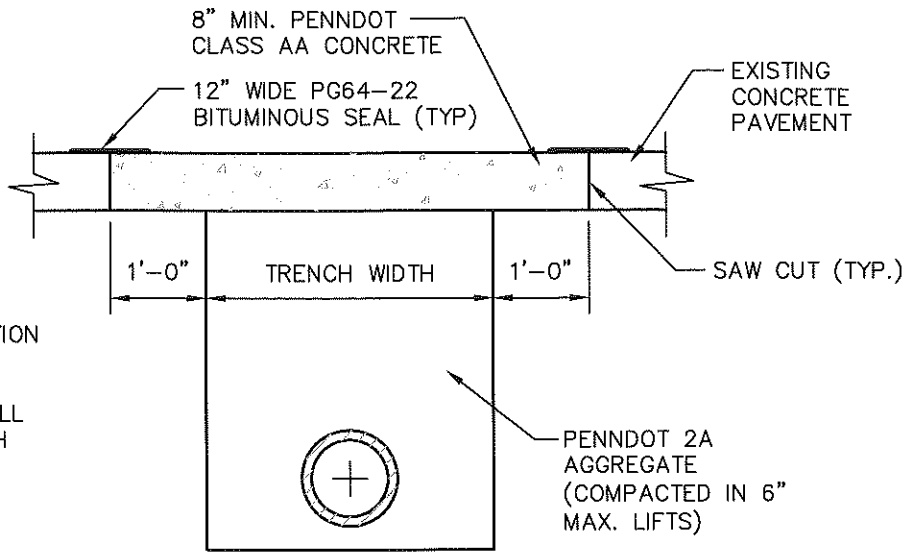
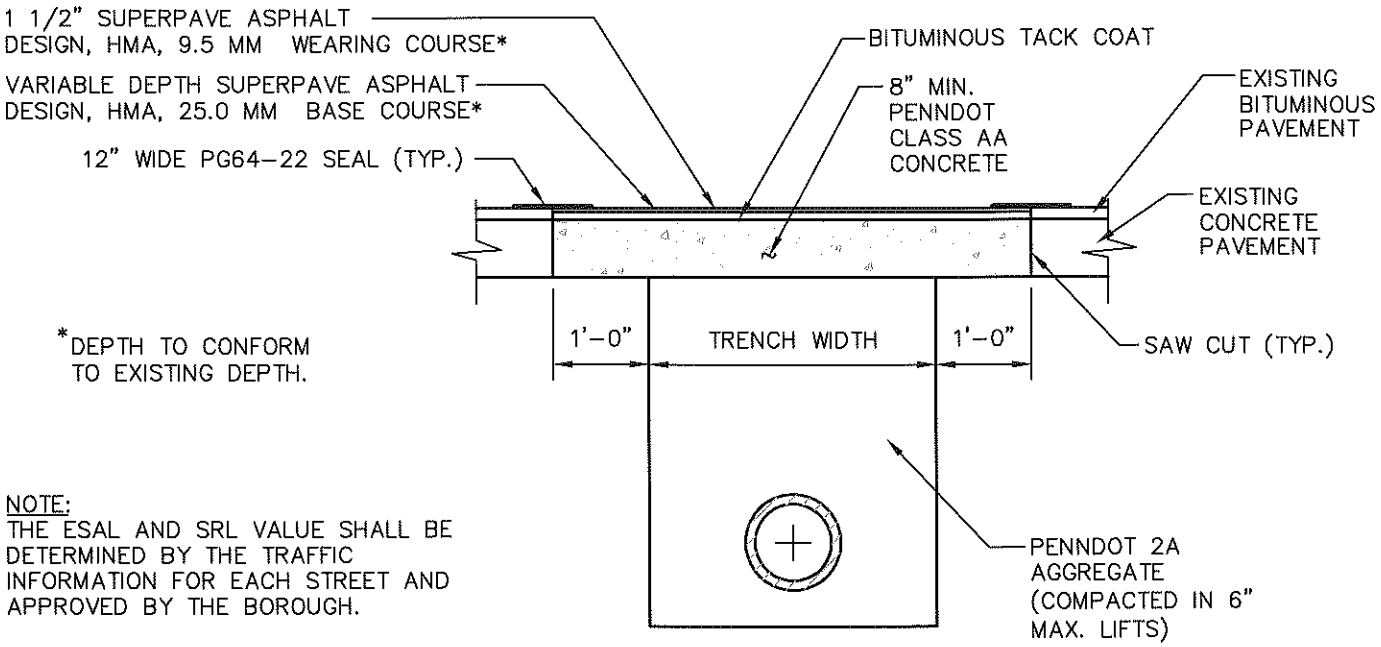
11/13

NOTES:

1. IF THE TRENCH EXCAVATION EXCEEDS 4' IN WIDTH, REINFORCE CONCRETE BASE WITH #6 REINFORCING BARS AT 6" CENTERS WITH 2" CLEAR ON EACH END AND 3" CLEAR AT BOTTOM.
2. REINFORCING STEEL AND TIE BOLTS SHALL BE PLACED IN ACCORDANCE WITH PennDOT ROADWAY CONSTRUCTION STANDARD RC-26.
3. SURFACE TEXTURE AND CURING SHALL BE COMPLETED IN ACCORDANCE WITH PennDOT PUB. 408, SECTION 501.3.



PLAIN OR REINFORCED CEMENT CONCRETE PAVEMENT



*DEPTH TO CONFORM TO EXISTING DEPTH.

NOTE:
THE ESAL AND SRL VALUE SHALL BE DETERMINED BY THE TRAFFIC INFORMATION FOR EACH STREET AND APPROVED BY THE BOROUGH.

PLAIN OR REINFORCED CEMENT CONCRETE PAVEMENT WITH BITUMINOUS OVERLAY

MUNICIPAL STREET PERMANENT RIGID PAVEMENT RESTORATION

BOROUGH OF WYOMISSING

STANDARD DETAIL

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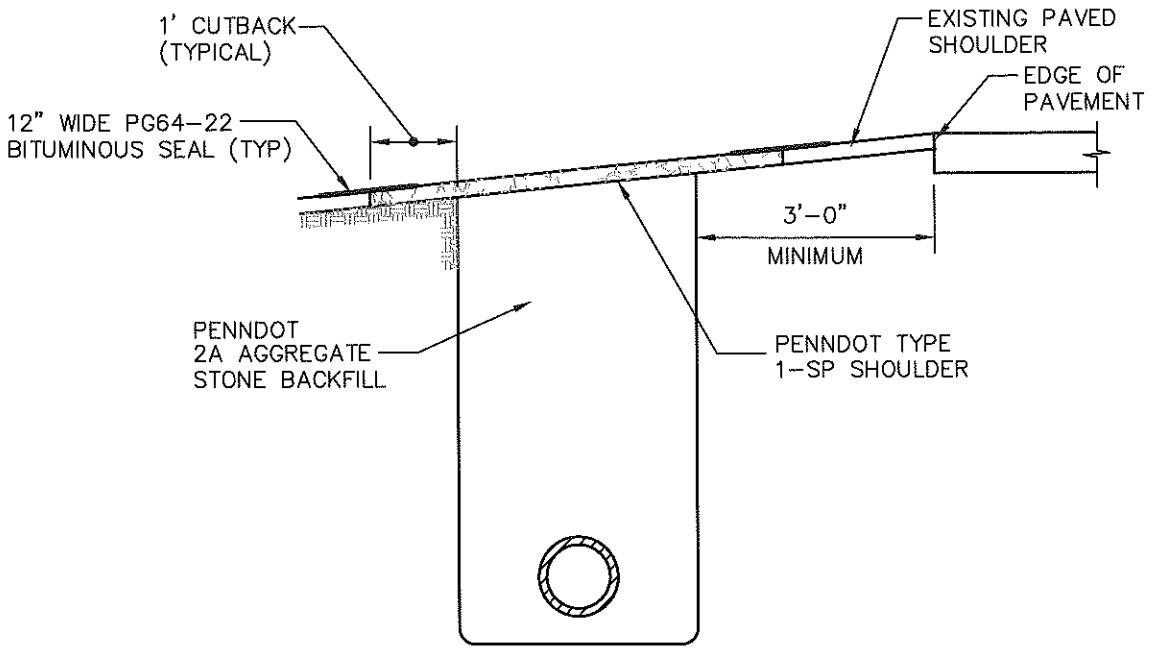
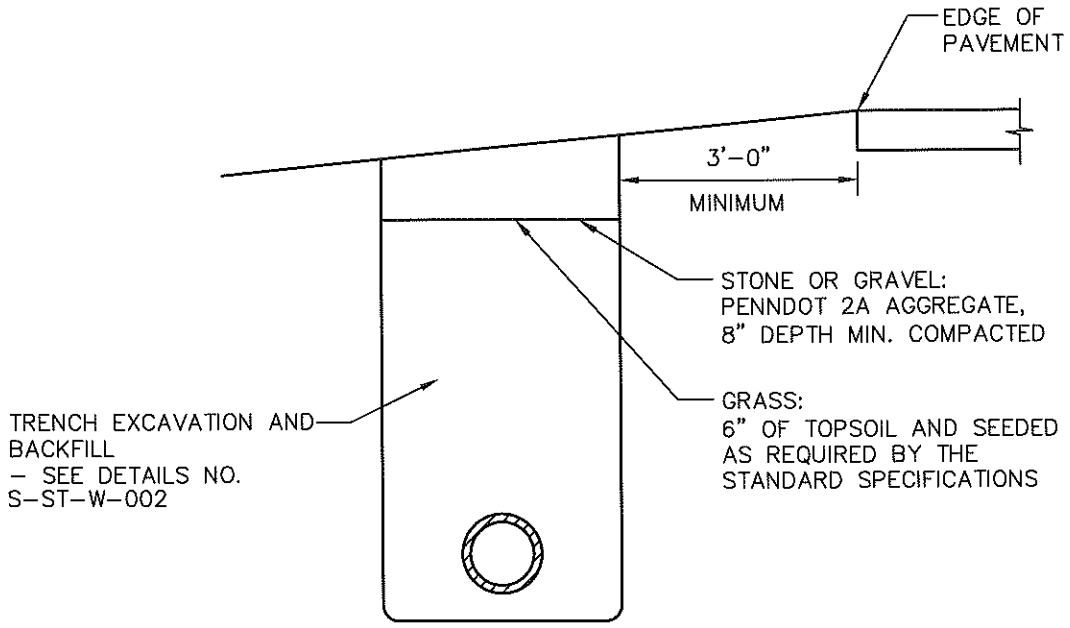


PAVED SHOULDER



UNPAVED SHOULDER

MUNICIPAL STREET
PERMANENT SHOULDER RESTORATION

BOROUGH OF WYOMISSING

STANDARD DETAIL

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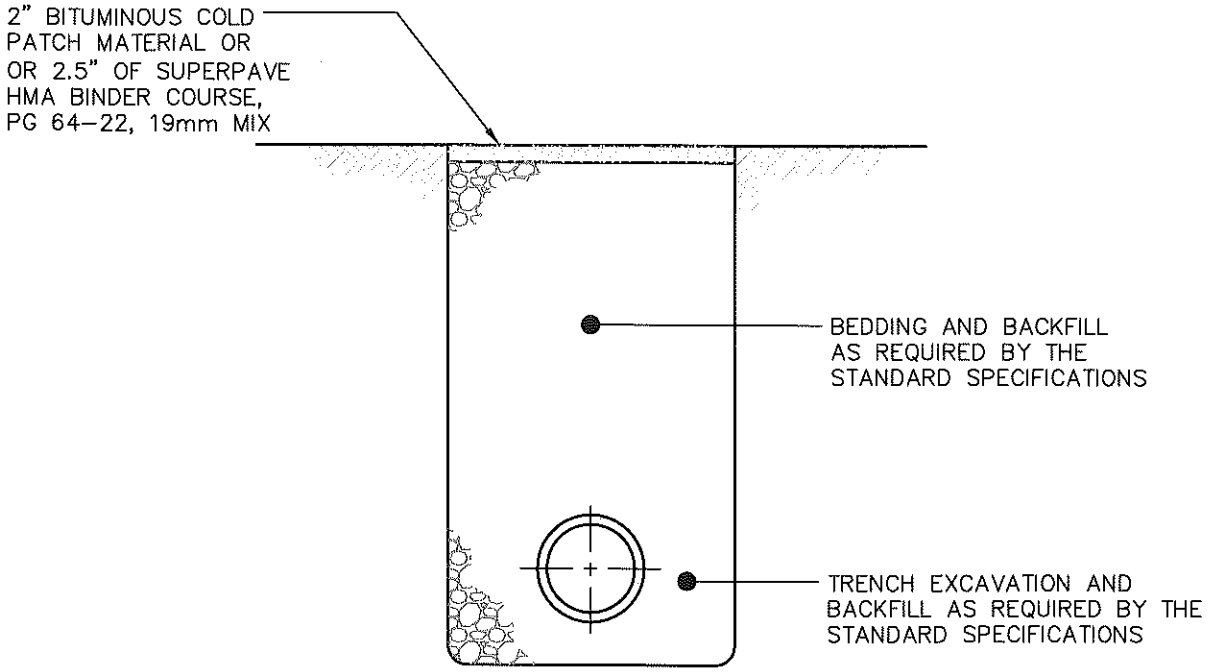


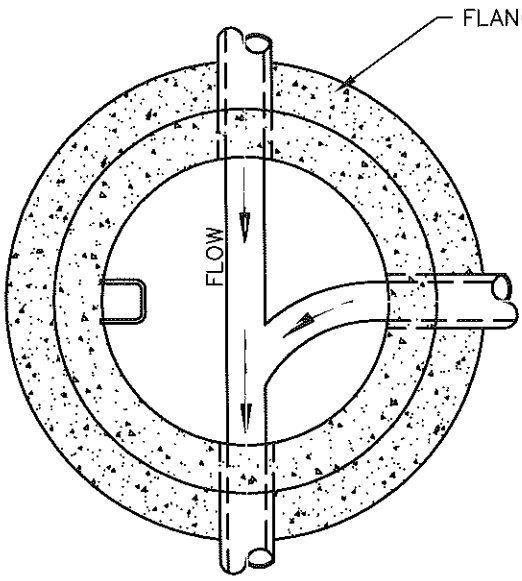
NOTE:
THE ESAL AND SRL VALUE SHALL BE DETERMINED BY THE TRAFFIC INFORMATION FOR EACH STREET AND APPROVED BY THE BOROUGH.

TEMPORARY STREET RESTORATION

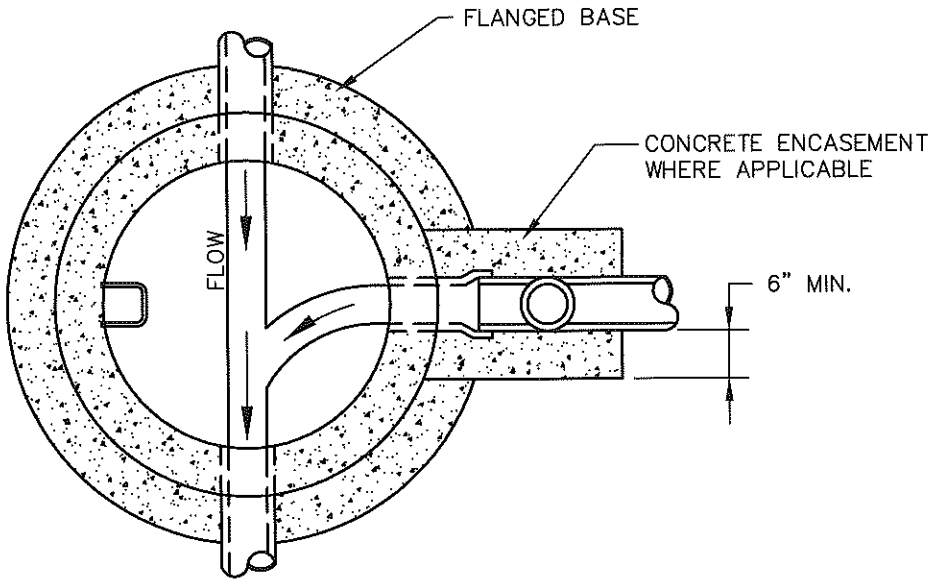
SCALE: NONE

BOROUGH OF WYOMISSING

STANDARD DETAIL



STANDARD MANHOLE



DROP MANHOLE

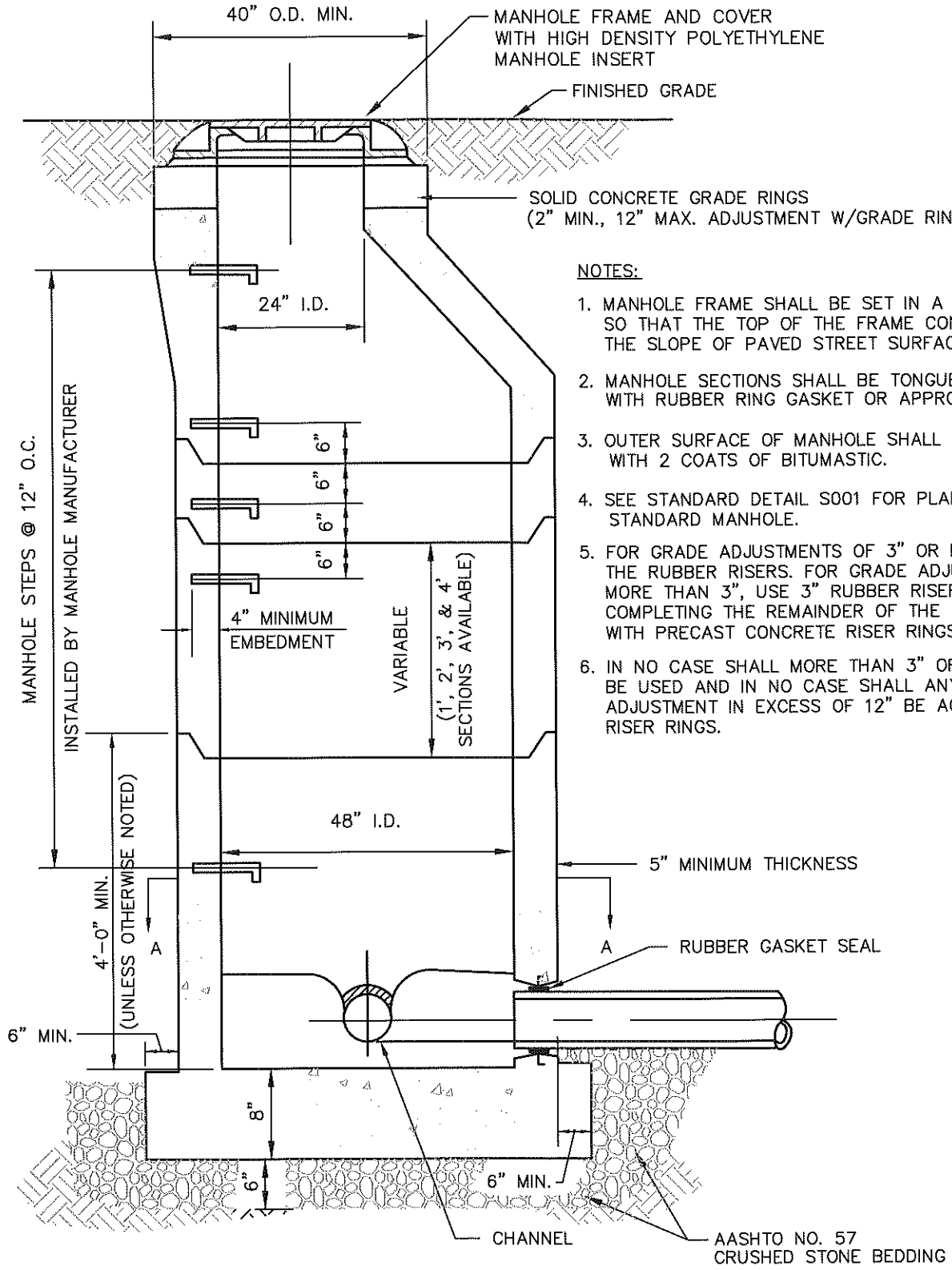
STANDARD AND DROP MANHOLE SECTIONAL PLANS

NO SCALE

NOTE: MANHOLE INVERTS OR CHANNELS TO BE FORMED IN BASE. CHANGES IN SIZE, GRADE, AND DIRECTION TO BE MADE SMOOTHLY AND EVENLY WITH AS LARGE A RADIUS AS POSSIBLE.

BOROUGH OF WYOMISSING

STANDARD DETAIL



NOTES:

1. MANHOLE FRAME SHALL BE SET IN A BED OF MORTAR SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED STREET SURFACES.
2. MANHOLE SECTIONS SHALL BE TONGUE AND GROOVE WITH RUBBER RING GASKET OR APPROVED EQUAL.
3. OUTER SURFACE OF MANHOLE SHALL BE COATED WITH 2 COATS OF BITUMASTIC.
4. SEE STANDARD DETAIL S001 FOR PLAN VIEW OF STANDARD MANHOLE.
5. FOR GRADE ADJUSTMENTS OF 3" OR LESS USE ONLY THE RUBBER RISERS. FOR GRADE ADJUSTMENTS OF MORE THAN 3", USE 3" RUBBER RISER RING, COMPLETING THE REMAINDER OF THE ADJUSTMENT WITH PRECAST CONCRETE RISER RINGS.
6. IN NO CASE SHALL MORE THAN 3" OF RUBBER RISER BE USED AND IN NO CASE SHALL ANY GRADE ADJUSTMENT IN EXCESS OF 12" BE ACHIEVED WITH RISER RINGS.

STANDARD MANHOLE SECTION DETAIL

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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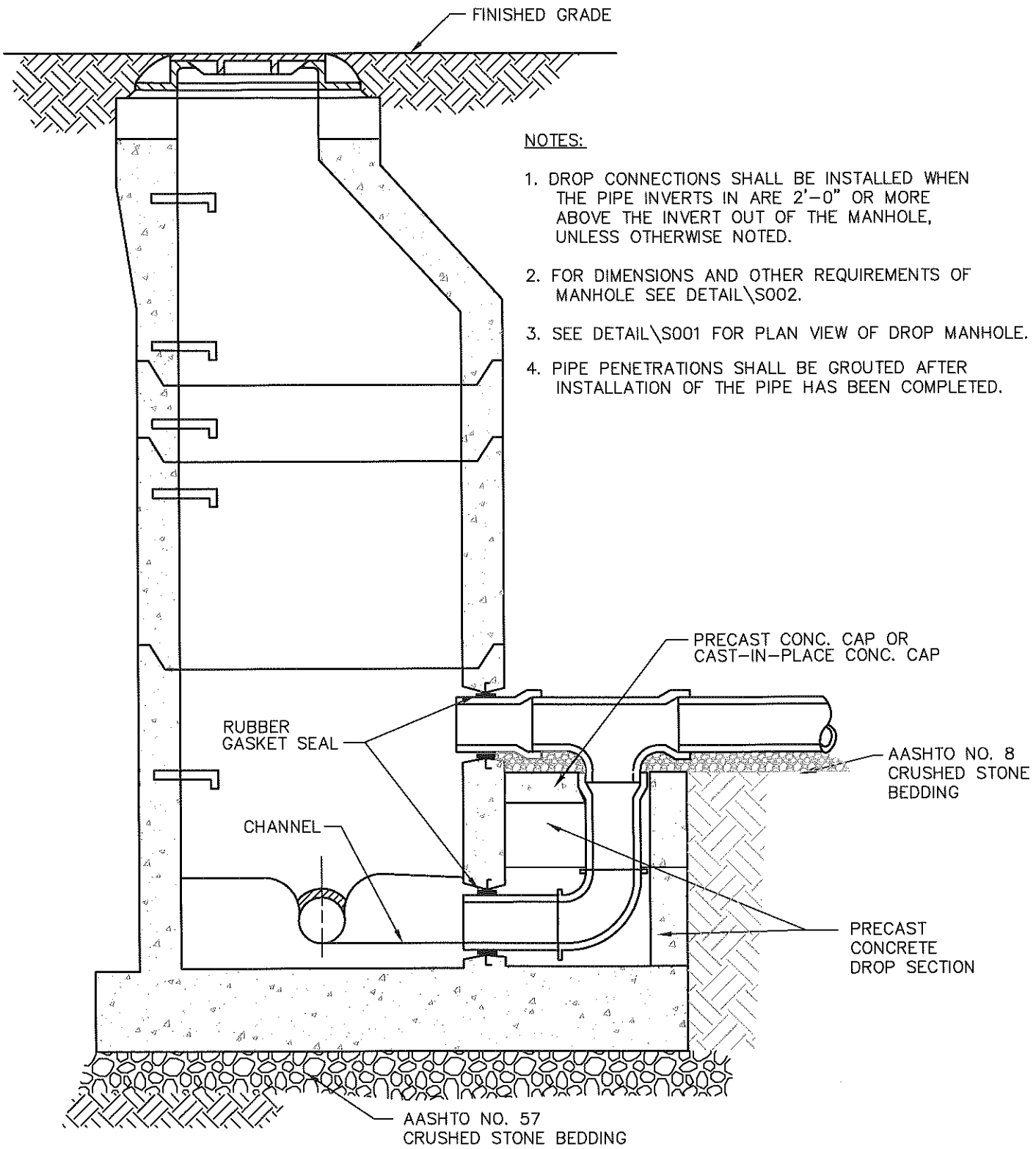

NOTES:

1. DROP CONNECTIONS SHALL BE INSTALLED WHEN THE PIPE INVERTS IN ARE 2'-0" OR MORE ABOVE THE INVERT OUT OF THE MANHOLE, UNLESS OTHERWISE NOTED.
2. FOR DIMENSIONS AND OTHER REQUIREMENTS OF MANHOLE SEE DETAIL\S002.
3. SEE DETAIL\S001 FOR PLAN VIEW OF DROP MANHOLE.
4. PIPE PENETRATIONS SHALL BE GROUTED AFTER INSTALLATION OF THE PIPE HAS BEEN COMPLETED.

DROP MANHOLE SECTION DETAIL

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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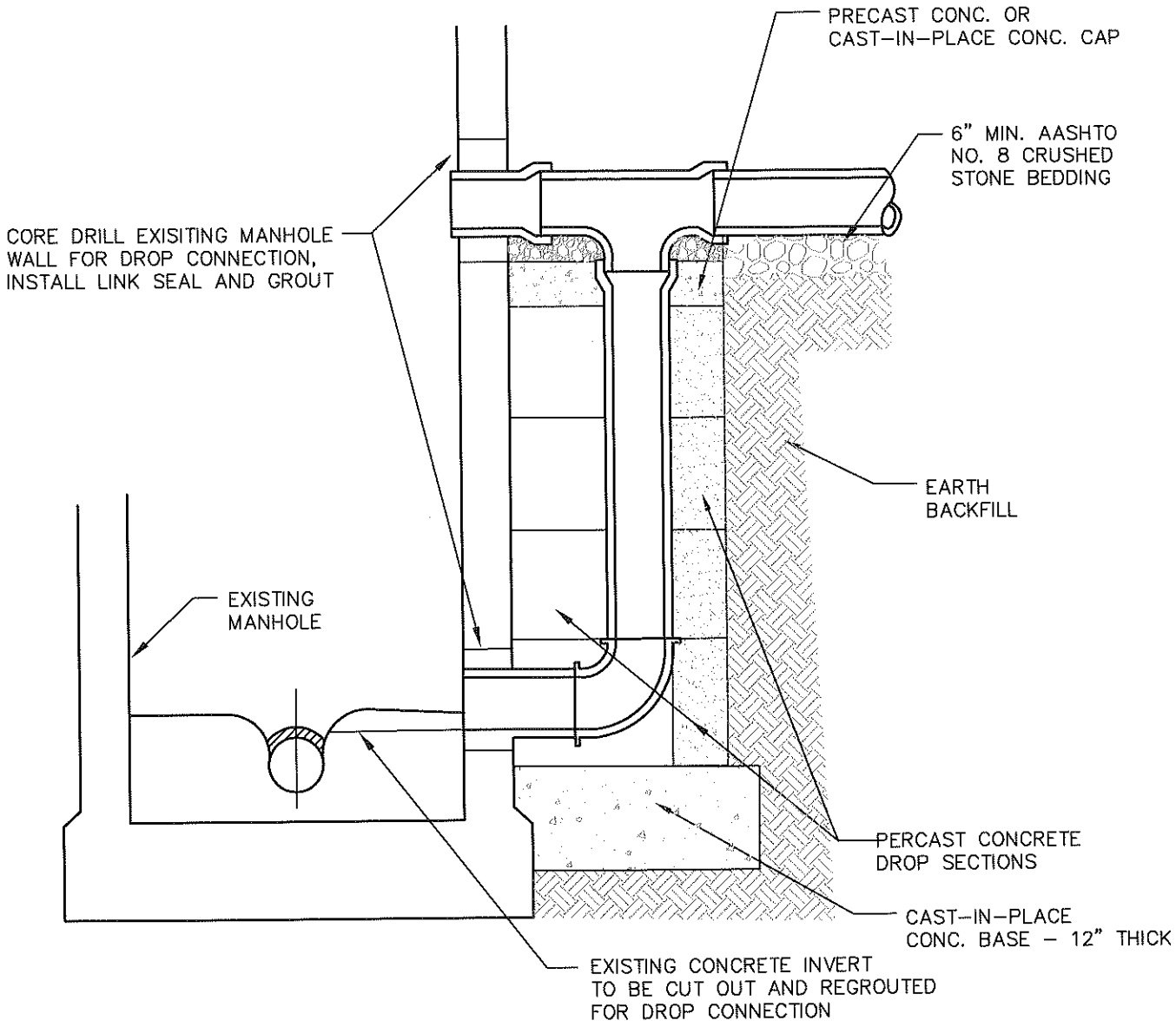

DROP CONNECTION TO EXISTING MANHOLE

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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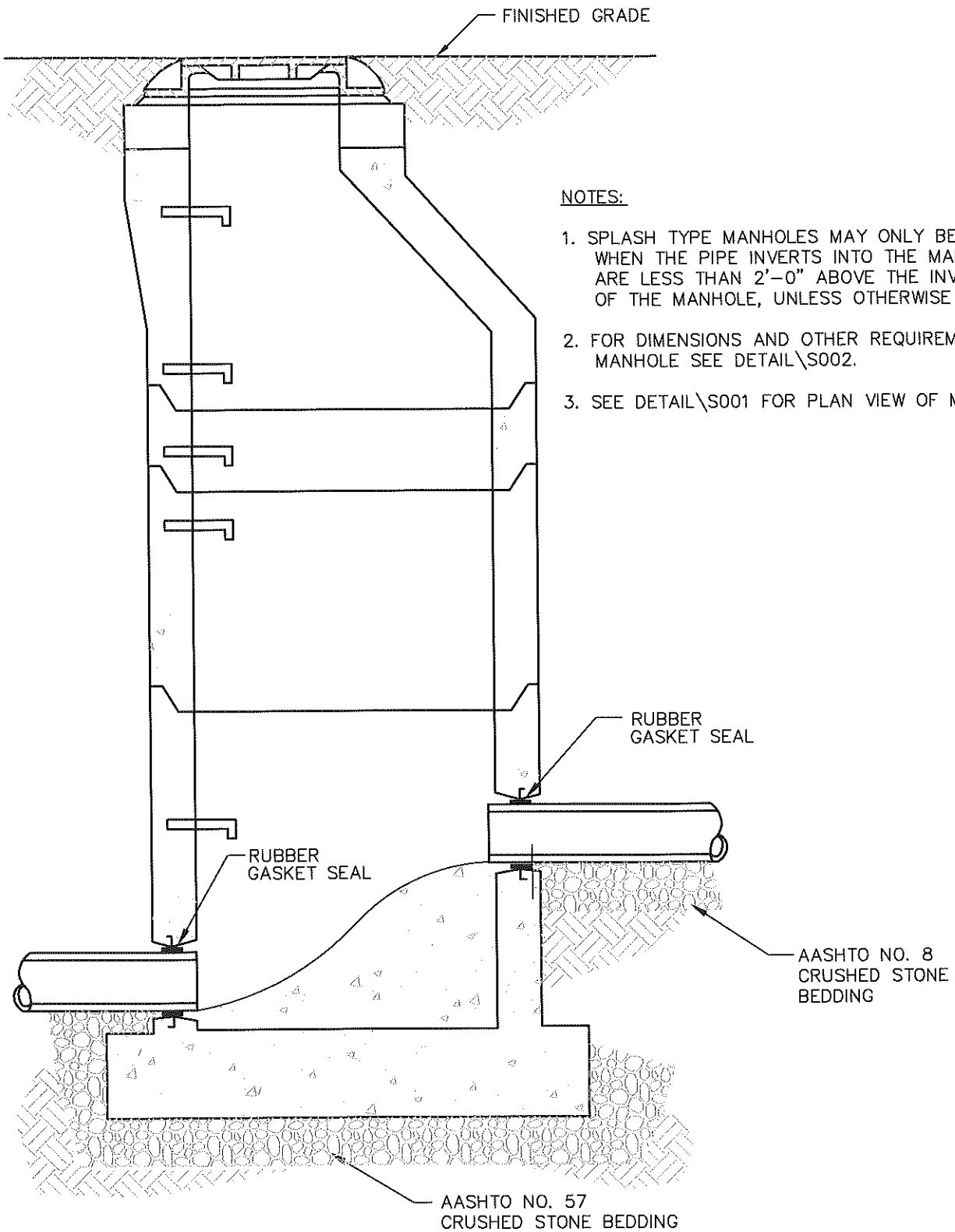

NOTES:

1. SPLASH TYPE MANHOLES MAY ONLY BE USED WHEN THE PIPE INVERTS INTO THE MANHOLE ARE LESS THAN 2'-0" ABOVE THE INVERT OUT OF THE MANHOLE, UNLESS OTHERWISE NOTED.
2. FOR DIMENSIONS AND OTHER REQUIREMENTS OF MANHOLE SEE DETAIL\S002.
3. SEE DETAIL\S001 FOR PLAN VIEW OF MANHOLE.

SPLASH TYPE MANHOLE SECTION DETAIL

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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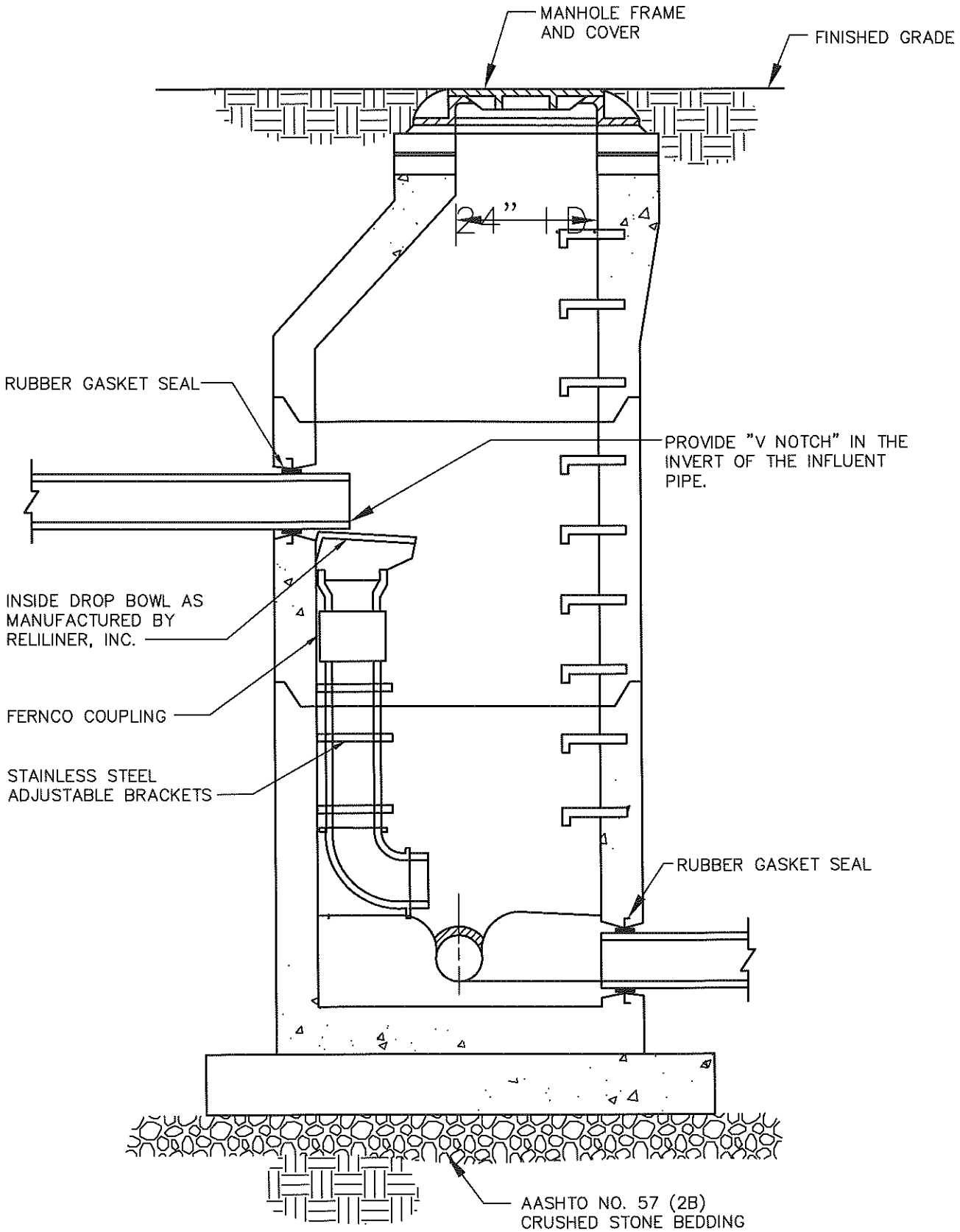

INSIDE DROP MANHOLE SECTION DETAIL

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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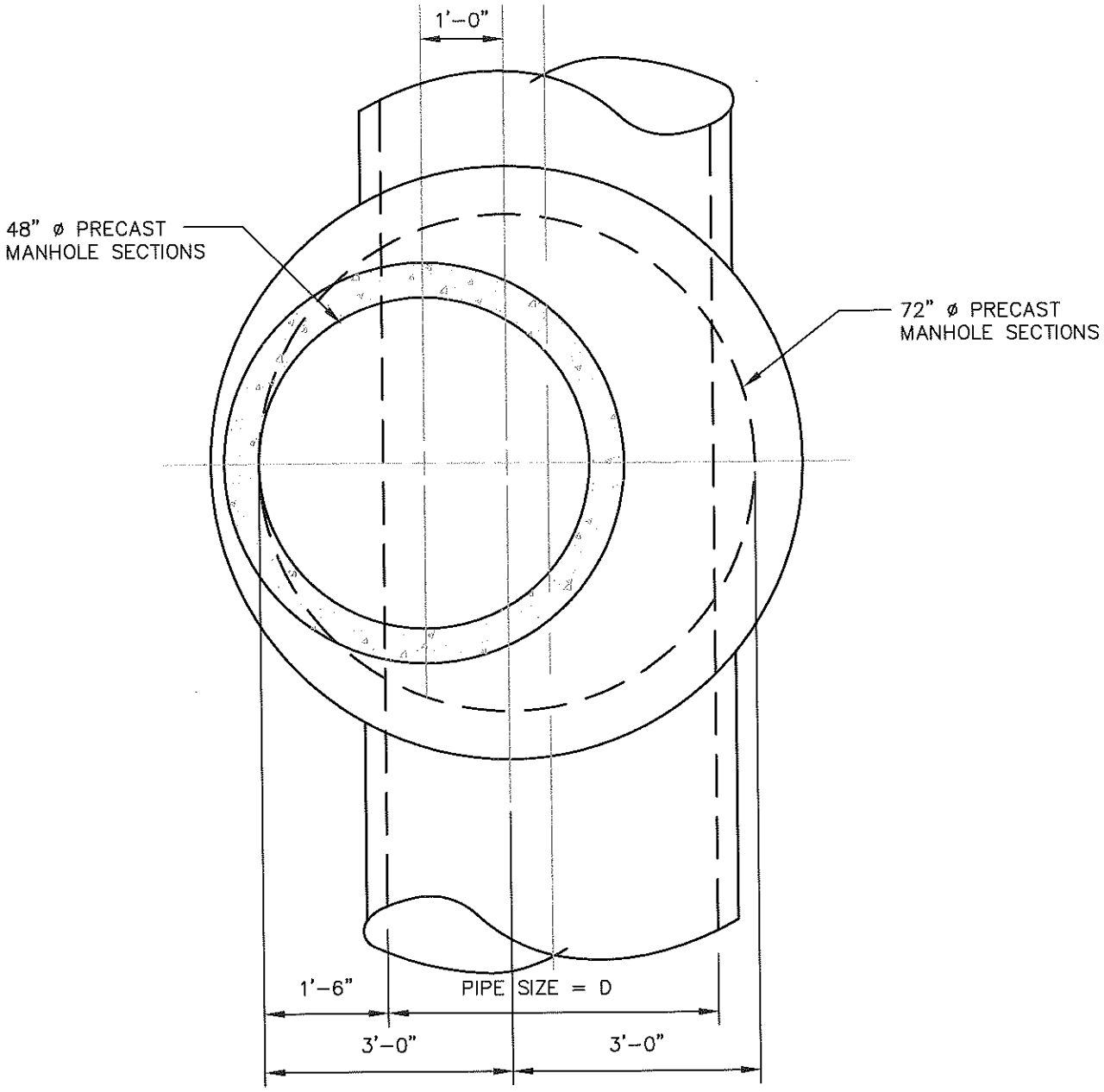

MANHOLE FOR 27" TO 48" ø PIPES – PLAN VIEW

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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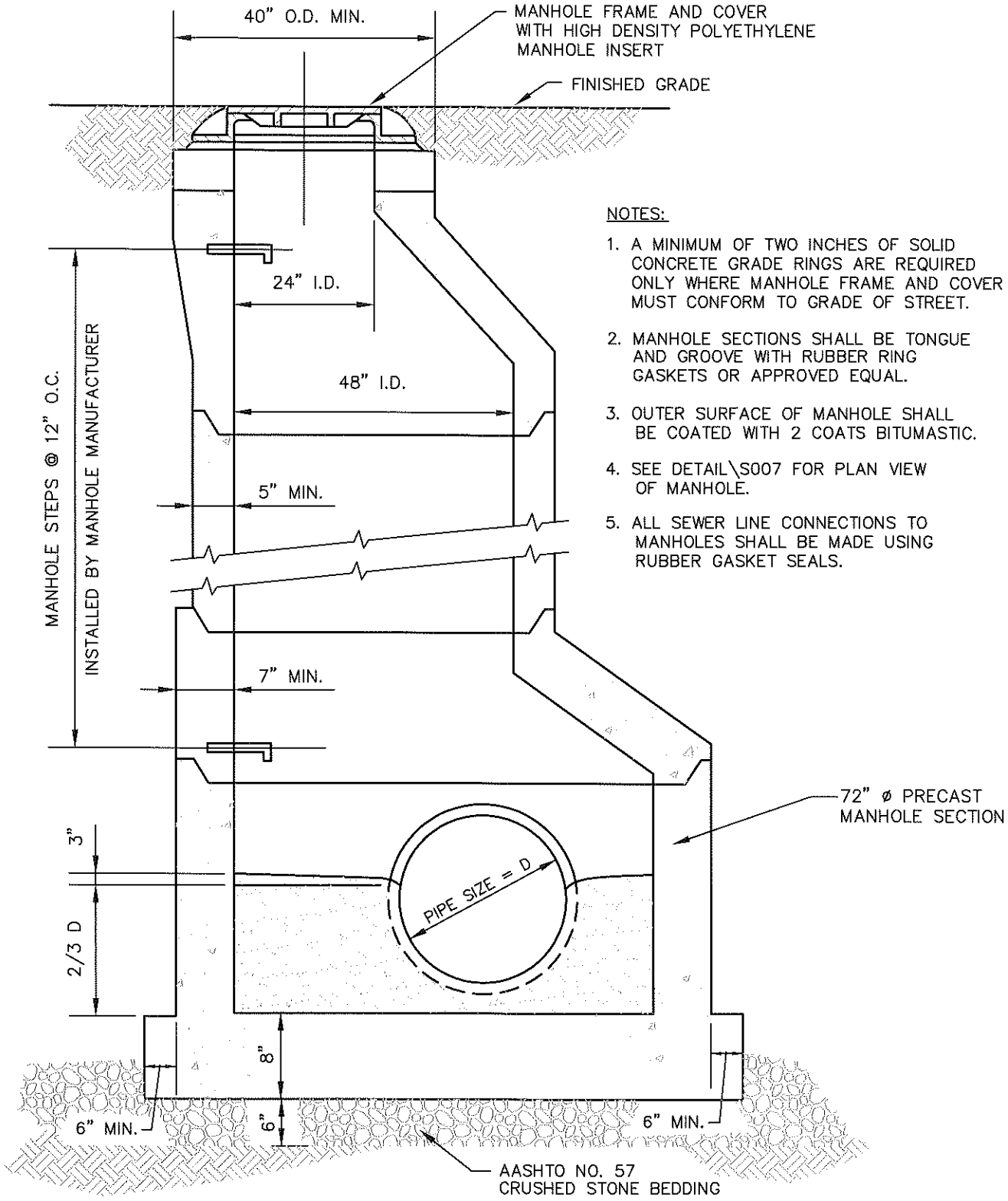


NOTES:

1. A MINIMUM OF TWO INCHES OF SOLID CONCRETE GRADE RINGS ARE REQUIRED ONLY WHERE MANHOLE FRAME AND COVER MUST CONFORM TO GRADE OF STREET.
2. MANHOLE SECTIONS SHALL BE TONGUE AND GROOVE WITH RUBBER RING GASKETS OR APPROVED EQUAL.
3. OUTER SURFACE OF MANHOLE SHALL BE COATED WITH 2 COATS BITUMASTIC.
4. SEE DETAIL\S007 FOR PLAN VIEW OF MANHOLE.
5. ALL SEWER LINE CONNECTIONS TO MANHOLES SHALL BE MADE USING RUBBER GASKET SEALS.

MANHOLE FOR 27" TO 48" ø PIPES – SECTION VIEW

NO SCALE

BOROUGH OF WYOMISSING

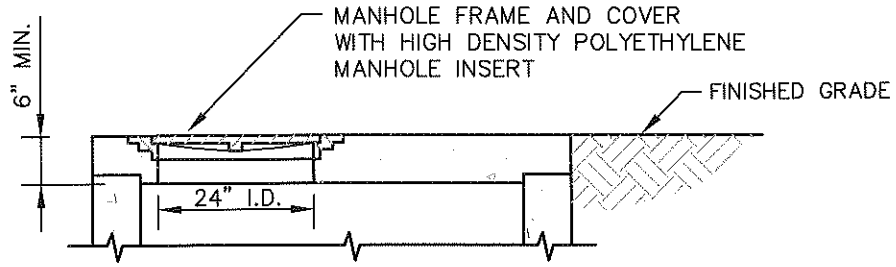
STANDARD DETAIL

P:\DETAILS\WYOMISSING\SANITARY\S008.dwg

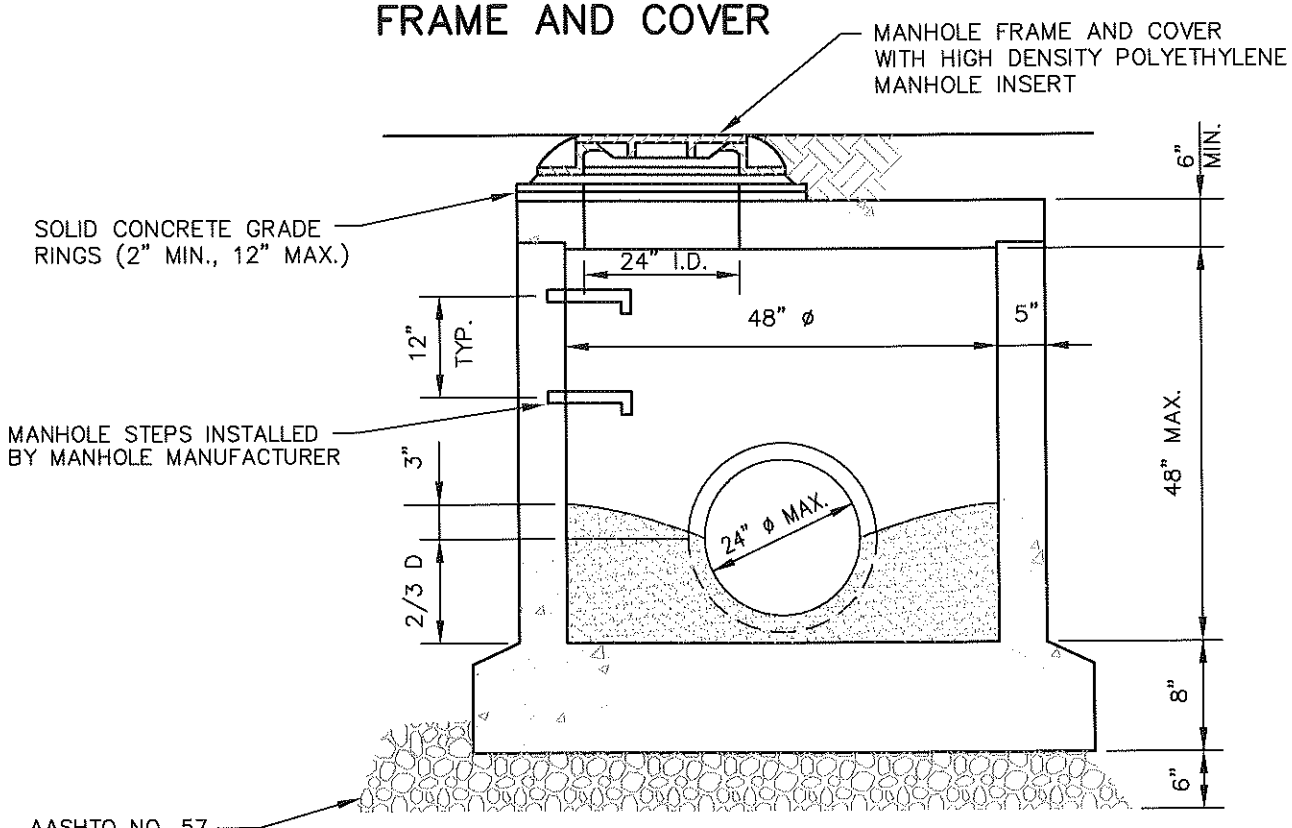
11/13

NOTES:

1. MANHOLE FRAME SHALL BE SET IN A BED OF MORTAR SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED STREET SURFACES.
2. MANHOLE SECTIONS SHALL BE TONGUE AND GROOVE WITH RUBBER RING GASKETS OR APPROVED EQUAL.
3. THE ENTIRE OUTER SURFACE OF THE MANHOLE SHALL BE COATED WITH 2 COATS OF BITUMASTIC.
4. ALL SEWER LINE CONNECTIONS TO MANHOLES SHALL BE MADE USING RUBBER GASKET SEALS.



MANHOLE WITH FLUSH FRAME AND COVER



MANHOLE WITH STANDARD FRAME AND COVER

48" ø SHALLOW MANHOLE

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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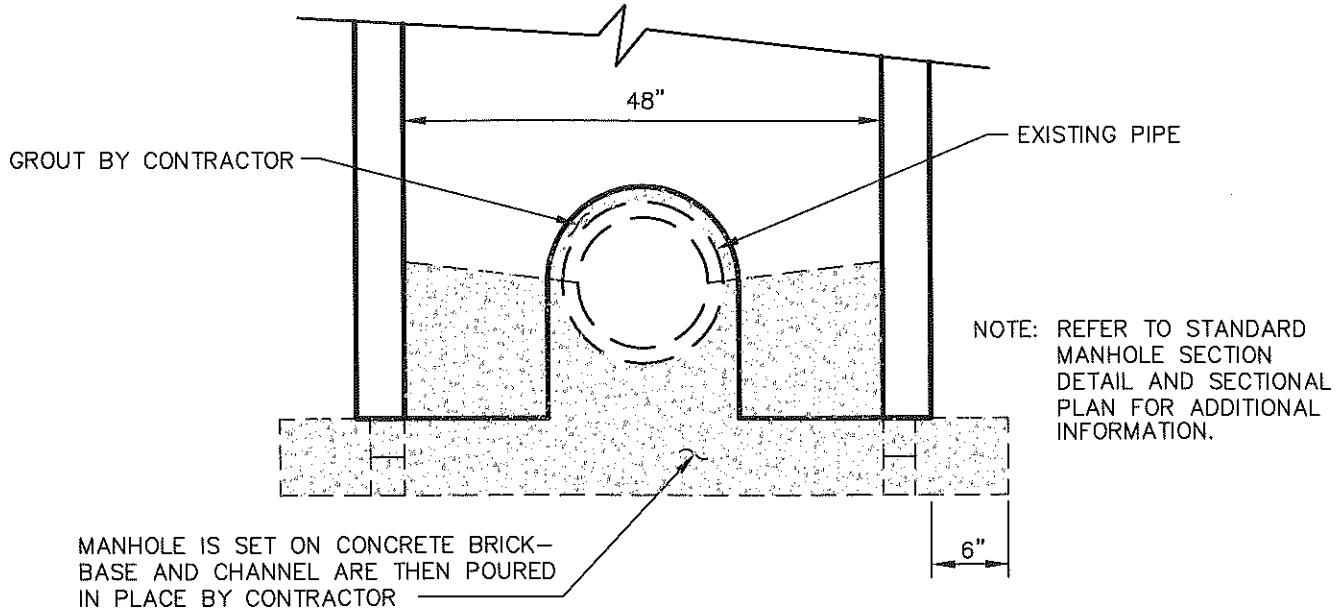
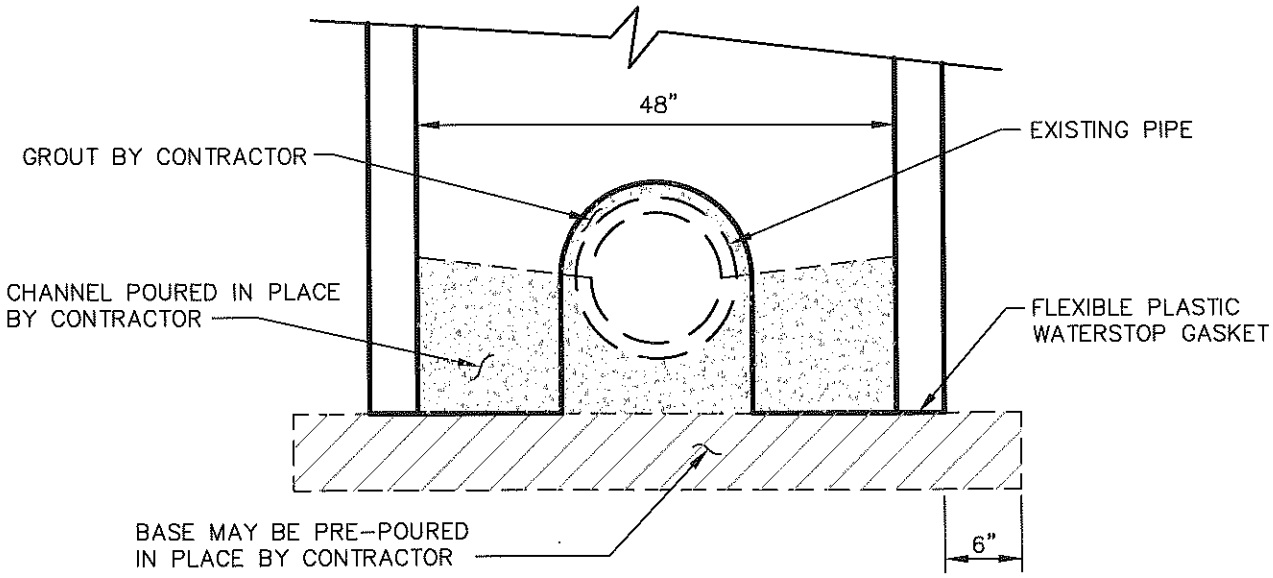


CONSTRUCTION METHOD #1

ALL MANHOLES SHALL MEET THE REQUIREMENTS OF ASTM C478



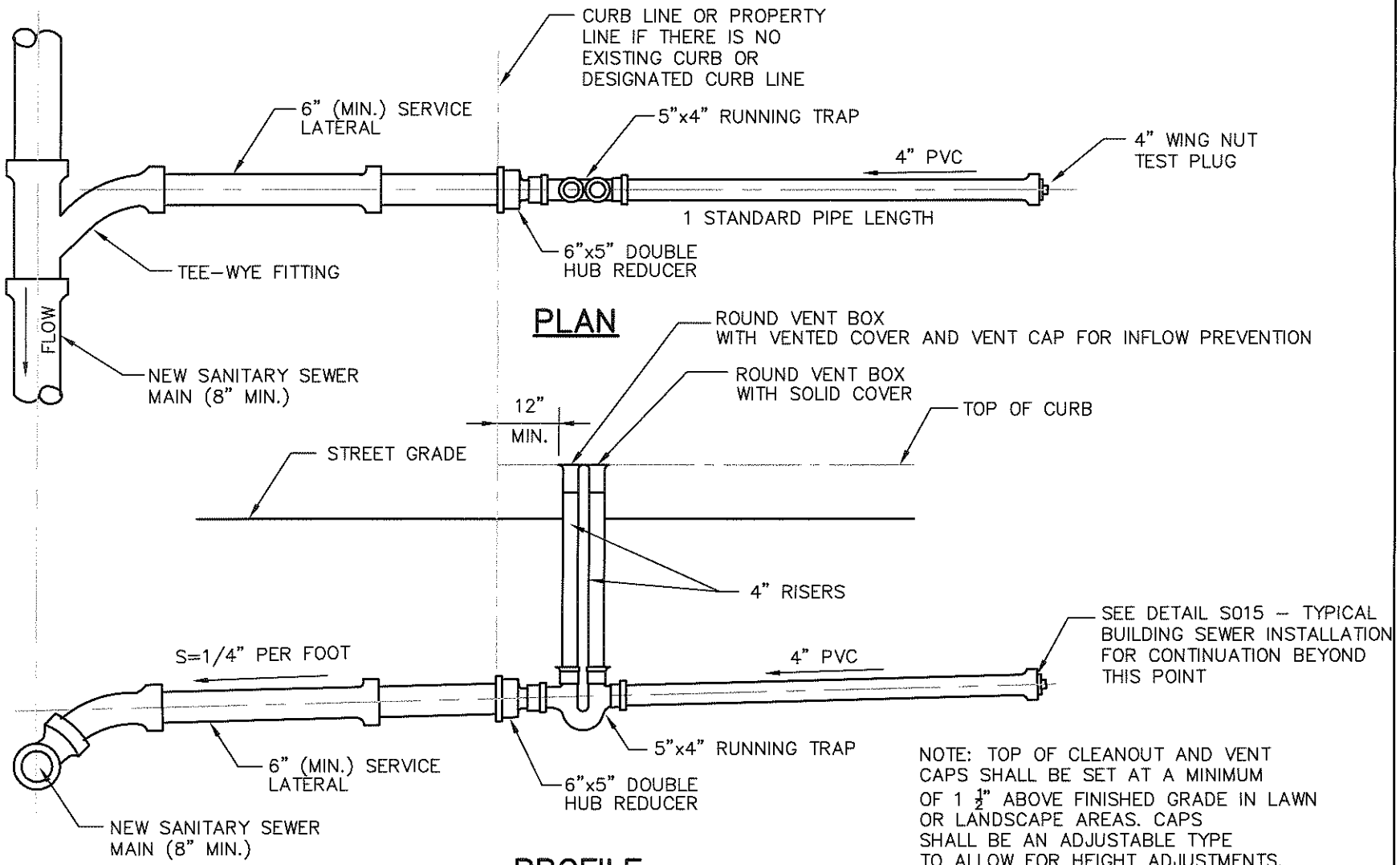
CONSTRUCTION METHOD #2

ALL MANHOLES SHALL MEET THE REQUIREMENTS OF ASTM C478

PRECAST MANHOLE DOGHOUSE OPENINGS

BOROUGH OF WYOMISSING

STANDARD DETAIL



NOTE: TOP OF CLEANOUT AND VENT CAPS SHALL BE SET AT A MINIMUM OF 1 $\frac{1}{2}$" ABOVE FINISHED GRADE IN LAWN OR LANDSCAPE AREAS. CAPS SHALL BE AN ADJUSTABLE TYPE TO ALLOW FOR HEIGHT ADJUSTMENTS. CLEANOUT AND VENT CAPS SHALL NOT BE INSTALLED IN DRIVEWAY OR OTHER PAVED AREAS UNLESS EXPRESSLY APPROVED BY THE BOROUGH IN WRITING.

TYPICAL SERVICE LATERAL WITH TRAP

(NEW CONSTRUCTION)

NOTE: RUNNING TRAP, VENT, AND CLEANOUT RISERS SHALL BE CAST IRON. PVC MATERIAL IS NOT ACCEPTABLE.

BOROUGH OF WYOMISSING

STANDARD DETAIL

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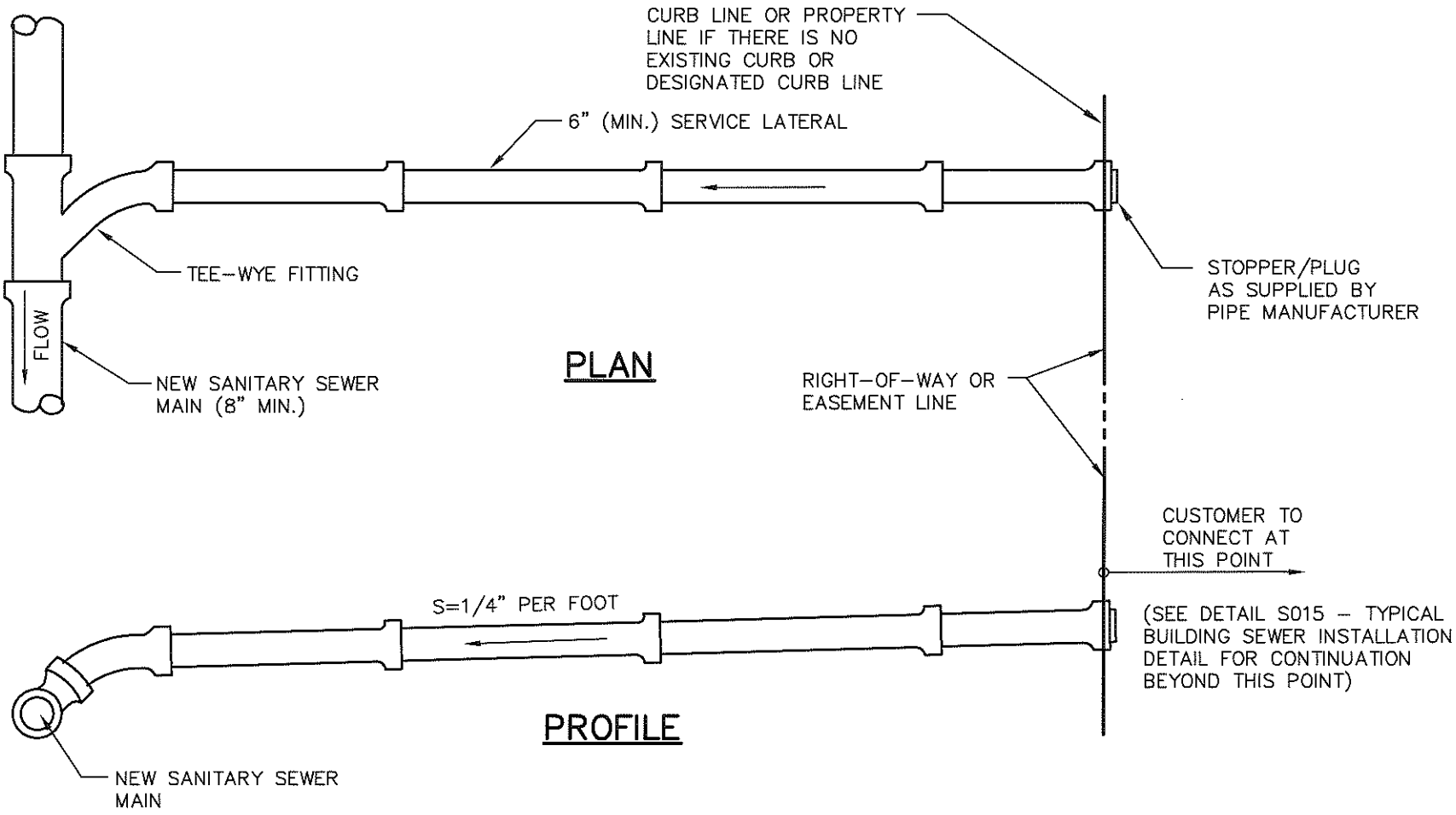

TYPICAL SERVICE LATERAL WITHOUT TRAP

(NEW CONSTRUCTION)

THE STANDARD SERVICE LATERAL CONSTRUCTION SHALL BE AS SHOWN ON DETAIL\S012. THE INSTALLATION OF A SERVICE LATERAL WITHOUT A RUNNING TRAP SHALL ONLY BE ALLOWED AFTER PRIOR APPROVAL, IN WRITING, BY THE BOROUGH.

BOROUGH OF WYOMISSING

STANDARD DETAIL

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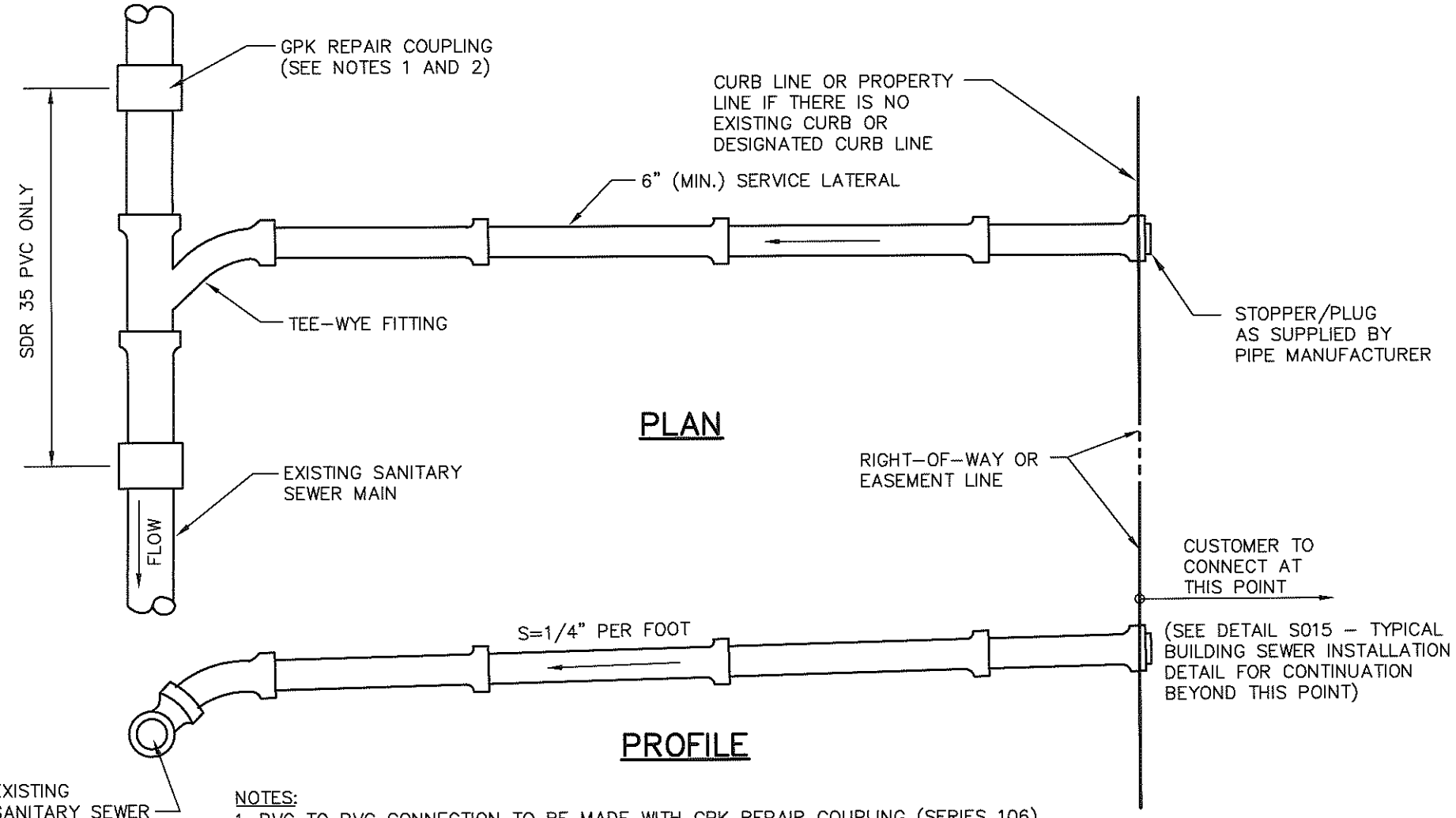

NOTES:

1. PVC TO PVC CONNECTION TO BE MADE WITH GPK REPAIR COUPLING (SERIES 106) OR EQUAL.
2. ALL OTHER CONNECTIONS TO BE MADE WITH FERNCO COUPLING WITH STAINLESS STEEL STRAPS, STAINLESS STEEL SHEAR RING AND PVC BUSHING WHEN REQUIRED.
3. A MINIMUM OF 10 LINEAL FEET OF NEW PIPE (INCLUDING WYE) TO BE INSTALLED ON-LINE WITH THE EXISTING MAIN.

TYPICAL LATERAL CONNECTION TO EXISTING MAIN

BOROUGH OF WYOMISSING

STANDARD DETAIL 11/13

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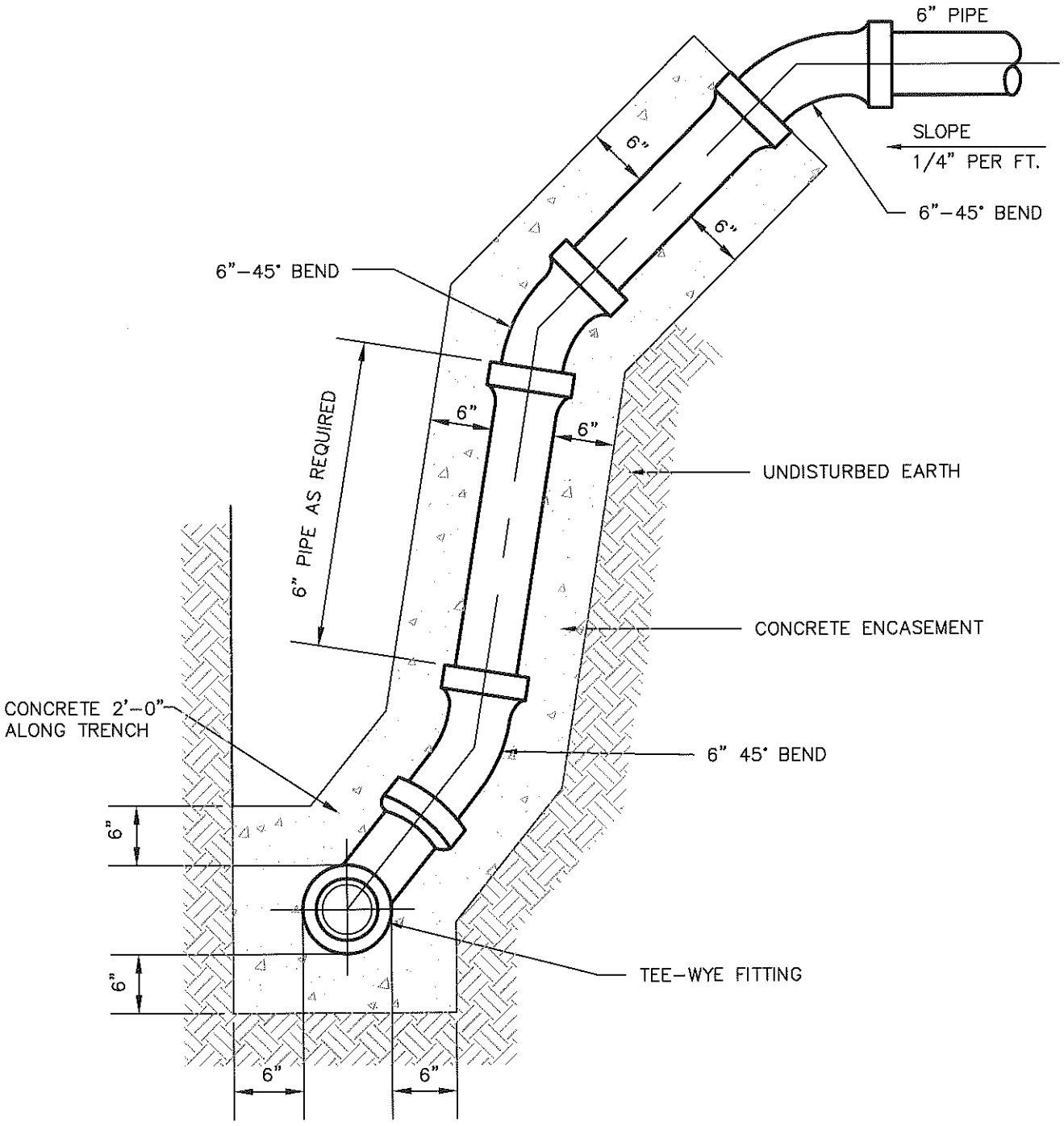

TYPICAL STANDPIPE
SINGLE SERVICE CONNECTION

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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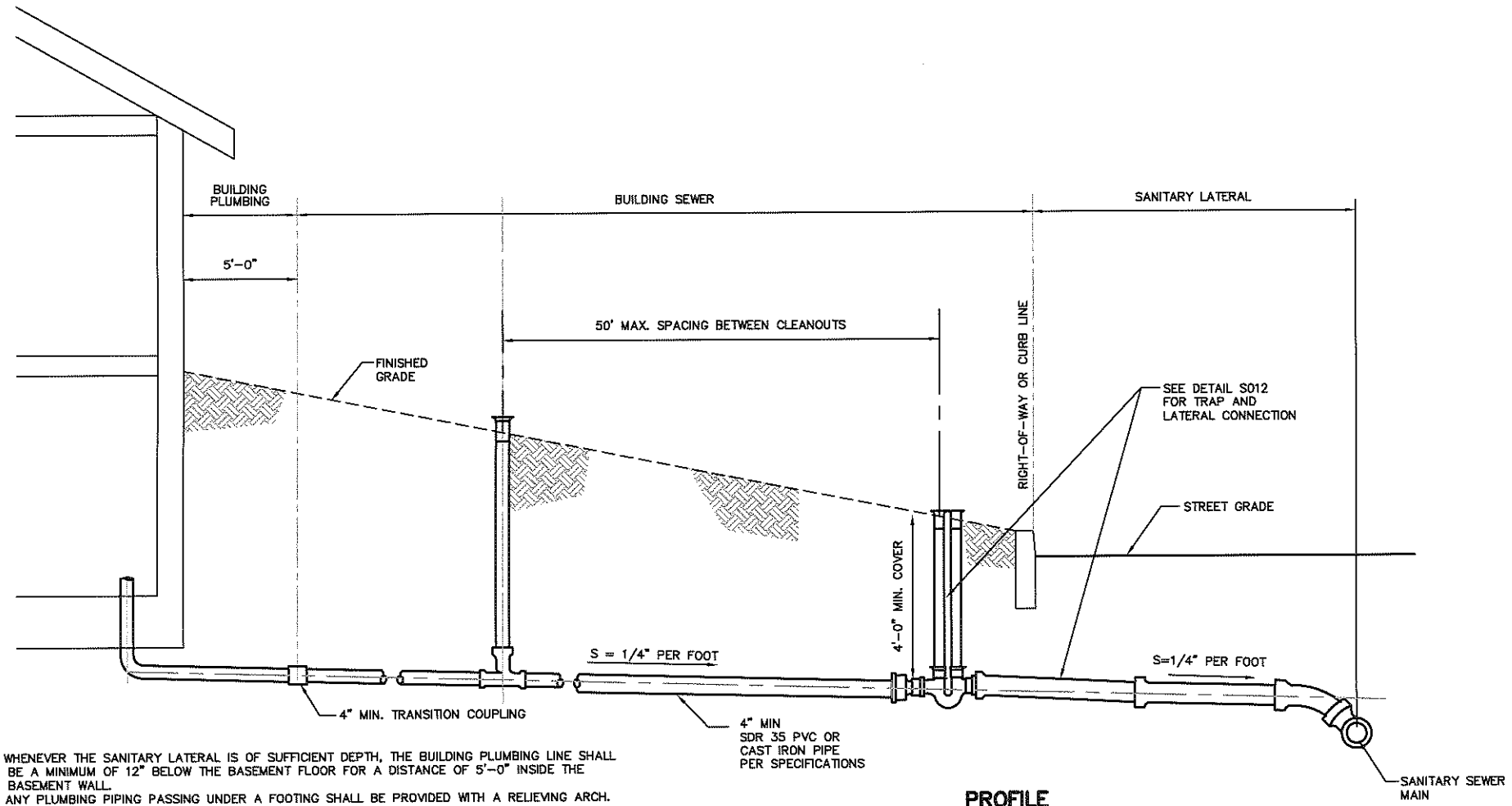
11/13



1. WHENEVER THE SANITARY LATERAL IS OF SUFFICIENT DEPTH, THE BUILDING PLUMBING LINE SHALL BE A MINIMUM OF 12" BELOW THE BASEMENT FLOOR FOR A DISTANCE OF 5'-0" INSIDE THE BASEMENT WALL.
2. ANY PLUMBING PIPING PASSING UNDER A FOOTING SHALL BE PROVIDED WITH A RELIEVING ARCH.
3. WHENEVER A CLEANOUT FALLS UNDER A SIDEWALK AREA OR UNDER ANY SLAB CONSTRUCTED OF A PERMANENT MATERIAL, THE CLEANOUT SHALL BE EXTENDED TO GRADE LEVEL AND FITTED WITH AN ADJUSTABLE BOX WITH A BRASS COVER NOT LESS THAN 1/4" THICK AND HELD IN PLACE WITH 5/16" BRASS SCREWS. THE CLEANOUT SHALL HAVE A SOLID CAP.
4. CLEANOUTS SHALL BE INSTALLED IN THE BUILDING SEWER IN SUCH MANNER, NUMBER AND POSITION AS TO PERMIT CLEANING SUCH LINES IN THEIR ENTIRE LENGTH, BUT IN NO CASE SHALL THERE BE LESS THAN TWO (2) CLEANOUTS IN EACH BUILDING SEWER EXCEEDING 50' IN LENGTH, NOR SHALL THEY BE SPACED MORE THAN 50' APART.

PROFILE

TYPICAL BUILDING SEWER INSTALLATION

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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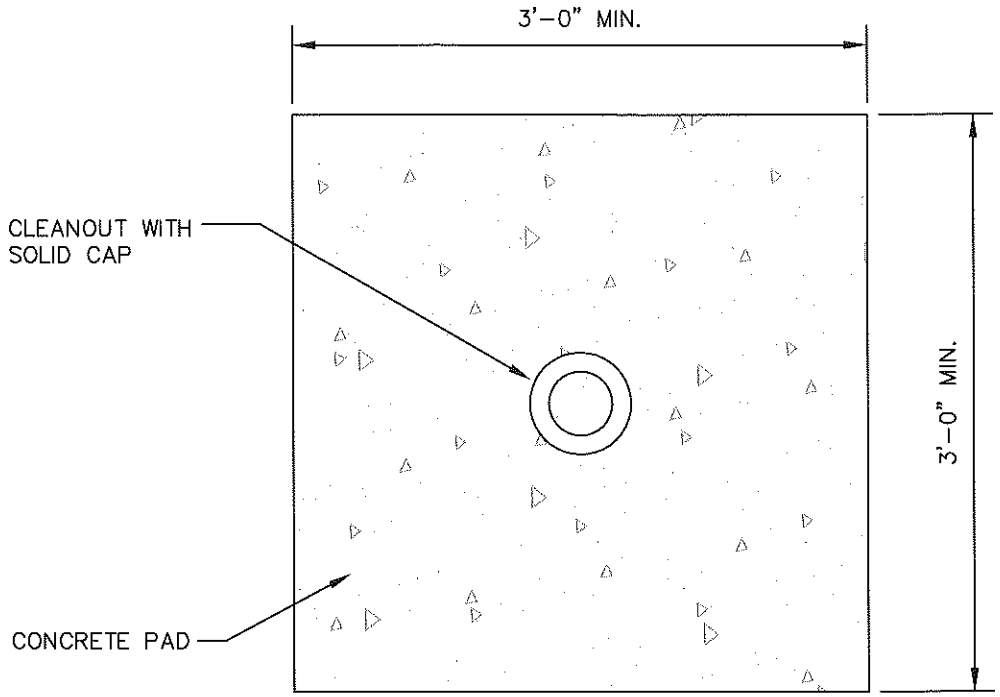
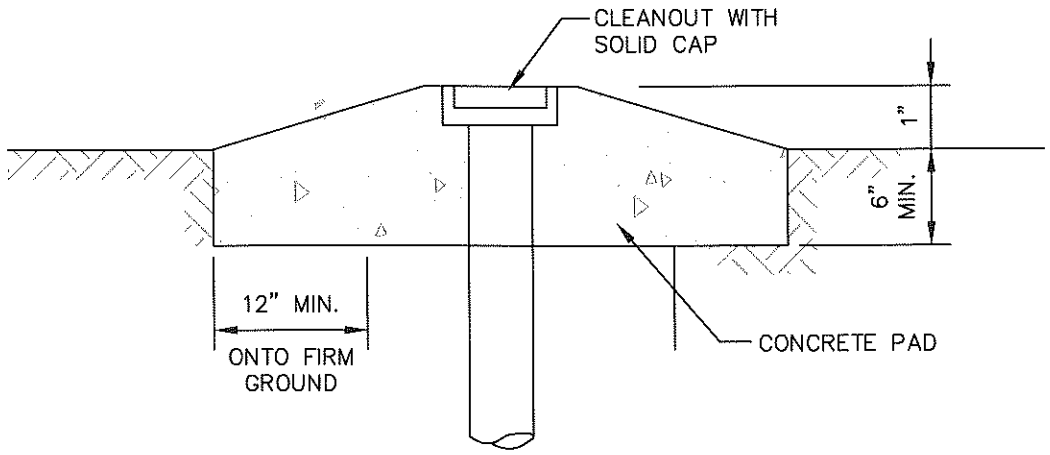


PLAN VIEW



SECTION VIEW

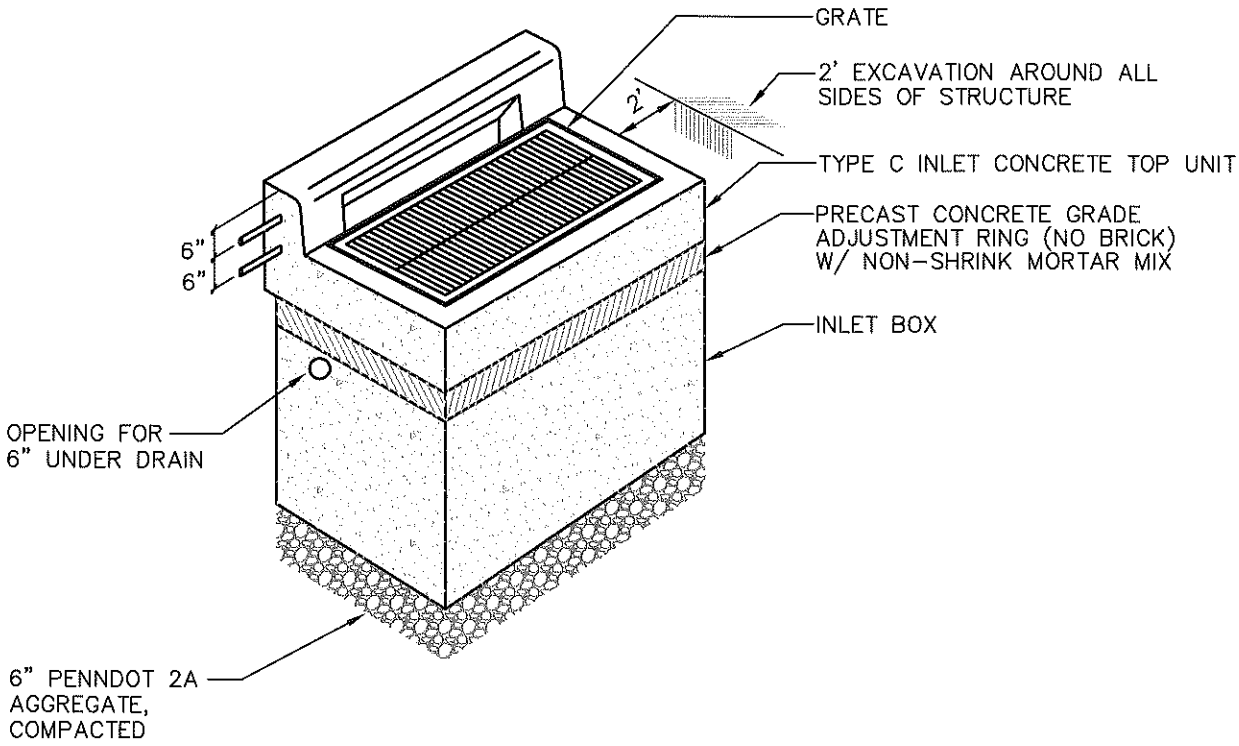
BUILDING SEWER CLEANOUT DETAIL

NO SCALE

NOTES:
1. PROVIDE CONCRETE PAD IF CLEANOUT IS LOCATED IN PAVED AREA.
2. CLEANOUT SHALL BE INSTALLED AS DETAILED ABOVE FINAL GRADE IN PAVED AND LANDSCAPED AREAS. CLEANOUT MAY BE INSTALLED FLUSH WITH SIDEWALK SURFACES ONLY UPON PRIOR APPROVAL OF THE BOROUGH AND ENGINEER.
3. CLEANOUTS SHALL NOT BE LOCATED IN DRAINAGE SWALES.

BOROUGH OF WYOMISSING

STANDARD DETAIL



NOTES:

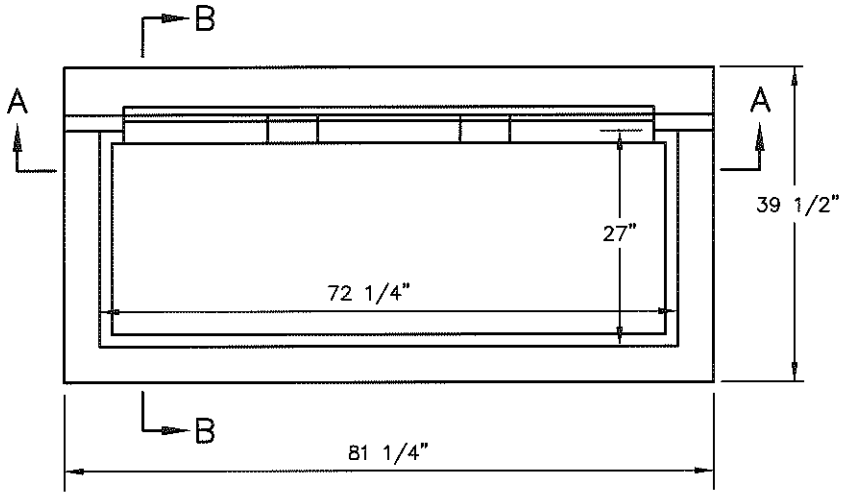
1. CONSTRUCT IN ACCORDANCE WITH REQUIREMENTS OF PENNDOT. PUB. 408, SEC. 605 FOR INLET ASSEMBLIES.
2. GRADE ADJUSTMENT SHALL BE PRECAST CONCRETE CONSTRUCTION. (NO RED BRICK OR MASONRY BRICK)

PRE-CAST STORM INLET-TYPE C

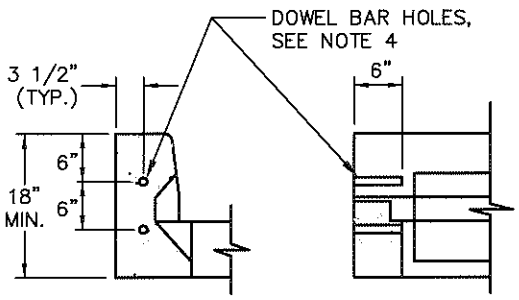
NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

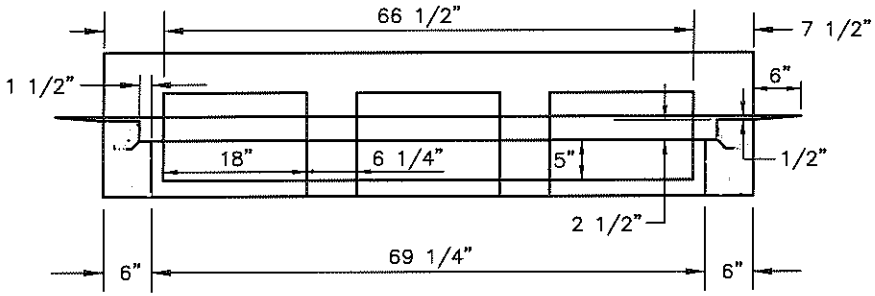


PLAN VIEW

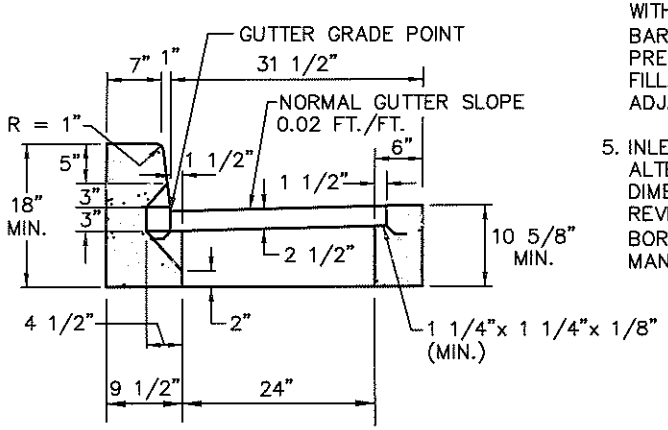


SIDE VIEW FRONT VIEW

DOWEL HOLE LOCATIONS



SECTION A – A



SECTION B – B

NOTES

1. THESE DETAILS DEPICT THE SHAPE AND DIMENSIONS REQUIRED FOR UNIFORMITY AND COMPATIBILITY. THEY DO NOT INCLUDE DETAILS REQUIRED FOR MANUFACTURING AND HANDLING PRECAST TOP UNITS. ONLY TOP UNITS SUPPLIED BY A MANUFACTURER LISTED IN PENNDOT BULLETIN 15 SHALL BE PERMITTED.
2. CAST–IN–PLACE TOP UNITS MAY BE MONOLITHIC WITH THE INLET BOX.
3. PROVIDE ANGLES EMBEDDED IN THE CONCRETE AS A BEARING AREA FOR THE GRATE FOR ALL TOP UNITS WHICH SEAT THE GRATE DIRECTLY WITHIN THE UNIT.
4. DOWEL TYPE C INLET TOP UNITS WITH 2 – #8 x 1'–0" DOWEL BARS AND PLACE 1/4" PREMOLDED EXPANSION JOINT FILLER WHEN CONNECTING TO ADJACENT CURB SECTIONS.
5. INLET BOXES AND TOPS OF ALTERNATE SIZES AND DIMENSIONS ARE SUBJECT TO REVIEW AND APPROVAL BY THE BOROUGH'S PUBLIC WORKS MANAGER.

2'X6' TYPE C INLET CONCRETE TOP UNITS

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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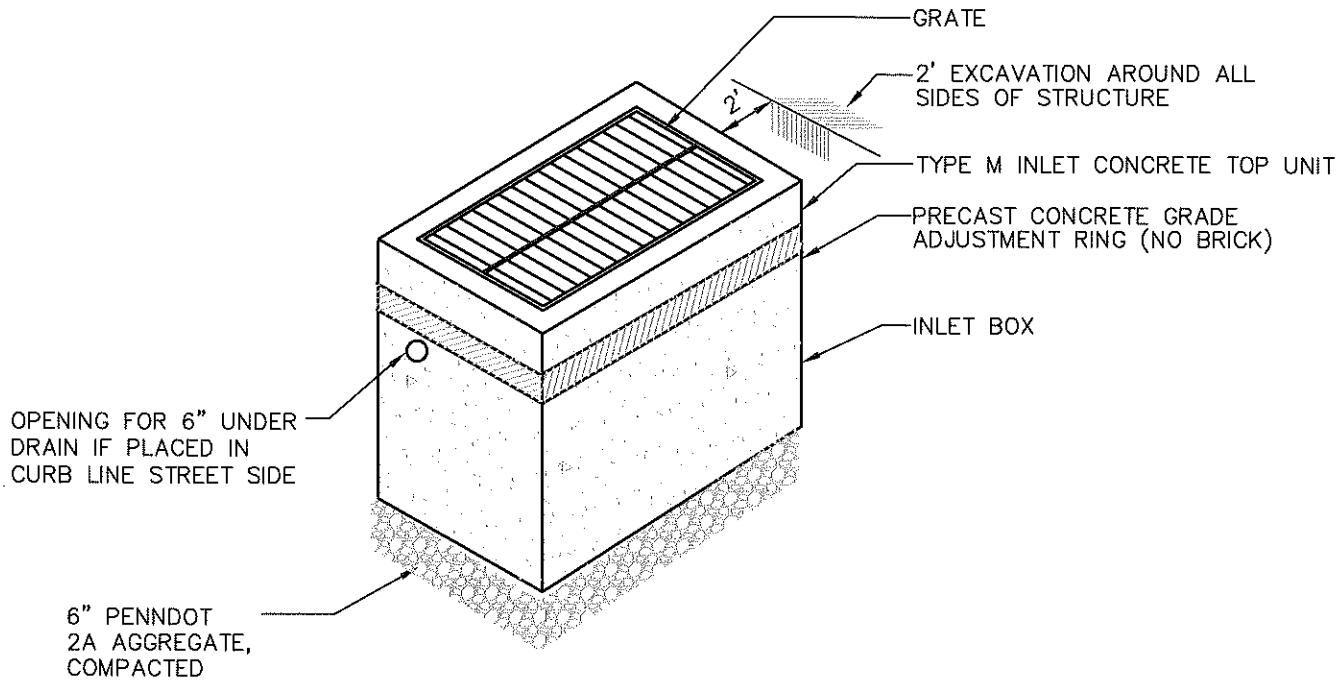


NOTES:

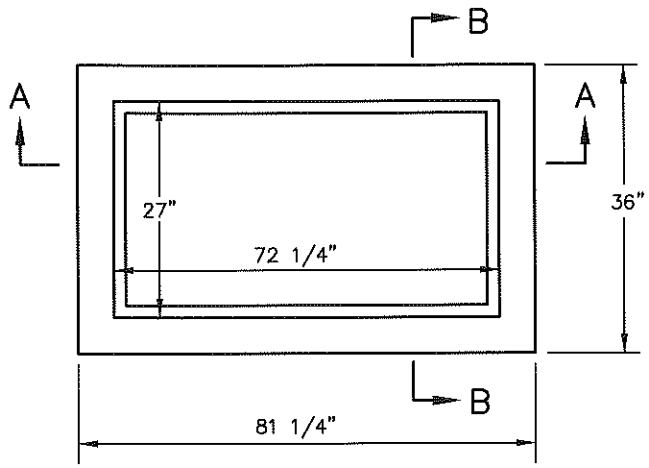
1. CONSTRUCT IN ACCORDANCE WITH REQUIREMENTS OF PUB. 408, SEC. 605 FOR PENNDOT INLET ASSEMBLIES.
2. GRADE ADJUSTMENT SHALL BE PRECAST CONCRETE CONSTRUCTION. (NO RED BRICK OR MASONRY BRICK)

PRE-CAST STORM INLET-TYPE M

NO SCALE

BOROUGH OF WYOMISSING

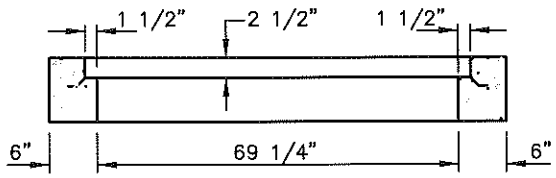
STANDARD DETAIL



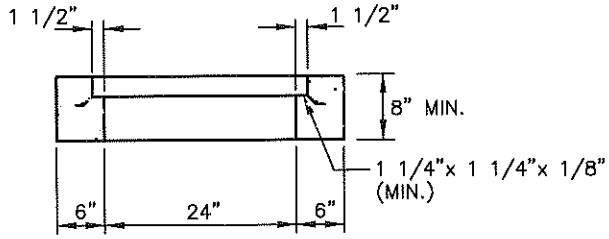
PLAN VIEW

NOTES

1. THESE DETAILS DEPICT THE SHAPE AND DIMENSIONS REQUIRED FOR UNIFORMITY AND COMPATIBILITY. THEY DO NOT INCLUDE DETAILS REQUIRED FOR MANUFACTURING AND HANDLING PRECAST TOP UNITS. ONLY TOP UNITS SUPPLIED BY A MANUFACTURER LISTED IN PENNDOT BULLETIN 15 SHALL BE PERMITTED.
2. CAST-IN-PLACE TOP UNITS MAY BE MONOLITHIC WITH THE INLET BOX.
3. PROVIDE ANGLES EMBEDDED IN THE CONCRETE AS A BEARING AREA FOR THE GRATE FOR ALL TOP UNITS WHICH SEAT THE GRATE DIRECTLY WITHIN THE UNIT.
4. DOWEL TYPE C INLET TOP UNITS WITH 2 - #8 x 1'-0" DOWEL BARS AND PLACE 1/4" PREMOLDED EXPANSION JOINT FILLER WHEN CONNECTING TO ADJACENT CURB SECTIONS.
5. INLET BOXES AND TOPS OF ALTERNATE SIZES AND DIMENSIONS ARE SUBJECT TO REVIEW AND APPROVAL BY THE BOROUGH'S PUBLIC WORKS MANAGER.



SECTION A - A



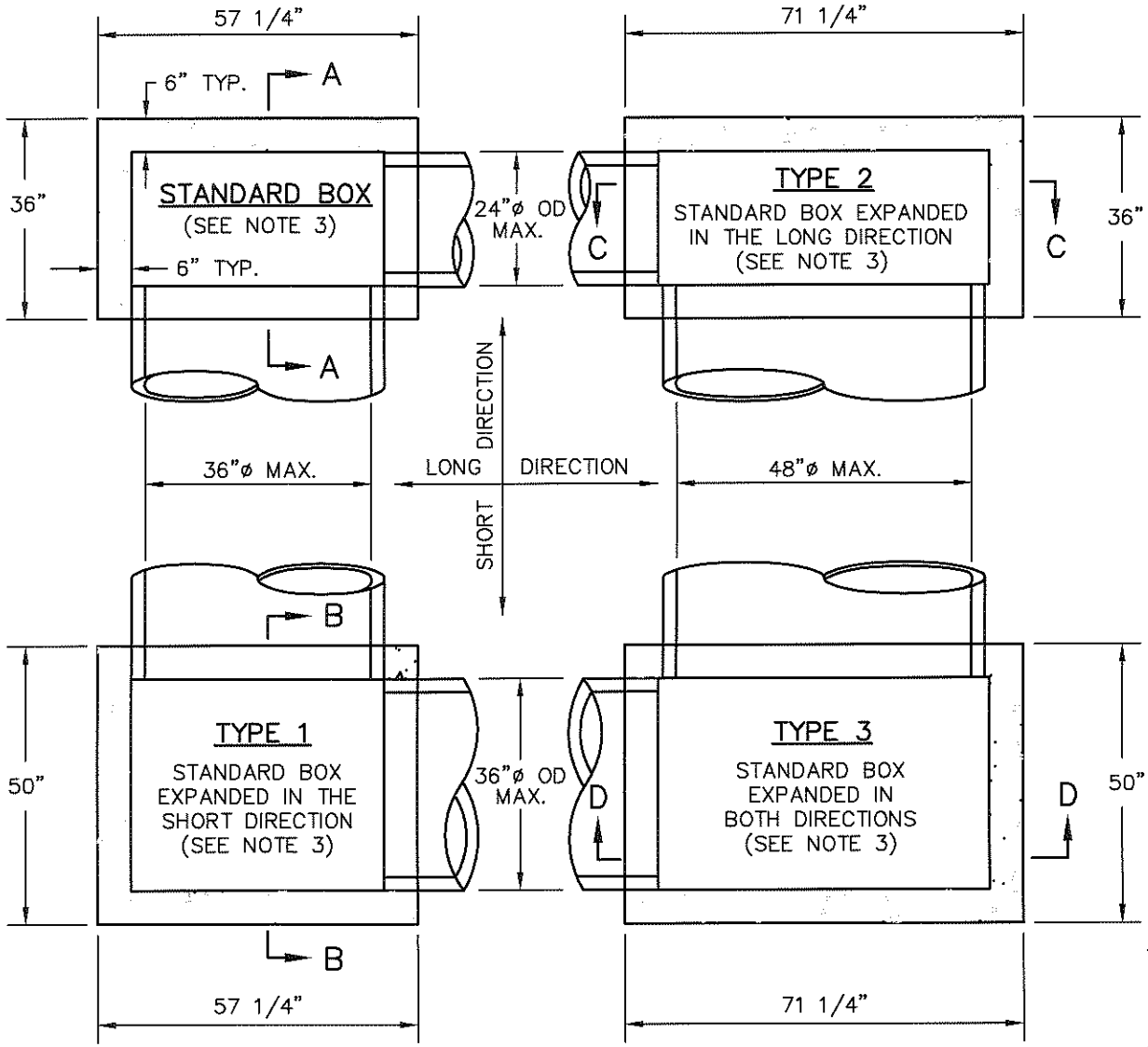
SECTION B - B

2'x6' TYPE M INLET CONCRETE TOP UNITS

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL



NOTES

1. CONSTRUCT INLET BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF PENNDOT PUB. 408, SECTION 714.
2. ONLY PRECAST INLET BOXES SUPPLIED BY A MANUFACTURER LISTED IN PENNDOT BULLETIN 15 SHALL BE PERMITTED. USE CLASS AA CEMENT CONC. FOR PRECAST BOXES.
3. PROVIDE STANDARD INLET BOXES AND COVER ADJUSTMENT SLABS WITH A 24" X 45 1/4" OPENING TO ACCOMODATE STANDARD TOP COMPONENTS.
4. INLETS THAT EXCEED THE MAXIMUM HEIGHT SHOWN SHALL REQUIRE A SPECIAL DETAIL AND DESIGN FOR THE INLET WALLS AND BASE. CONSTRUCT INLETS THAT EXCEED 5 FEET IN HEIGHT WITH STEPS SIMILAR TO MANHOLES. SEE RC-39.
5. LOCATE PIPE OR PIPES, AS INDICATED, WITH THE INLET BOTTOM SHAPED TO CHANNEL THE FLOW TOWARD THE OUTLET PIPE.
6. PLACE SUBBASE MATERIAL MEETING THE REQUIREMENTS OF PENNDOT PUBLICATION 408, SECTION 350.2, 12" MINIMUM DEPTH IN 4 INCH LAYERS BENEATH INLET BOX, COMPACTED TO A DENSITY SATISFACTORY TO THE ENGINEER AND INCIDENTAL TO THE INLET PAY ITEM.
7. FOR PIPE DIAMETERS LARGER THAN 48" USE A MODIFIED INLET BOX, PER RC-34, SHEET 8 OF 9.
8. FOR PIPE DIAMETERS LARGER THAN 48" IN THE LONG DIRECTION OR LARGER THAN 30" IN THE SHORT DIRECTION, A SPECIAL DETAIL AND DESIGN IS REQUIRED.
9. INLET BOXES THAT ARE NOT MONOLITHIC SHALL HAVE CONSTRUCTION JOINTS AS REQUIRED, PER RC-34, SHEET 6 OF 9.
10. FOR INLETS OTHER THAN AS SHOWN ON THE STANDARDS, PROVIDE REINFORCEMENT BASED ON HS25 LOADING AND IN ACCORDANCE WITH PENNDOT PUB. 408 SPECIFICATIONS.
11. SEE STANDARD DETAIL ST006 FOR SECTION VIEWS OF PRECAST CONCRETE INLET BOXES.

STANDARD PRECAST CONCRETE INLET BOXES

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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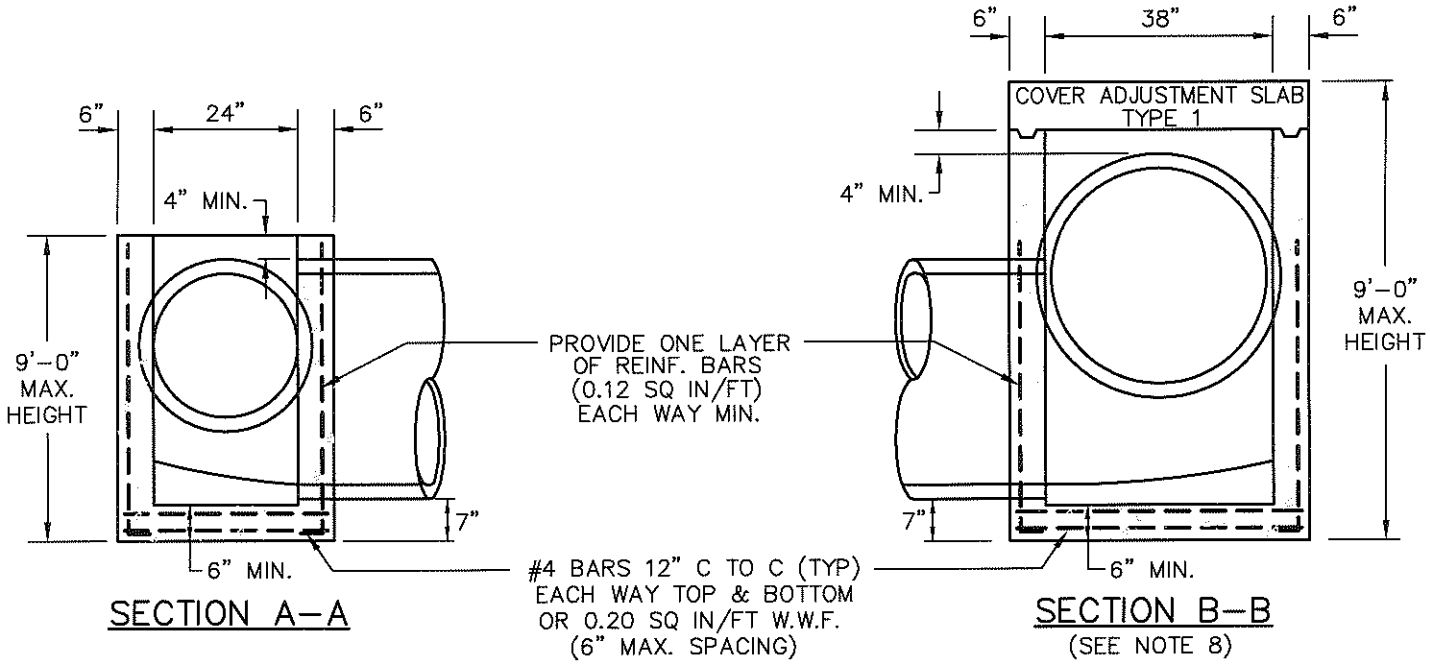
BOROUGH OF WYOMISSING

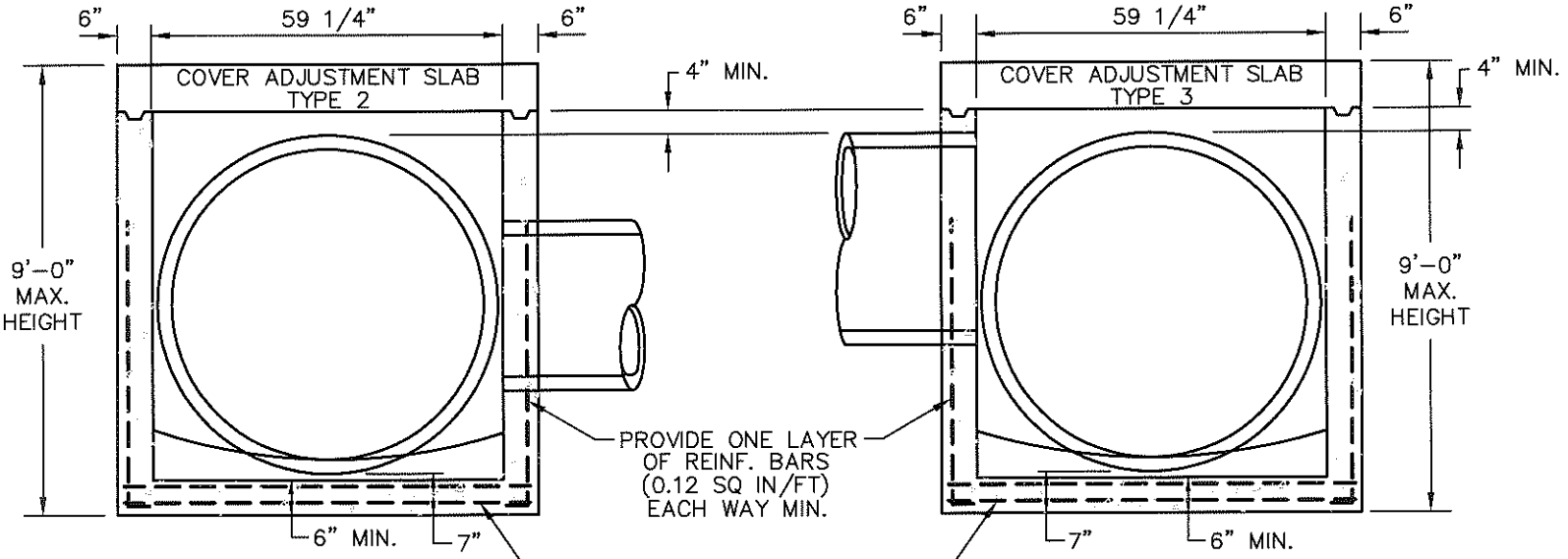
STANDARD PRECAST CONCRETE INLET BOXES

NO SCALE



SECTION A–A

SECTION B–B
(SEE NOTE 8)



SECTION C–C
(SEE NOTE 8)

SECTION D–D
TYPE 3 ONLY
(SEE NOTE 9)

SEE STANDARD DETAIL ST005 FOR PLAN VIEWS AND NOTES FOR PRECAST INLET BOXES.

STANDARD DETAIL

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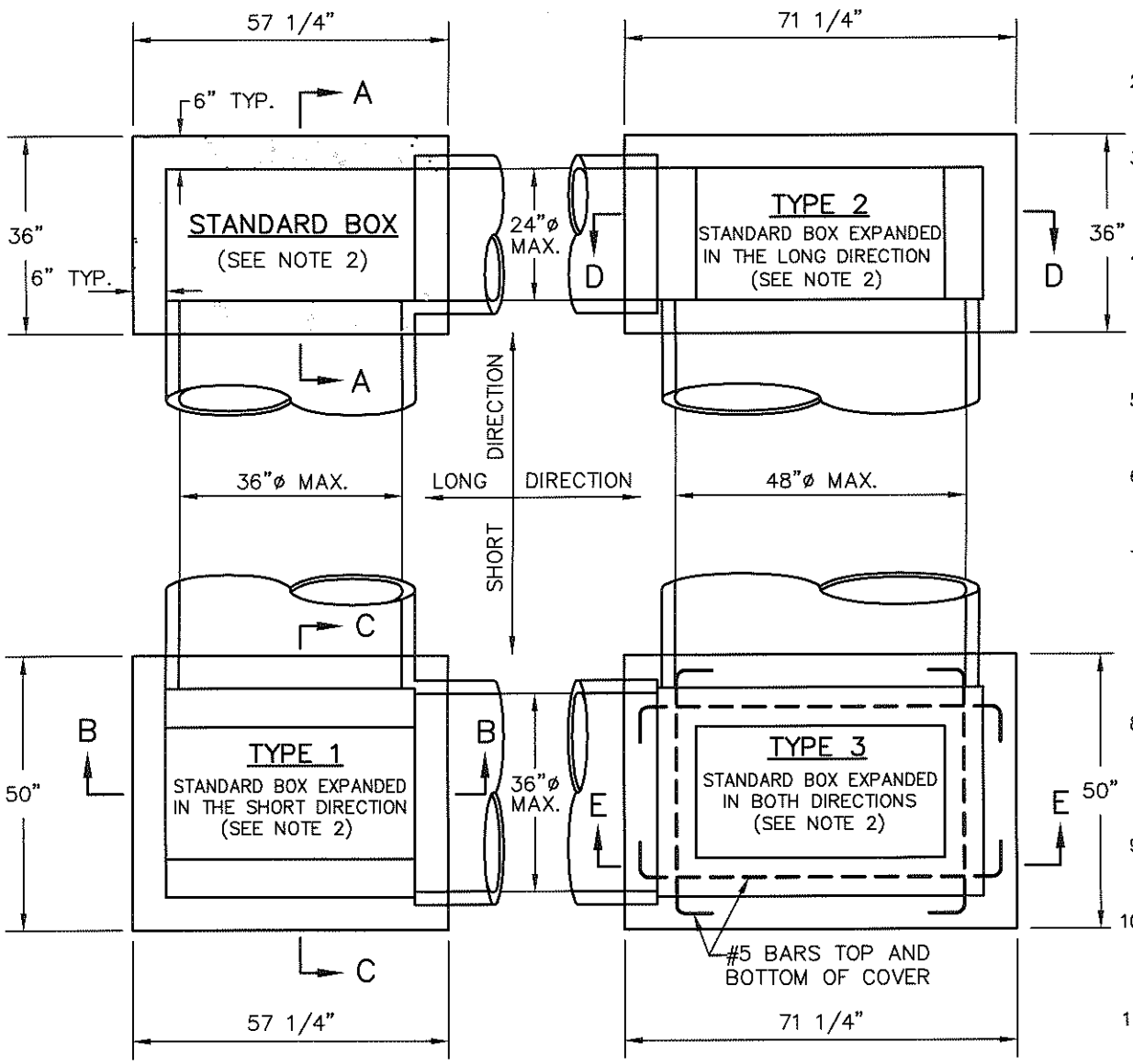

NOTES

1. CONSTRUCT INLET BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF PENNDOT PUBLICATION 408, SECTION 605, FOR CAST-IN-PLACE UNITS.
2. PROVIDE INLET BOXES WITH 24" X 45 1/4" STANDARD OPENING TO ACCOMODATE THE STANDARD TOP COMPONENTS.
3. PROVIDE 6" INLET WALLS, UNLESS OTHERWISE INDICATED, FOR CONCRETE CONSTRUCTION AND 8" INLET WALLS FOR BRICK CONSTRUCTION.
4. INLETS THAT EXCEED THE MAXIMUM HEIGHT SHOWN SHALL REQUIRE A SPECIAL DETAIL AND DESIGN FOR THE INLET WALLS AND BASE. CONSTRUCT INLETS THAT EXCEED 5 FEET IN HEIGHT WITH STEPS SIMILAR TO MANHOLES. SEE PennDOT RC-39.
5. DO NOT EXTEND PIPE BLOCK-OUTS INTO THE BASE WHEN BASE IS NOT MONOLITHIC WITH THE INLET WALLS.
6. LOCATE PIPE OR PIPES, AS INDICATED, WITH THE INLET BOTTOM SHAPED TO CHANNEL THE FLOW TOWARD THE OUTLET PIPE.
7. PLACE #4 REINFORCEMENT BARS, MINIMUM 12 INCHES LONG, SPACED AT 12 INCHES C. TO C., AS DOWELS BETWEEN THE INLET BASE AND WALLS WHEN THE CONCRETE WALLS AND INLET BASE ARE NOT CONSTRUCTED MONOLITHICALLY. THE DOWELS MAY BE ELIMINATED IF THE ALTERNATE JOINT SHOWN IN DETAIL A IS CONSTRUCTED.
8. FOR CAST-IN-PLACE CONSTRUCTION, WHEN THE BASE IS CONSTRUCTED MONOLITHICALLY WITH THE VERTICAL WALLS, PROVIDE 3 INCH MINIMUM FROM THE BOTTOM OF THE PIPE TO THE BOTTOM OF THE INLET BOX.
9. FOR PIPE DIAMETERS LARGER THAN 36" IN THIS WALL FOR A TYPE I, USE A MODIFIED TYPE 1 INLET BOX PER RC-34, SHEET 8 OF 9.
10. FOR PIPE DIAMETERS LARGER THAN 48" IN THIS WALL FOR A TYPE 2, USE A MODIFIED TYPE II INLET BOX PER RC-34, SHEET 8 OF 9.
11. FOR PIPE DIAMETERS LARGER THAN 48" IN THE LONG DIRECTION OR LARGER THAN 36" IN THE SHORT DIRECTION, A SPECIAL DETAIL AND DESIGN IS REQUIRED.
12. SEE STANDARD DETAIL ST008 FOR SECTION VIEWS OF CAST-IN-PLACE INLET BOXES.

STANDARD CAST-IN-PLACE CONCRETE INLET BOXES

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL 11/13

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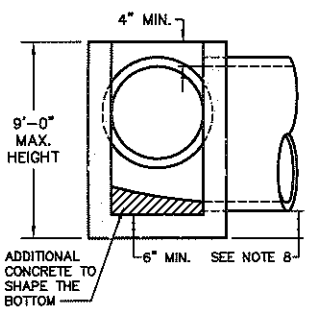
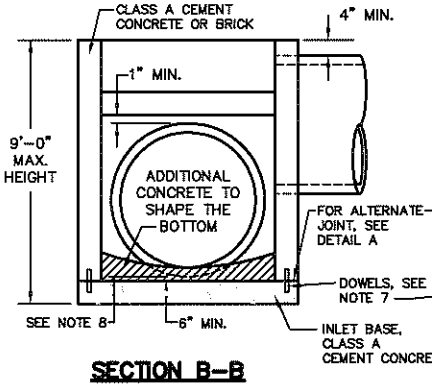
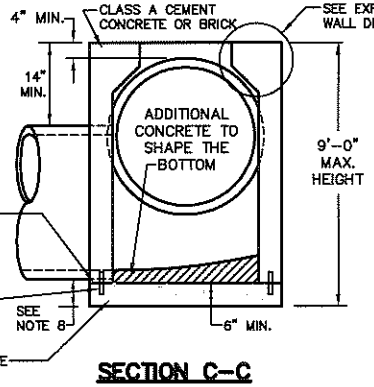


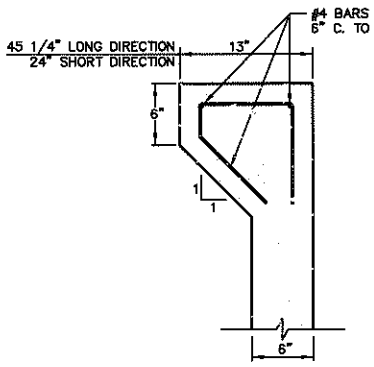
SECTION A-A



SECTION B-B



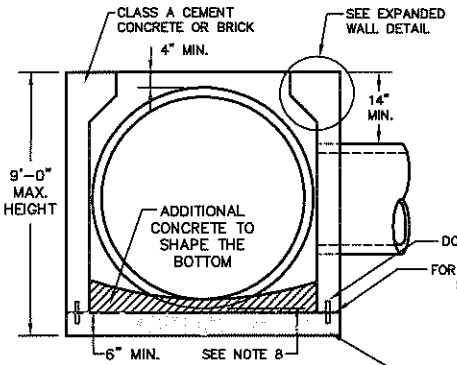
SECTION C-C
(SEE NOTE 9)



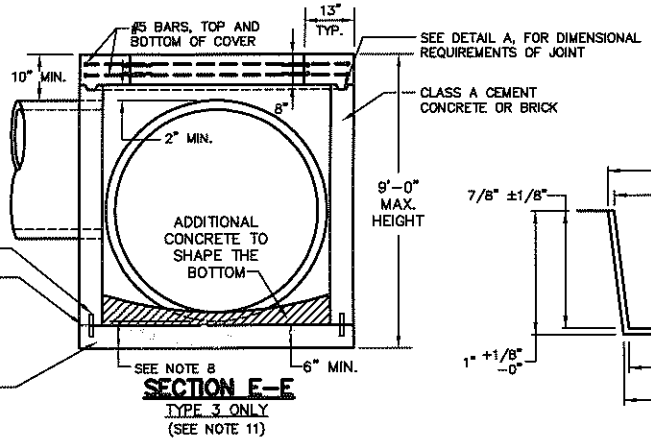
EXPANDED WALL DETAIL

NOTES

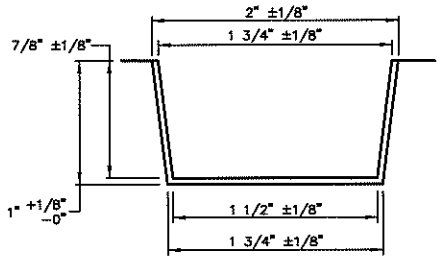
1. CONSTRUCT INLET BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF PENNDOT PUBLICATION 408, SECTION 605, FOR CAST-IN-PLACE UNITS.
2. PROVIDE INLET BOXES WITH 24" X 45 1/4" STANDARD OPENING TO ACCOMODATE THE STANDARD TOP COMPONENTS.
3. PROVIDE 6" INLET WALLS, UNLESS OTHERWISE INDICATED, FOR CONCRETE CONSTRUCTION AND 8" INLET WALLS FOR BRICK CONSTRUCTION.
4. INLETS THAT EXCEED THE MAXIMUM HEIGHT SHOWN SHALL REQUIRE A SPECIAL DETAIL AND DESIGN FOR THE INLET WALLS AND BASE. CONSTRUCT INLETS THAT EXCEED 5 FEET IN HEIGHT WITH STEPS SIMILAR TO MANHOLES. SEE PennDOT RC-39.
5. DO NOT EXTEND PIPE BLOCK-OUTS INTO THE BASE WHEN BASE IS NOT MONOLITHIC WITH THE INLET WALLS.
6. LOCATE PIPE OR PIPES, AS INDICATED, WITH THE INLET BOTTOM SHAPED TO CHANNEL THE FLOW TOWARD THE OUTLET PIPE.
7. PLACE #4 REINFORCEMENT BARS, MINIMUM 12 INCHES LONG, SPACED AT 12 INCHES C. TO C., AS DOWELS BETWEEN THE INLET BASE AND WALLS WHEN THE CONCRETE WALLS AND INLET BASE ARE NOT CONSTRUCTED MONOLITHICALLY. THE DOWELS MAY BE ELIMINATED IF THE ALTERNATE JOINT SHOWN IN DETAIL A IS CONSTRUCTED.
8. FOR CAST-IN-PLACE CONSTRUCTION, WHEN THE BASE IS CONSTRUCTED MONOLITHICALLY WITH THE VERTICAL WALLS, PROVIDE 3 INCH MINIMUM FROM THE BOTTOM OF THE PIPE TO THE BOTTOM OF THE INLET BOX.
9. FOR PIPE DIAMETERS LARGER THAN 36" IN THIS WALL FOR A TYPE I, USE A MODIFIED TYPE 1 INLET BOX PER RC-34, SHEET 8 OF 9.
10. FOR PIPE DIAMETERS LARGER THAN 48" IN THIS WALL FOR A TYPE 2, USE A MODIFIED TYPE II INLET BOX PER RC-34, SHEET 8 OF 9.
11. FOR PIPE DIAMETERS LARGER THAN 48" IN THE LONG DIRECTION OR LARGER THAN 36" IN THE SHORT DIRECTION, A SPECIAL DETAIL AND DESIGN IS REQUIRED.
12. SEE STANDARD DETAIL ST007 FOR PLAN VIEW OF CAST-IN-PLACE INLET BOXES.



SECTION D-D
(SEE NOTE 10)



SECTION E-E
TYPE 3 ONLY
(SEE NOTE 11)



DETAIL A
ALTERNATE JOINT

STANDARD CAST-IN-PLACE CONCRETE INLET BOXES

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL 11/13

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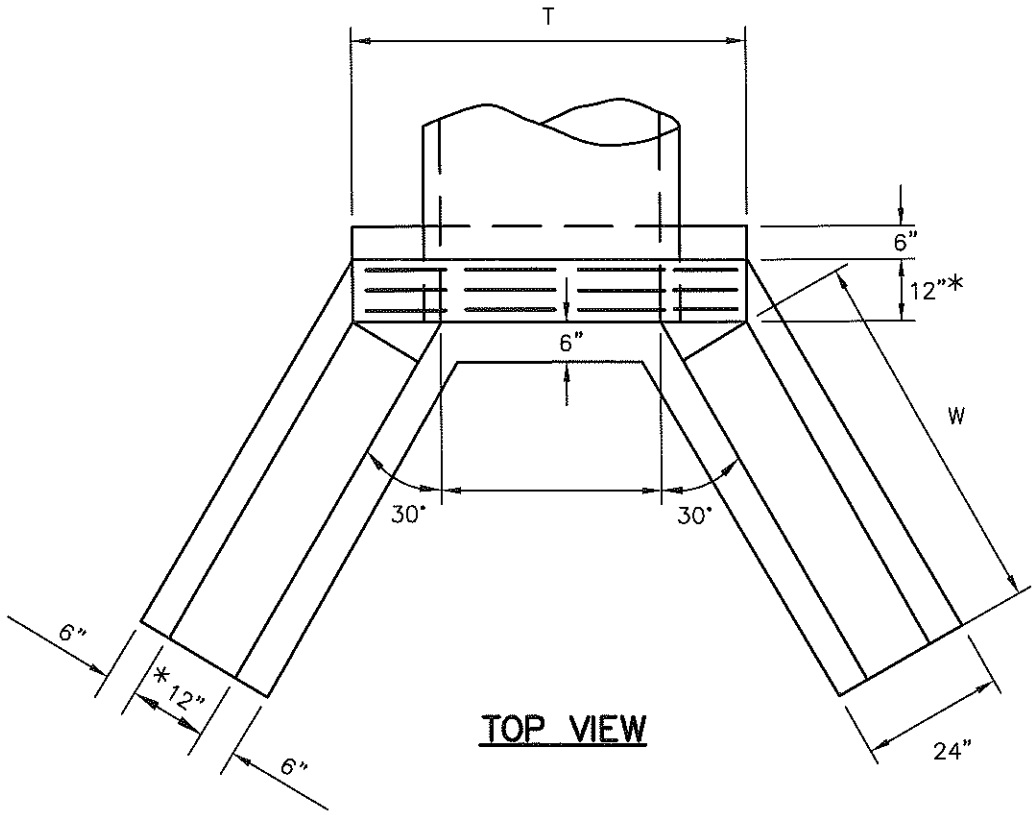
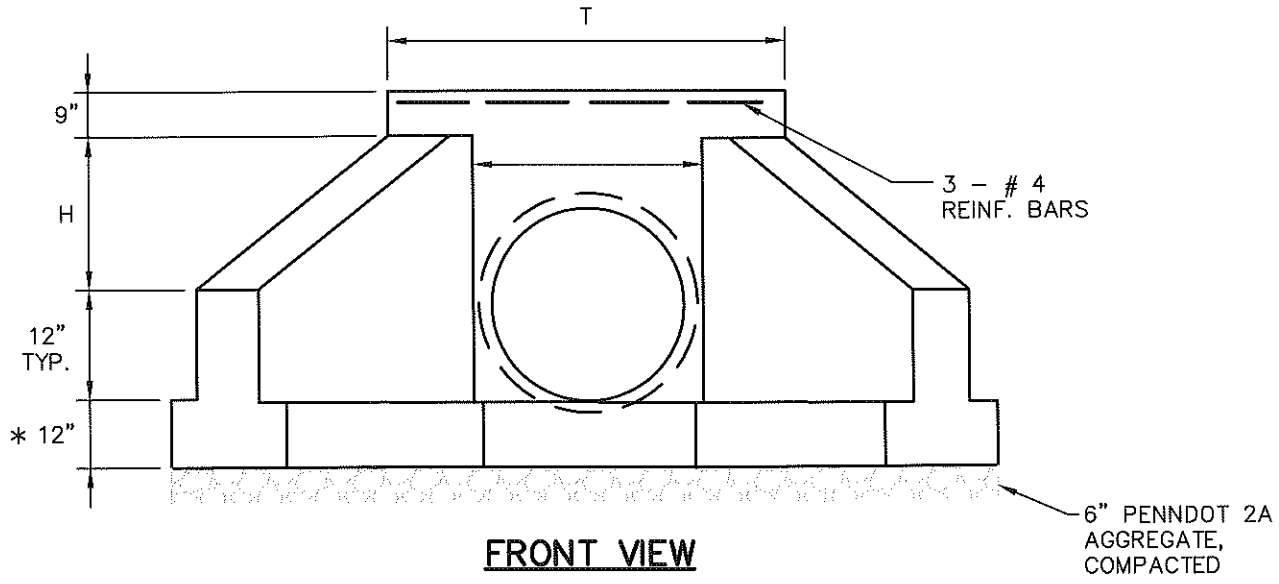


TOP VIEW

* 8" THICK FOR PRECAST ENDWALLS UP TO 24" PIPE DIAMETERS,
12" FOR LARGER PIPE SIZES OR CAST IN PLACE ENDWALLS



FRONT VIEW

TYPE D–W ENDWALL/HEADWALL

NO SCALE

NOTE: DIMENSIONS NOT SHOWN SHALL BE EQUAL TO THOSE REQUIRED BY PENNDOT AS SHOWN IN THE STANDARDS FOR ROADWAY CONSTRUCTION.

BOROUGH OF WYOMISSING

STANDARD DETAIL

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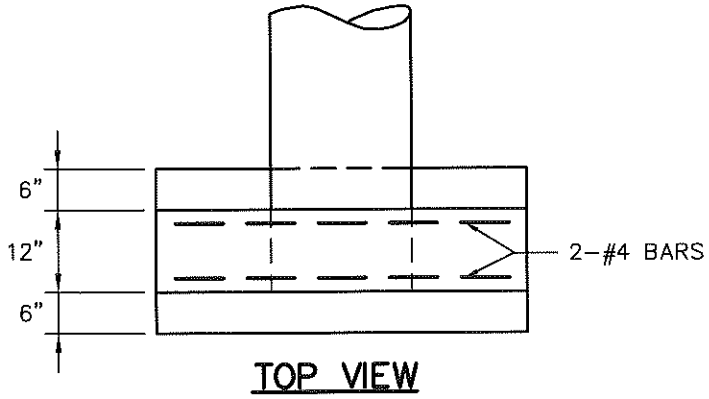
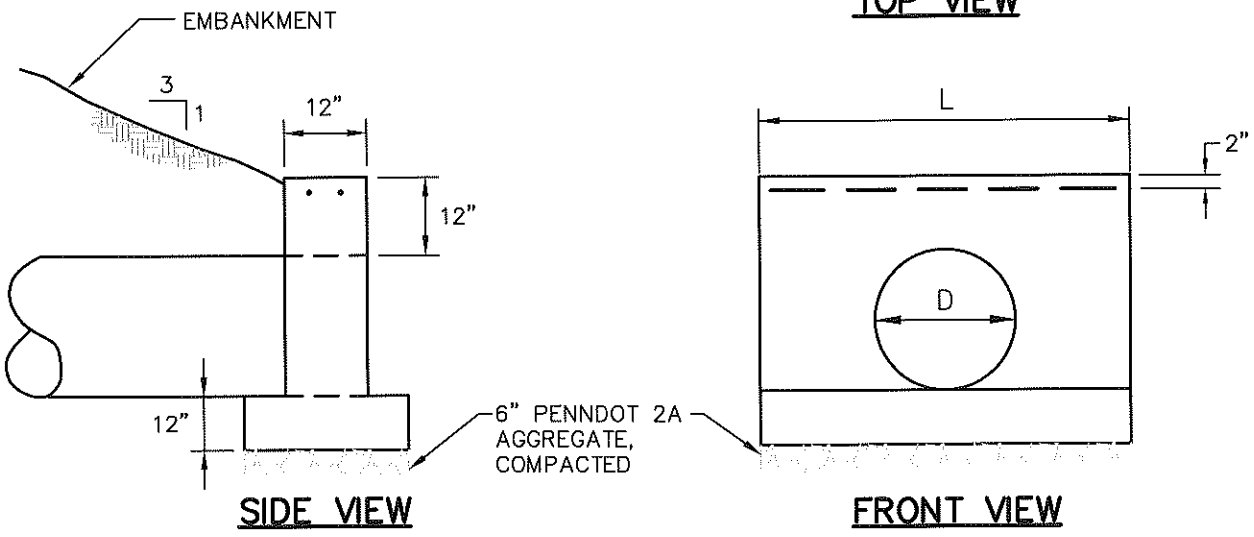
D	L
15"	4'–6"
18"	5'–0"
21"	5'–0"
24"	7'–0"
27"	7'–0"
30"	9'–0"



TOP VIEW



SIDE VIEW

FRONT VIEW

TYPICAL TYPE D ENDWALL

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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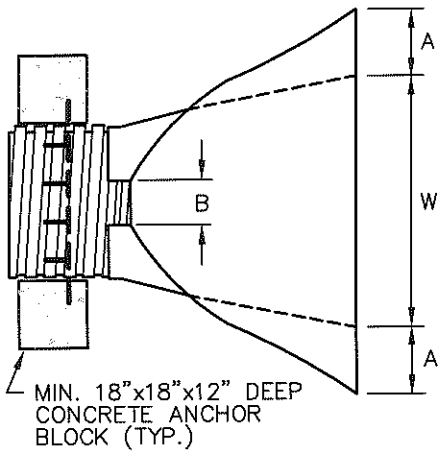
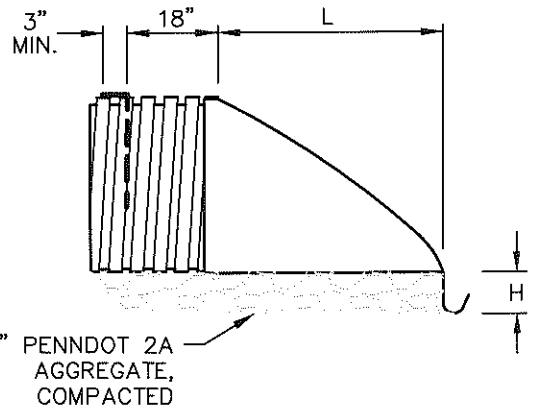
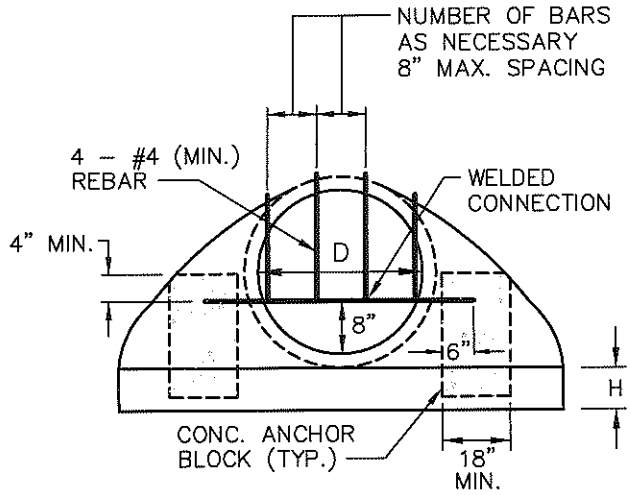
PIPE DIAMETER	DIMENSIONS (INCHES)					
	PART NO.	A(1+/-)	B MAX	H (1+/-)	L 1/2 +/-)	W (2 +/-)
12" AND 15"	1210NP	6.5	10	6.5	25	29
18"	1810NP	7.5	15	6.5	32	35
24"	2410NP	7.5	18	6.5	36	45
30"	3010NP	10.5	NA	7.0	53	68
36"	3610NP	10.5	NA	7.0	53	68



TOP VIEW



SIDE VIEW



END VIEW

TYPICAL CPP END SECTION

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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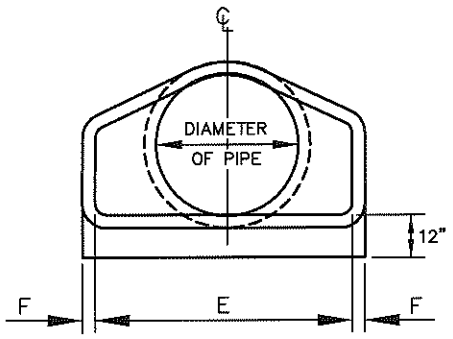
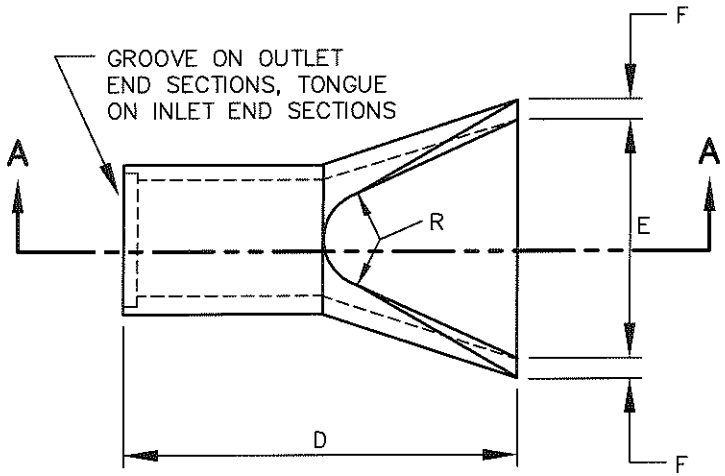
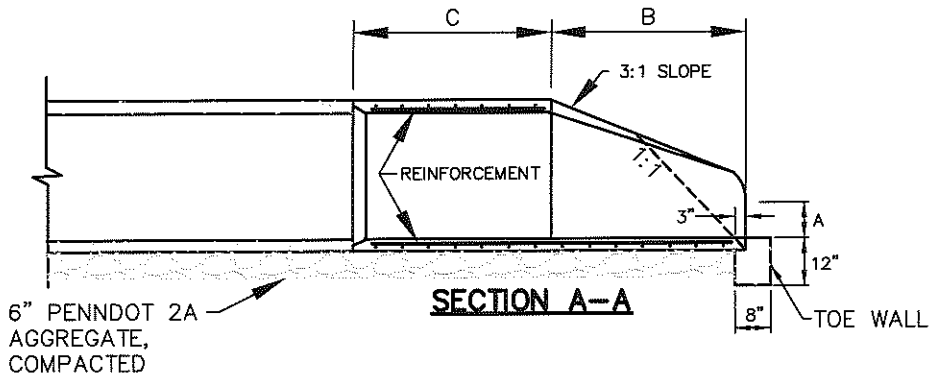


END VIEW

TABLE A – DIMENSIONS FOR END SECTION FOR CONCRETE PIPE							
DIAM.	A	B	C	D	E	F	R
18"	9"	2'–3"	3'–10"	6'–1"	3'–0"	2 1/2"	1/2"
21"	9"	3'–0"	3'–1"	6'–1"	3'–6"	2 3/4"	8"
24"	9 1/2"	3'–7 1/2"	2'–6"	6'–1 1/2"	4'–0"	3"	8"
27"	10 1/2"	4'–0"	2'–1 1/2"	6'–1 1/2"	4'–6"	3 1/4"	9"
30"	12"	4'–6"	1'–7 3/4"	6'–1 3/4"	5'–0"	3 1/2"	8"
33"	13 1/2"	4'–10 1/2"	3'–1 1/2"	8'–0"	5'–6"	3 3/4"	9"
36"	15"	5'–3"	2'–9"	8'–0"	6'–0"	4"	10"
42"	21"	5'–3"	2'–9"	8'–0"	6'–6"	4 1/2"	11"
48"	24"	6'–0"	2'–0"	8'–0"	7'–0"	5"	12"



PLAN



SECTION A–A

SLOPE DETAIL

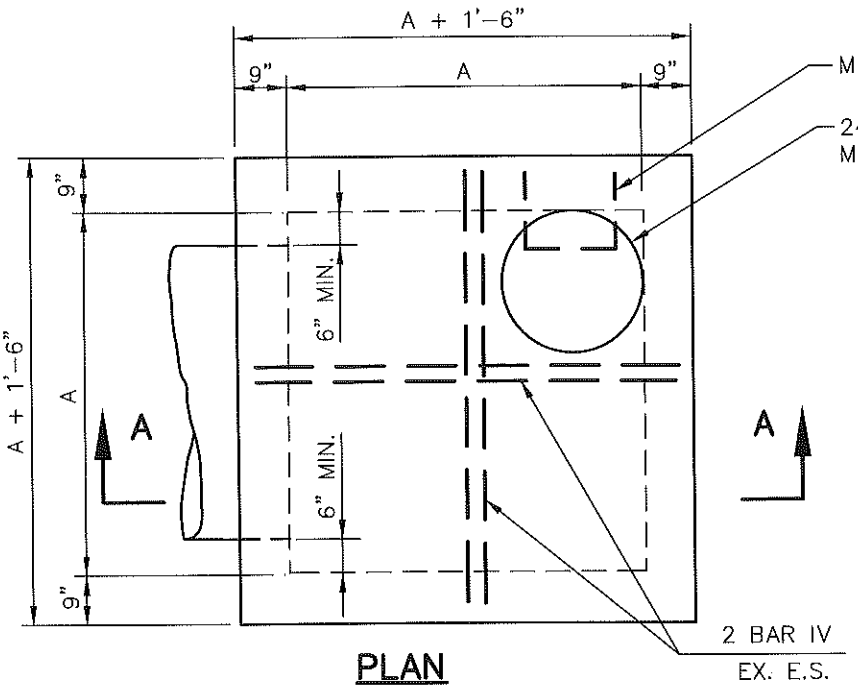
CONCRETE RCP END SECTION

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

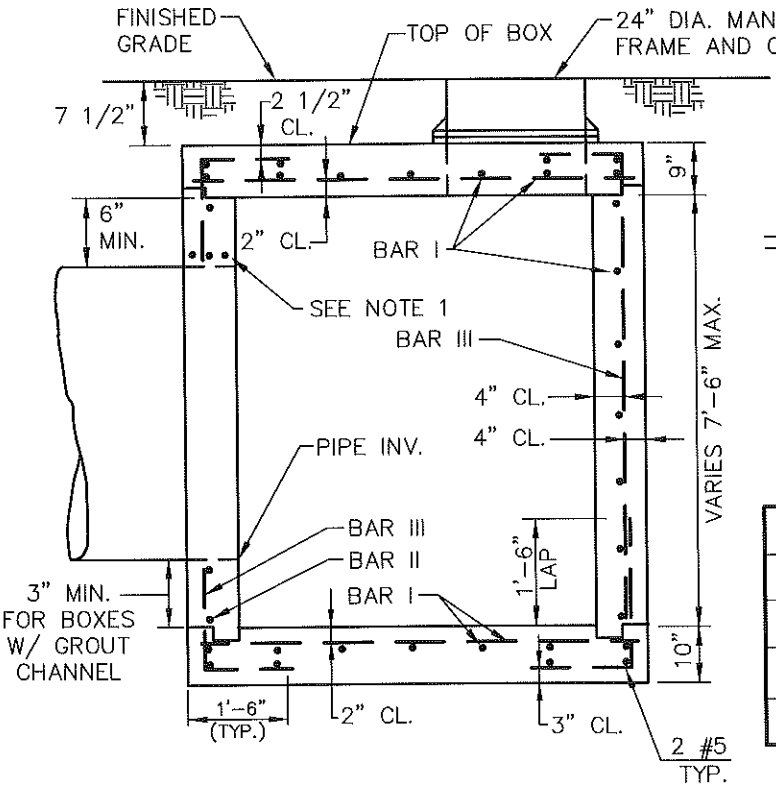
11/13



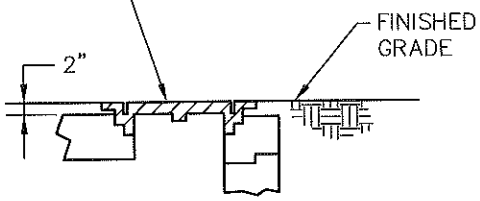
PLAN

NOTES:

1. FOR PIPES TO 24"ø USE 2-#5. FOR PIPES >24"ø USE 2-#7.
2. HORIZONTAL STEEL TO BE CONTINUOUS AT CORNERS



SECTION A-A



ALTERNATE CASTING TYPE

SIZE	REINFORCING BARS			
AxA	BAR I	BAR II	BAR III	BAR IV
4'x4'	#5@9	#5@8½	#5@9	#6
5'x5'	#6@9	#5@7½	#5@9	#7
6'x6'	#6@9	#5@7	#5@9	#7

CAST-IN-PLACE JUNCTION BOX

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL

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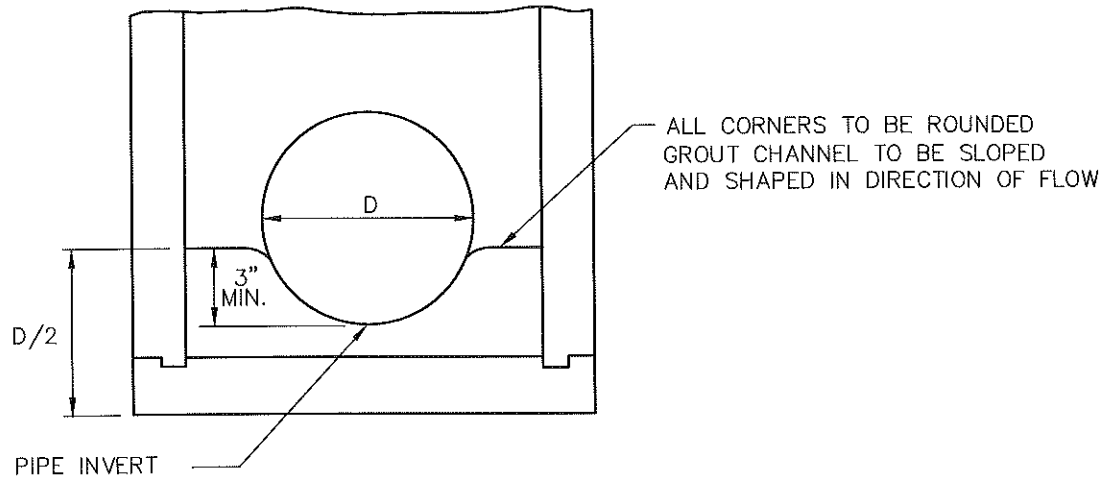
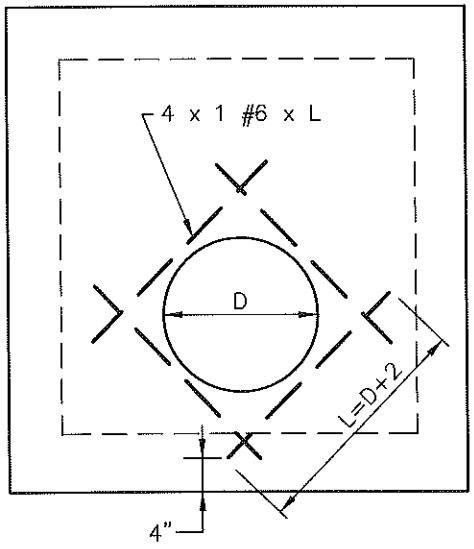
11/13



JUNCTION BOX



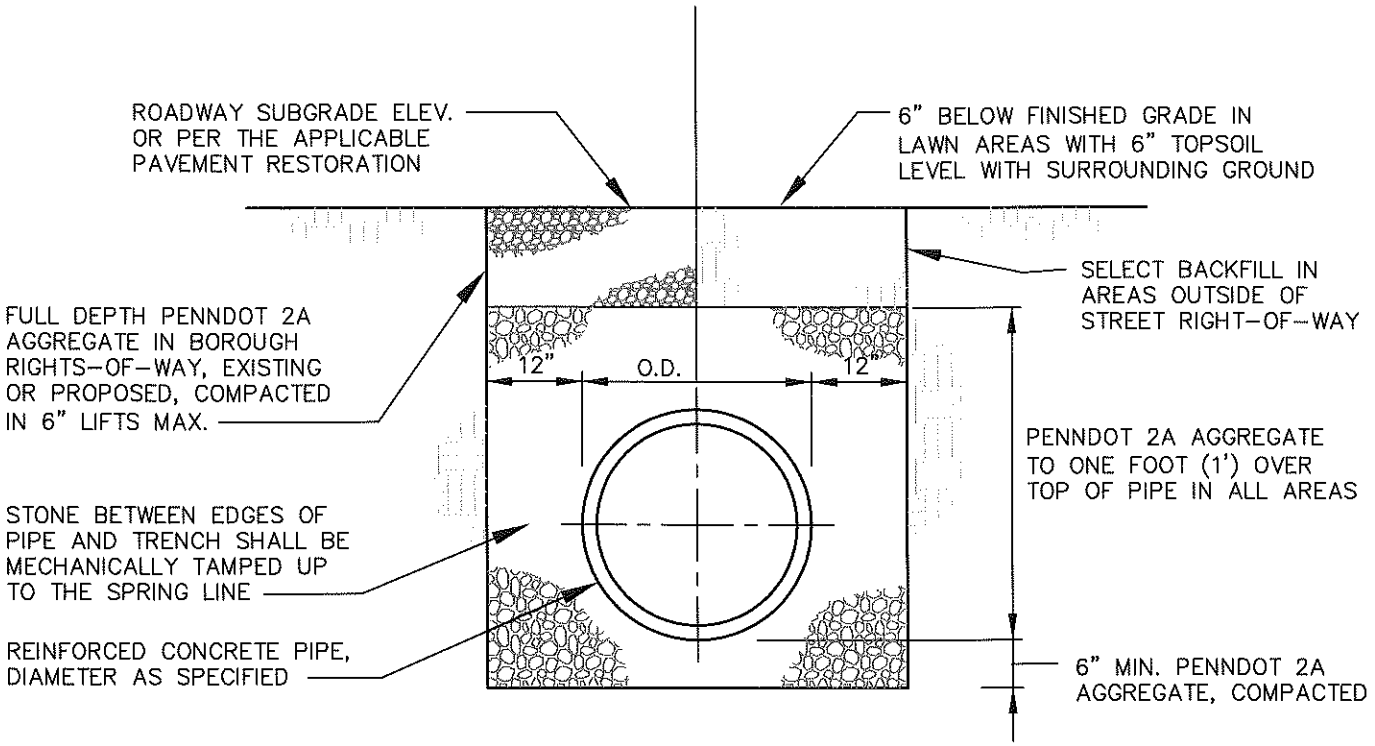
WALL DETAIL

JUNCTION BOX GROUT CHANNEL

NO SCALE

BOROUGH OF WYOMISSING

STANDARD DETAIL



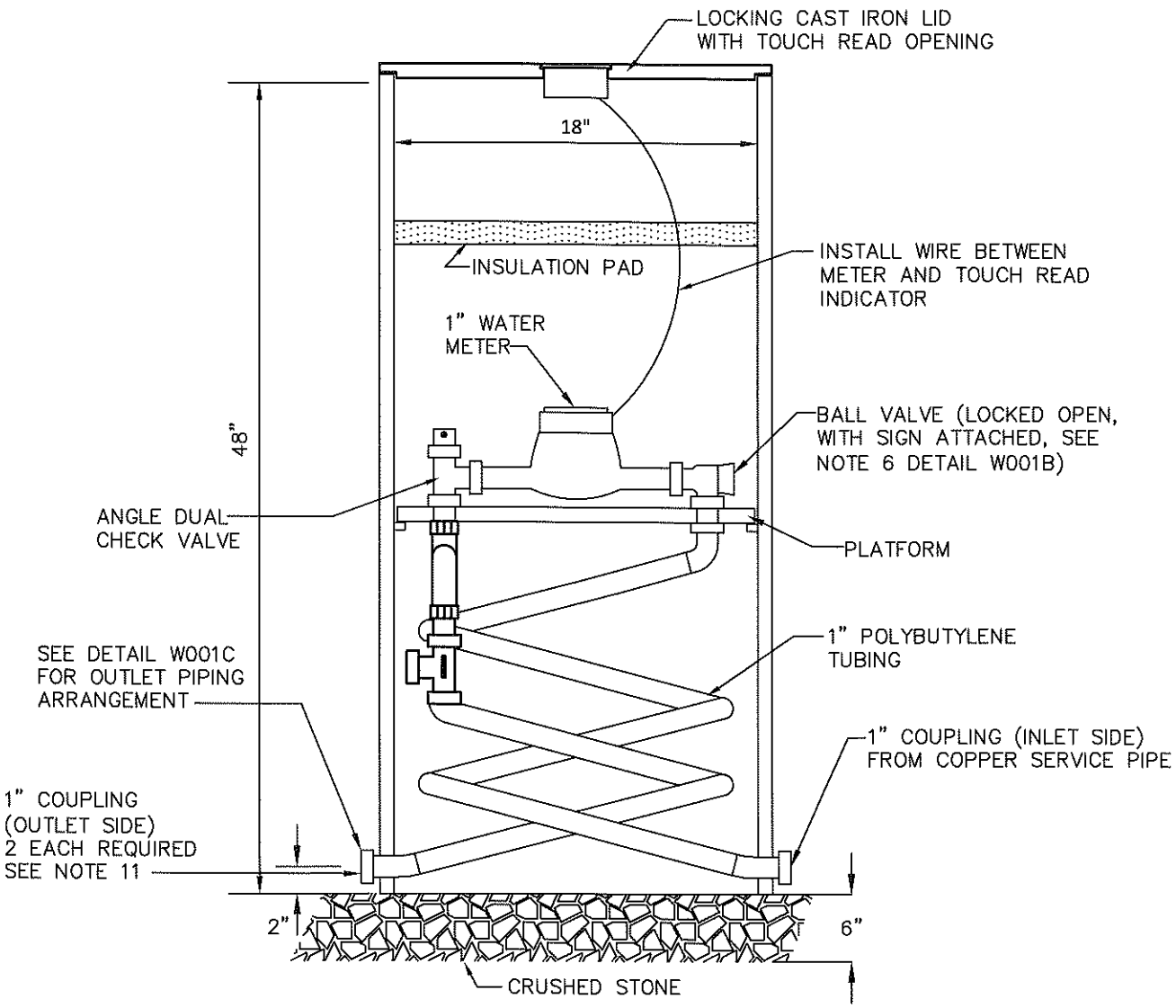
NOTES:

1. ALL BACKFILL MATERIAL TO BE COMPACTED IN LIFTS UP TO 48" MAX. OVER TOP OF PIPE PRIOR TO USING HYDRAULIC SHAKER.
2. PIPE MATERIAL PLACED IN EXISTING OR PROPOSED BOROUGH RIGHT-OF-WAY SHALL BE REINFORCED CONCRETE. ANY ALTERNATE MATERIAL IS SUBJECT TO APPROVAL BY THE BOROUGH'S PUBLIC WORKS MANAGER.
3. WHEREVER PENNDOT 2A AGGREGATE BACKFILL IS NOT REQUIRED, SELECT SOIL BACKFILL SHALL BE USED AS APPROVED BY THE ENGINEER, HAVING NO ROCK LARGER THAN 8", WET OR SATURATED SOIL, FROZEN OR OTHER DELETERIOUS MATERIALS AND COMPACTED IN 24" DEPTH MAX. LIFTS.

STORM SEWER
BEDDING AND BACKFILL
FOR REINFORCED CONCRETE PIPE

SCALE: NONE

BOROUGH OF WYOMISSING
STANDARD DETAIL



THERMAL COIL METER BOX WITH SEPARATE FIRE LINE

NOTES:
1. SEE DETAIL W001B FOR NOTES.

BOROUGH OF WYOMISSING

STANDARD DETAIL

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REVISED 11/13

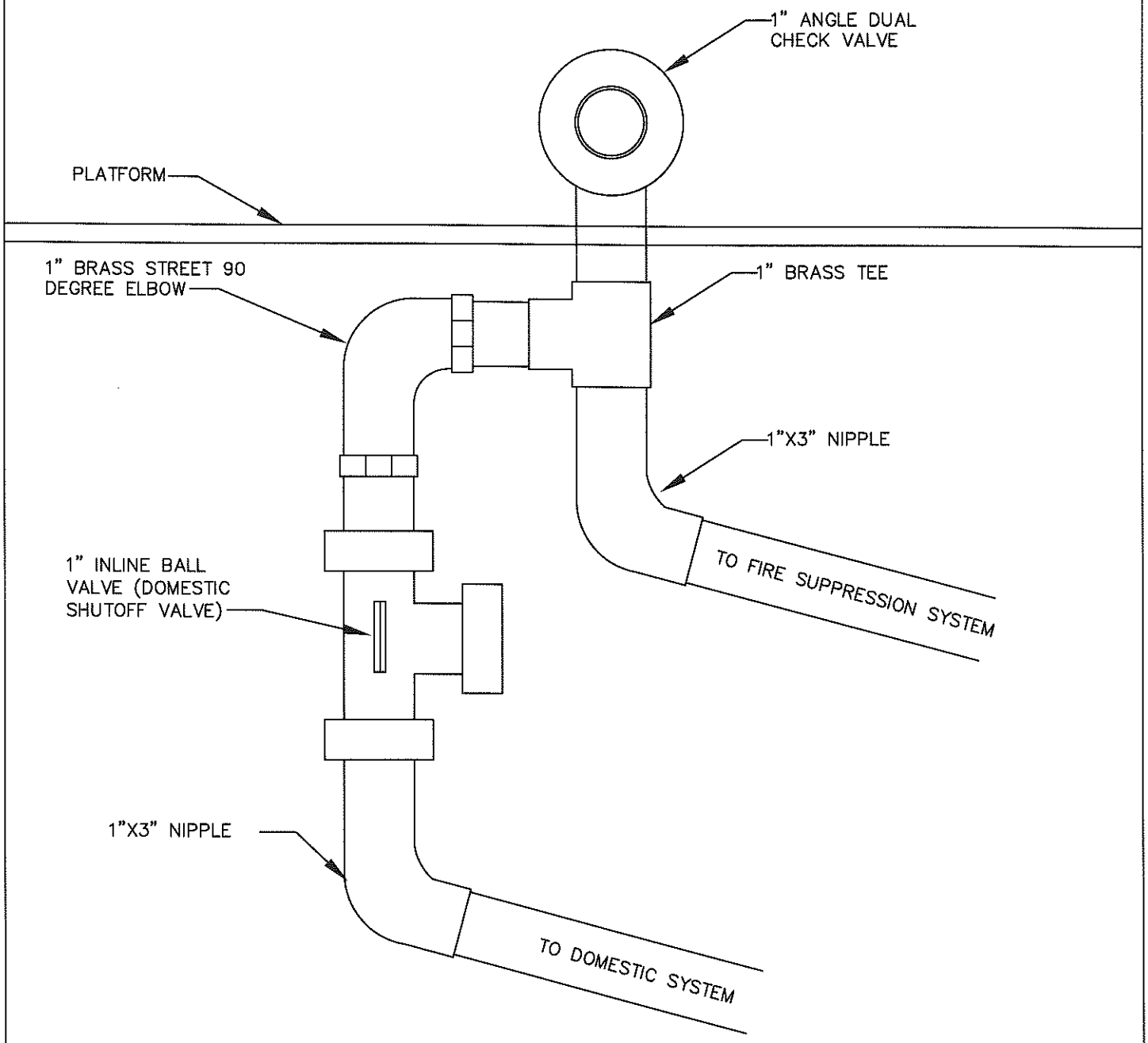
NOTES:

1. METER BOX SHALL BE AS MANUFACTURED BY FORD OR MUELLER/HUNT OR APPROVED EQUAL.
2. THIS CONFIGURATION IS FOR 1" INSTALLATIONS ONLY.
3. THIS CONFIGURATION IS FOR A DWELLING CONSTRUCTED WITH A FIRE SUPPRESSION SPRINKLER SYSTEM.
4. SEE SHEET W01C FOR DETAIL OF OUTLET PIPING.
5. SEE SHEET W01D FOR PLAN VIEW OF METER PIT.
6. A WARNING SIGN, WITH MIN. ¼" LETTERS SHALL BE AFFIXED ADJACENT TO THE MAIN SHUTOFF VALVE AND SHALL STATE: WARNING THE WATER SYSTEM FOR THIS HOME SUPPLIES FIRE SPRINKLERS THAT REQUIRE CERTAIN FLOWS AND PRESSURES TO FIGHT A FIRE. DEVICES THAT RESTRICT THE FLOW OR DECREASE THE PRESSURE OR AUTOMATICALLY SHUT OFF THE WATER TO THE FIRE SPRINKLER SYSTEM, SUCH AS WATER SOFTENERS, FILTRATION SYSTEMS, AND AUTOMATIC SHUTOFF VALVES, SHALL NOT BE ADDED TO THIS SYSTEM WITHOUT A REVIEW OF THE FIRE SPRINKLER SYSTEM BY A FIRE PROTECTION SPECIALIST. DO NOT REMOVE THIS SIGN.
7. LARGER DIAMETER METERS USED FOR LARGER DIAMETER SUPPRESSION SYSTEMS WILL REQUIRE CONCRETE METER VAULTS, OR MUELLER/HUNT EZ-VAULT METER SETTER.
8. SIZING OF INCOMING SERVICE PIPE, WATER METER, SUPPRESSION SYSTEM AND DOMESTIC SYSTEM PIPE DIAMETERS, IS THE RESPONSIBILITY OF THE PROPERTY OWNER. MINIMUM METER SIZE IS ONE (1) INCH.
9. VALVES AND CHECK VALVES SHALL BE MANUFACTURED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS AND SHALL BE BY AN APPROVED MANUFACTURER.
10. FOR 1-1/2" AND 2" METER SYSTEMS, METER BOX SHALL BE MUELLER/HUNT EZ-VAULT OR APPROVED EQUAL.
11. DOMESTIC AND FIRE SUPPRESSION LINES EXIT METER PIT AT SAME ELEVATION.

THERMAL COIL METER BOX WITH SEPARATE FIRE LINE

BOROUGH OF WYOMISSING

STANDARD DETAIL



METER BOX (WITH FIRE LINE)
OUTLET PIPING DETAIL
PROFILE VIEW

NOTES:
1. METER BOX SHALL BE AS MANUFACTURED BY FORD OR MUELLER/HUNT OR APPROVED EQUAL.
2. THIS CONFIGURATION IS FOR 1" INSTALLATIONS ONLY.
3. THIS CONFIGURATION IS FOR A DWELLING CONSTRUCTED WITH A FIRE SUPPRESSION SPRINKLER SYSTEM.

BOROUGH OF WYOMISSING

STANDARD DETAIL

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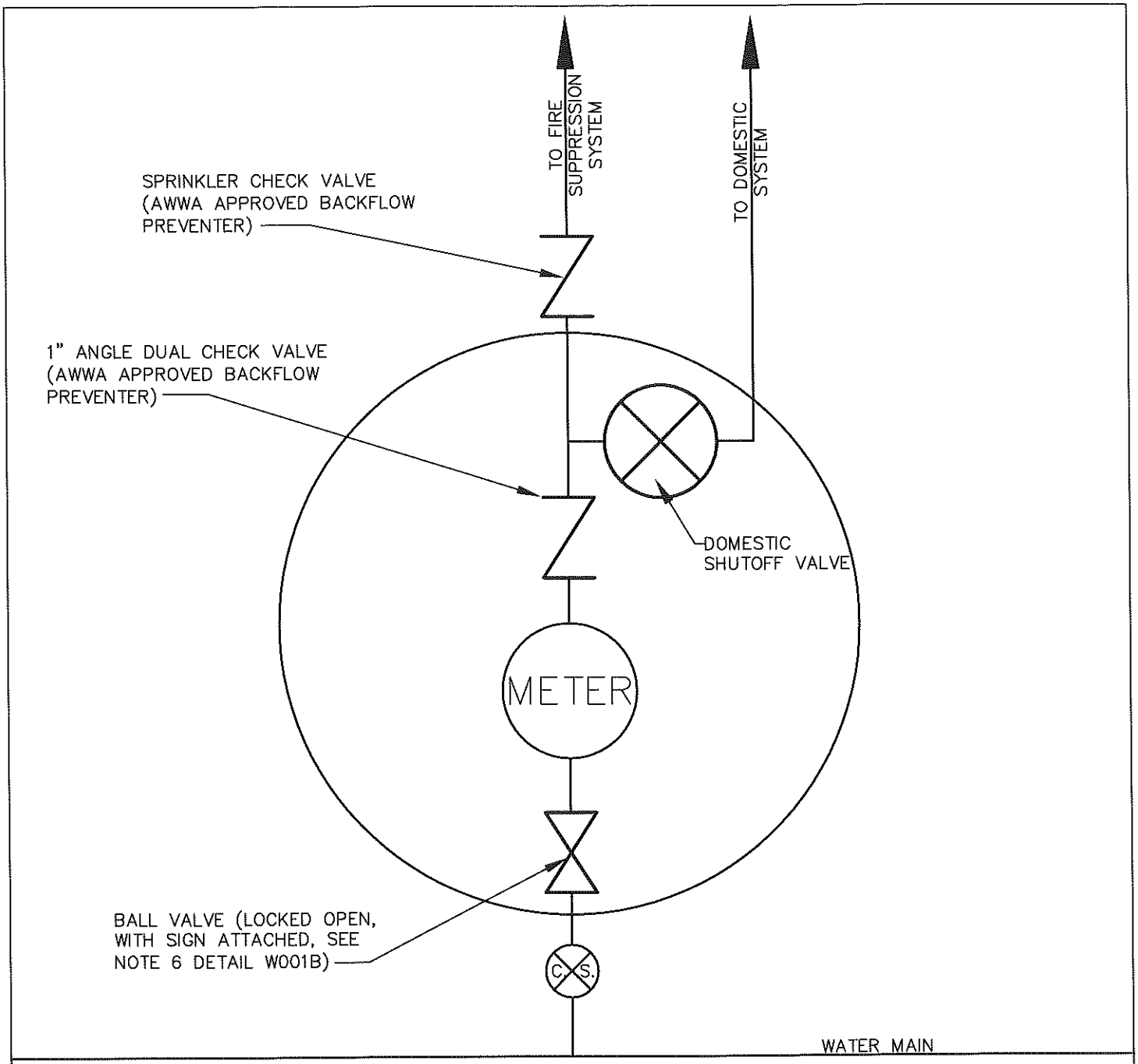
REVISED 2/11



METER BOX (WITH FIRE LINE) PLAN VIEW

NOTES:
1. METER BOX SHALL BE AS MANUFACTURED BY FORD OR MUELLER/HUNT OR APPROVED EQUAL.
2. THIS CONFIGURATION IS FOR 1" INSTALLATIONS ONLY.
3. THIS CONFIGURATION IS FOR A DWELLING CONSTRUCTED WITH A FIRE SUPPRESSION SPRINKLER SYSTEM.

BOROUGH OF WYOMISSING

STANDARD DETAIL

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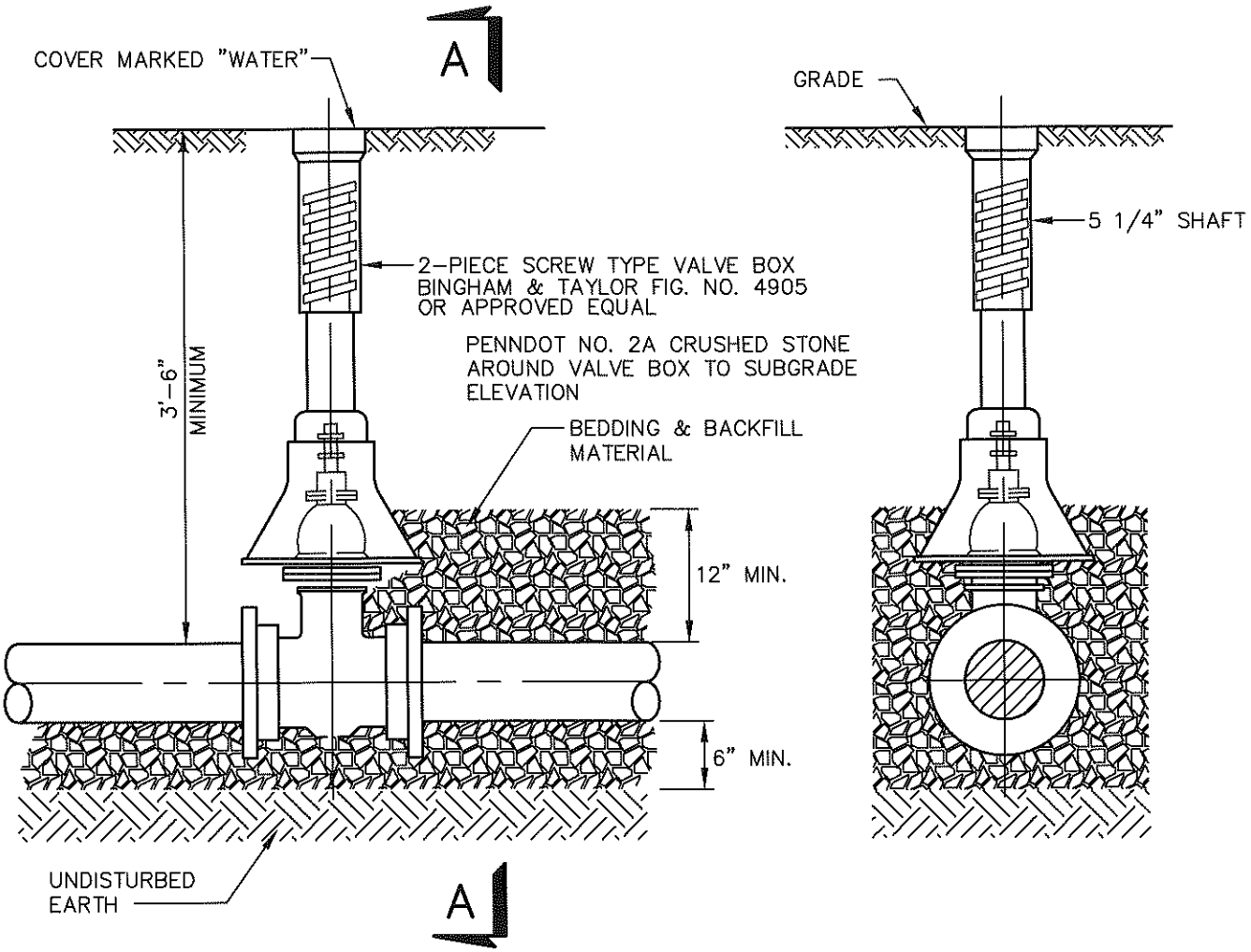
REVISED 2/11

BOROUGH OF WYOMISSING

STANDARD DETAIL



ELEVATION

SECTION A-A

NOTE: VALVE BOX BASES TO BE:

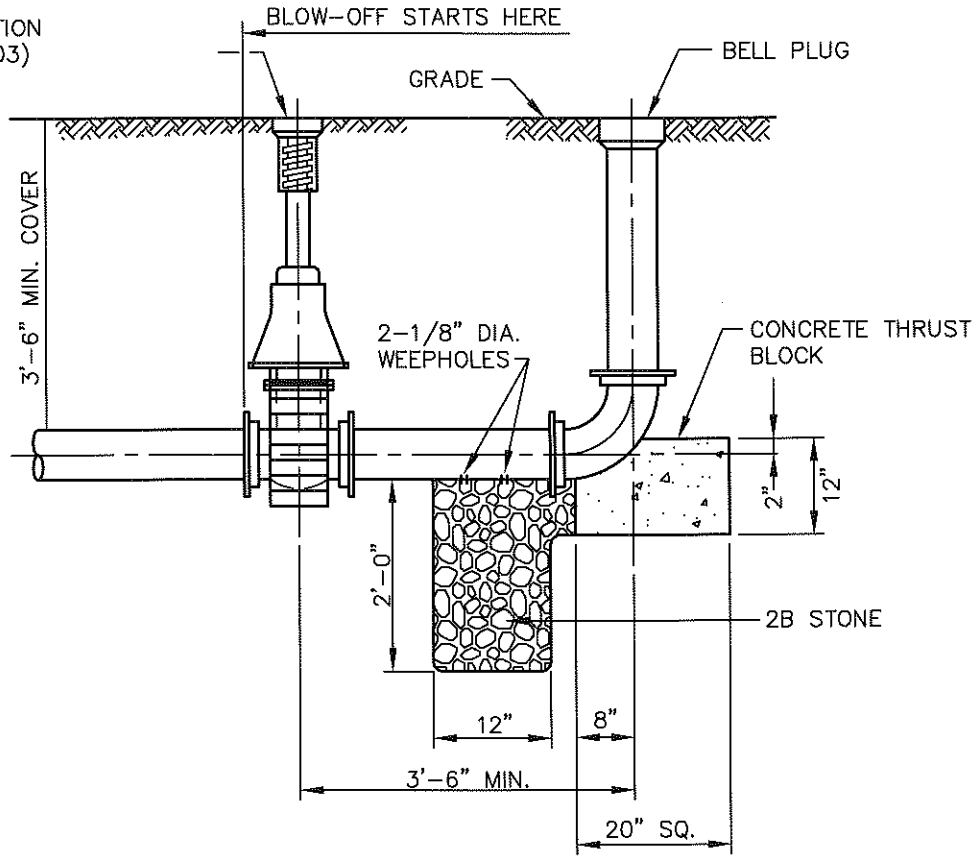
No. 4 DOME	–	VALVES 4" AND SMALLER
No. 6 ROUND	–	6" AND 8" VALVES
No. 160 OVAL	–	10" TO 16" VALVES

GATE VALVE INSTALLATION

BOROUGH OF WYOMISSING

STANDARD DETAIL

STANDARD GATE
VALVE INSTALLATION
(SEE DETAIL\W003)



ELEVATION

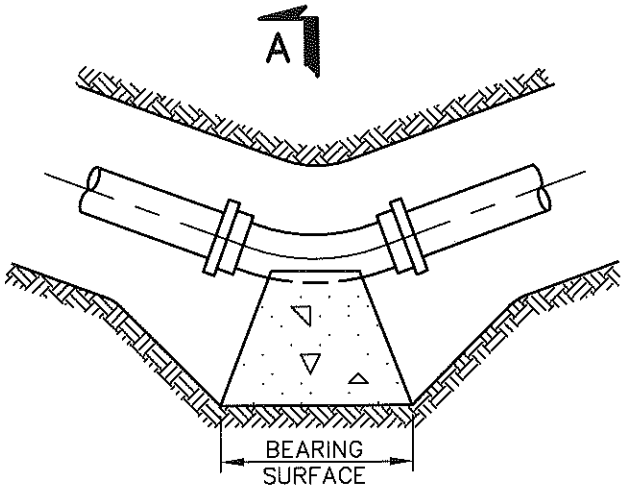
NOTES:

1. PIPE AND VALVE SIZE INDICATED ON DRAWINGS.
2. WHERE POSSIBLE, BLOW-OFFS SHALL BE LOCATED SO THAT DISCHARGE WILL BE TO EXISTING DRAINAGE DITCHES OR STRUCTURES AS DIRECTED BY THE ENGINEER.
3. MUELLER CO. NO. A-410 FABRICATED HIDDEN TYPE FLUSHING HYDRANT AND GIL INDUSTRIES, INC. AQUARIUS ONE-O-ONE GHS 2" SLIM LINE HIDDEN HYDRANT WILL BE CONSIDERED AS ACCEPTABLE ALTERNATES AT CERTAIN LOCATIONS.

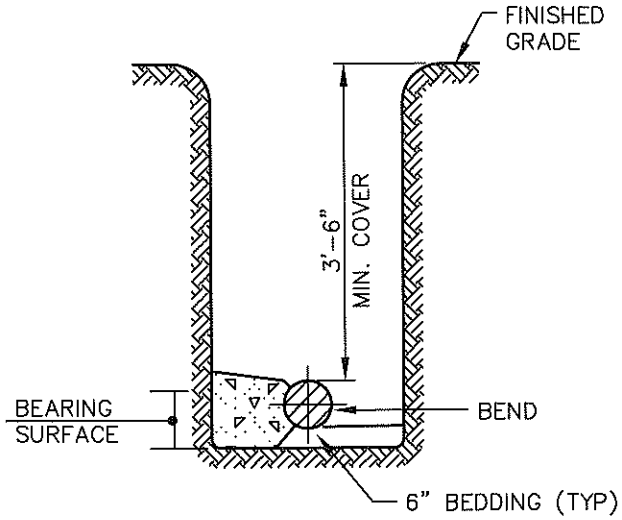
BLOW-OFF

BOROUGH OF WYOMISSING

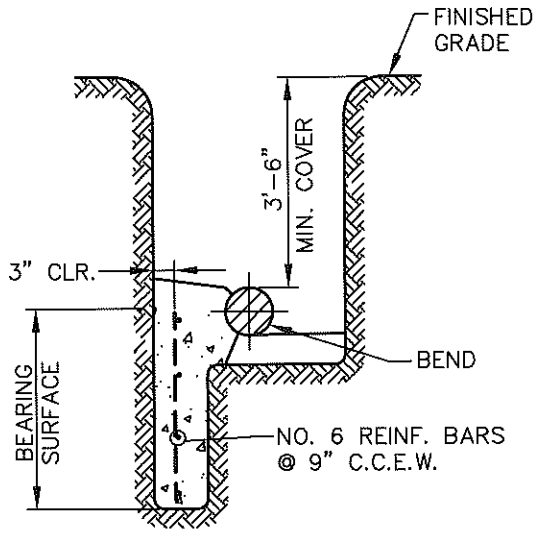
STANDARD DETAIL



PLAN



SECTION A-A



SECTION A-A

ADDITIONAL BEARING AS REQUIRED

NOTES:

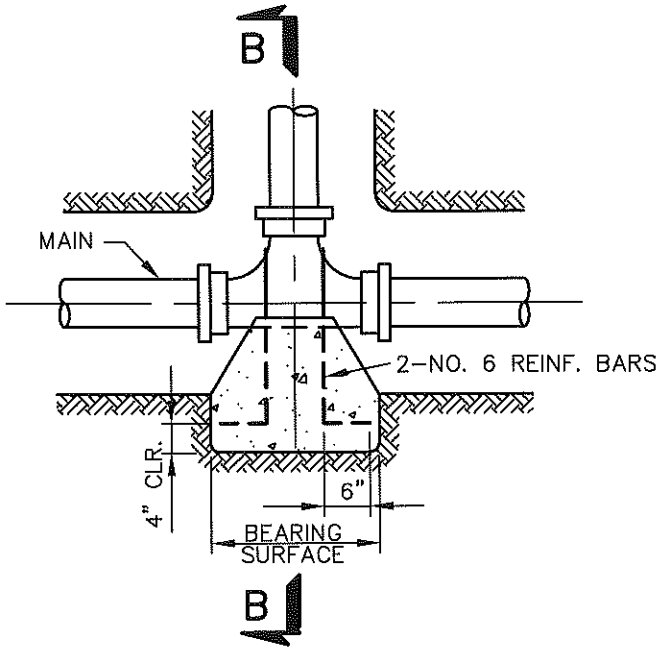
1. SEE STANDARD DETAIL W006 FOR BEARING AREA REQUIRED.
2. NO COUPLING OR JOINTS SHALL BE COVERED WITH CONCRETE.

THRUST BLOCKING FOR BENDS

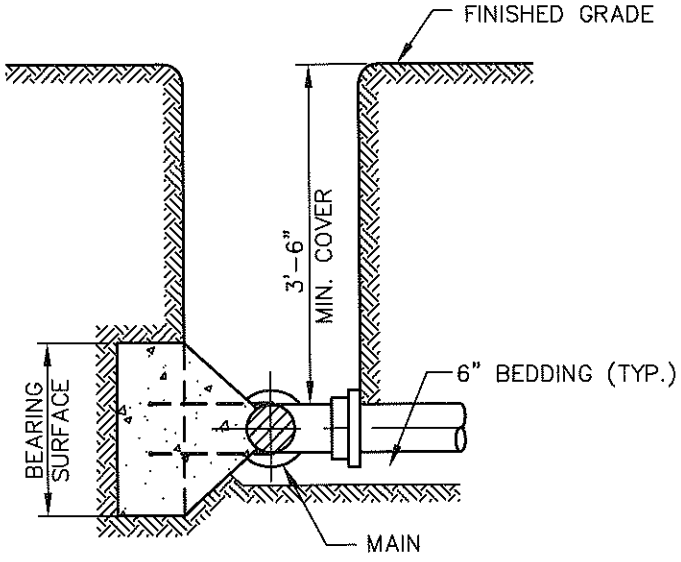
(TYPICAL BLOCKING FOR HORIZONTAL & VERTICAL DOWNWARD THRUSTS UP TO 150 PSI WORKING PRESSURE)

BOROUGH OF WYOMISSING

STANDARD DETAIL



PLAN



SECTION B–B

NOTES:

1. SEE STANDARD DETAIL W006 FOR BEARING AREA REQUIRED.
2. NO COUPLING OR JOINTS SHALL BE COVERED WITH CONCRETE.
3. REINFORCING BAR STRAPS TO BE SHAPED TO PIPE CURVATURE.
4. ALL EXPOSED STEEL TO BE PAINTED WITH TWO COATS ASPHALTIC PAINT.

THRUST BLOCKING FOR TEES

(TYPICAL BLOCKING FOR HORIZONTAL & VERTICAL DOWNWARD THRUSTS UP TO 150 PSI WORKING PRESSURE)

BOROUGH OF WYOMISSING

STANDARD DETAIL

BEARING AREA REQUIRED, SQUARE FEET

TYPE OF BEARING MATERIAL AND ALLOWABLE LOADS, PSF	4" AND LESS DEGREE BEND				6" AND 8" DEGREE BEND				10" AND 12" DEGREE BEND			
	$11\frac{1}{4}$	$22\frac{1}{2}$	45	90	$11\frac{1}{4}$	$22\frac{1}{2}$	45	90	$11\frac{1}{4}$	$22\frac{1}{2}$	45	90
LOOSE SAND OR MEDIUM CLAY – 2,000	1.0	2.0	2.7	4.0	1.5	3.0	6.0	10.0	3.0	6.2	12.0	22.0
PACKED GRAVEL AND SAND – 4,000	1.0	1.0	1.5	2.0	1.0	1.5	3.0	5.0	1.5	3.1	6.0	11.0
ROCK – 10,000	1.0	1.0	1.0	1.0	1.0	1.0	1.2	2.0	1.0	1.3	2.4	4.4

BEARING AREA REQUIRED, SQUARE FEET

TYPE OF BEARING MATERIAL AND ALLOWABLE LOADS	14" AND 16" DEGREE BEND OR DEFLECTION				18" AND 20" DEGREE BEND OR DEFLECTION			
	$11\frac{1}{4}$	$22\frac{1}{2}$	45	90	$11\frac{1}{4}$	$22\frac{1}{2}$	45	90
LOOSE SAND OR MEDIUM CLAY –2,000	6.0	12.0	22.5	40.0	9.5	19.0	37.0	67.0
PACKED GRAVEL AND SAND – 4,000	3.0	6.0	11.3	20.0	4.8	9.5	18.5	33.5
ROCK – 10,000	1.2	2.4	4.5	8.0	2.0	3.8	7.4	13.5

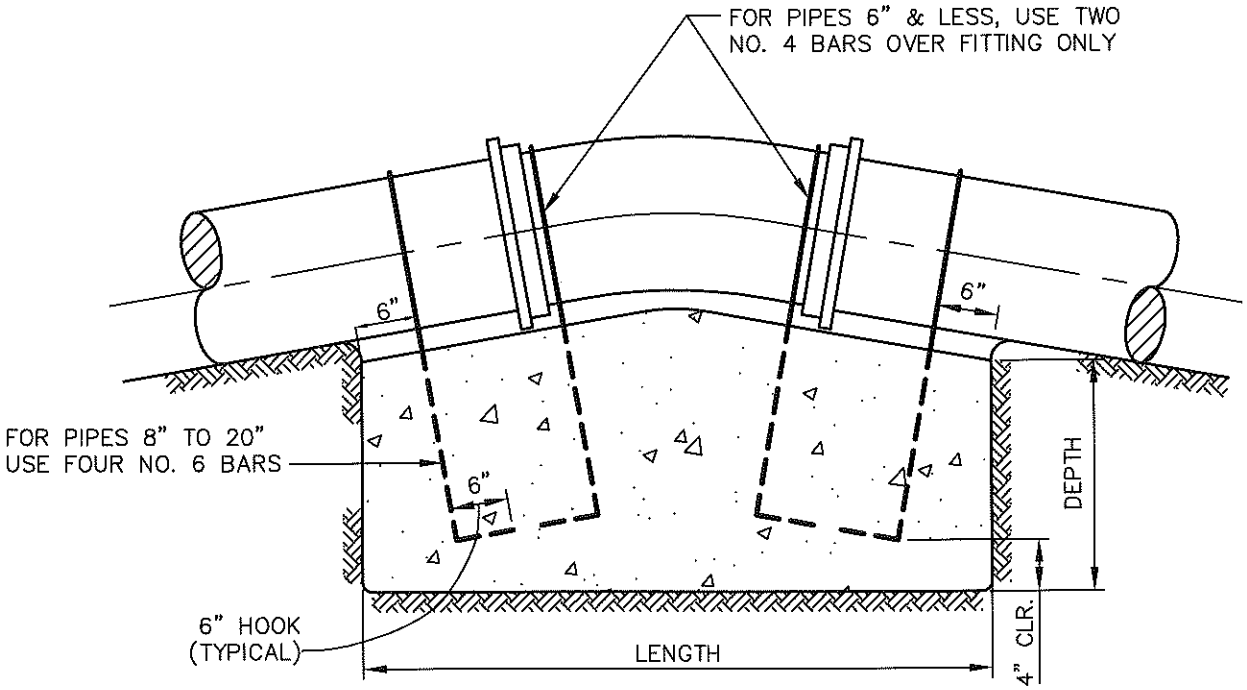
NOTE: THRUST BLOCKING FOR TEES SHALL HAVE THE SAME BEARING AREA AS 90° BENDS OF THE PIPE SIZE OF THE OUTLET. DEAD ENDS SHALL HAVE THE SAME BEARING AS 90° BENDS.

THRUST BLOCKING SCHEDULE

(SCHEDULE OF DIMENSIONS UP TO 150 PSI WORKING PRESSURE)

BOROUGH OF WYOMISSING

STANDARD DETAIL



TYPICAL SECTION

PIPE SIZES (inches)	DIMENSIONS OF CONCRETE BLOCKING								
	LENGTH			WIDTH			DEPTH		
	$11\frac{1}{4}°$	$22\frac{1}{2}°$	45°	$11\frac{1}{4}°$	$22\frac{1}{2}°$	45°	$11\frac{1}{4}°$	$22\frac{1}{2}°$	45°
4 & SMALLER	2'	4'	4'	1.5'	3'	3'	1'	2'	3'
6 & 8	3'	4'	6'	3'	3'	3'	2'	3'	4'
10 & 12	4.5'	6'	8'	3'	3'	4'	3'	4.5'	5'
14 & 16	6'	8'	11'	3.5'	3.5'	5'	3.5'	5'	5'
18 & 20	7'	9'	13'	4'	5'	5.5'	4'	5'	6'

NOTES:

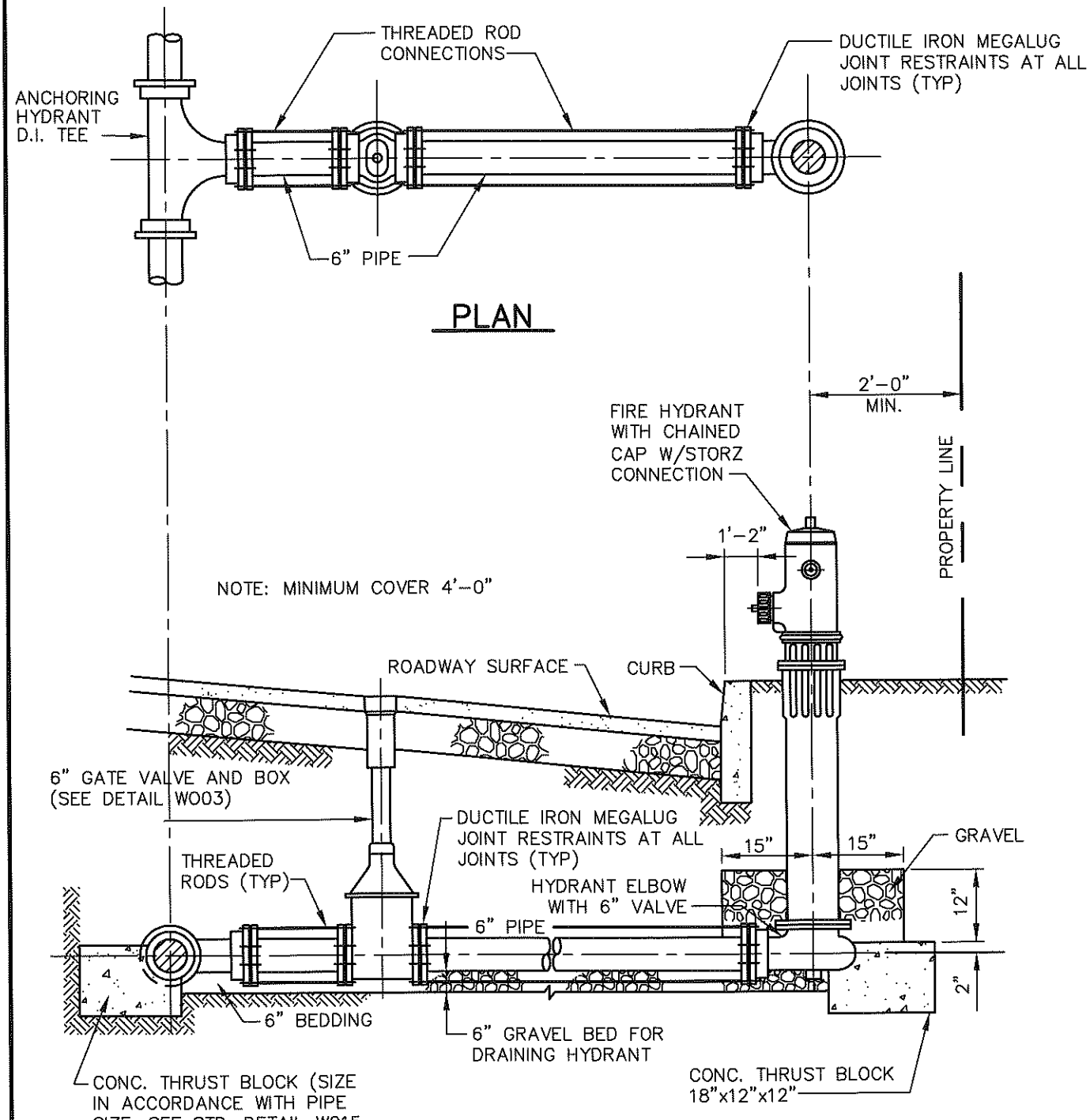
1. NO COUPLING OR JOINTS SHALL BE COVERED WITH CONCRETE.
2. REINFORCING BAR STRAPS TO BE SHAPED TO PIPE CURVATURE.
3. ALL EXPOSED STEEL TO BE PAINTED WITH TWO COATS ASPHALTIC PAINT.

THRUST BLOCKING – VERTICAL THRUSTS

(VERTICAL THRUSTS UPWARD
UP TO 150 PSI WORKING PRESSURE)

BOROUGH OF WYOMISSING

STANDARD DETAIL



ELEVATION

NOTE : ALL THREADED RODS SHALL BE COATED WITH BITUMASTIC AFTER INSTALLATION.

FIRE HYDRANT INSTALLATION

(AT CURBS WITH RODDED CONNECTIONS)

APPROVED FIRE HYDRANT IS AN AMERICAN FLOW CONTROL-B62B TRAFFIC MODEL WITH BERKS COUNTY THREADS

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REVISED 11/13

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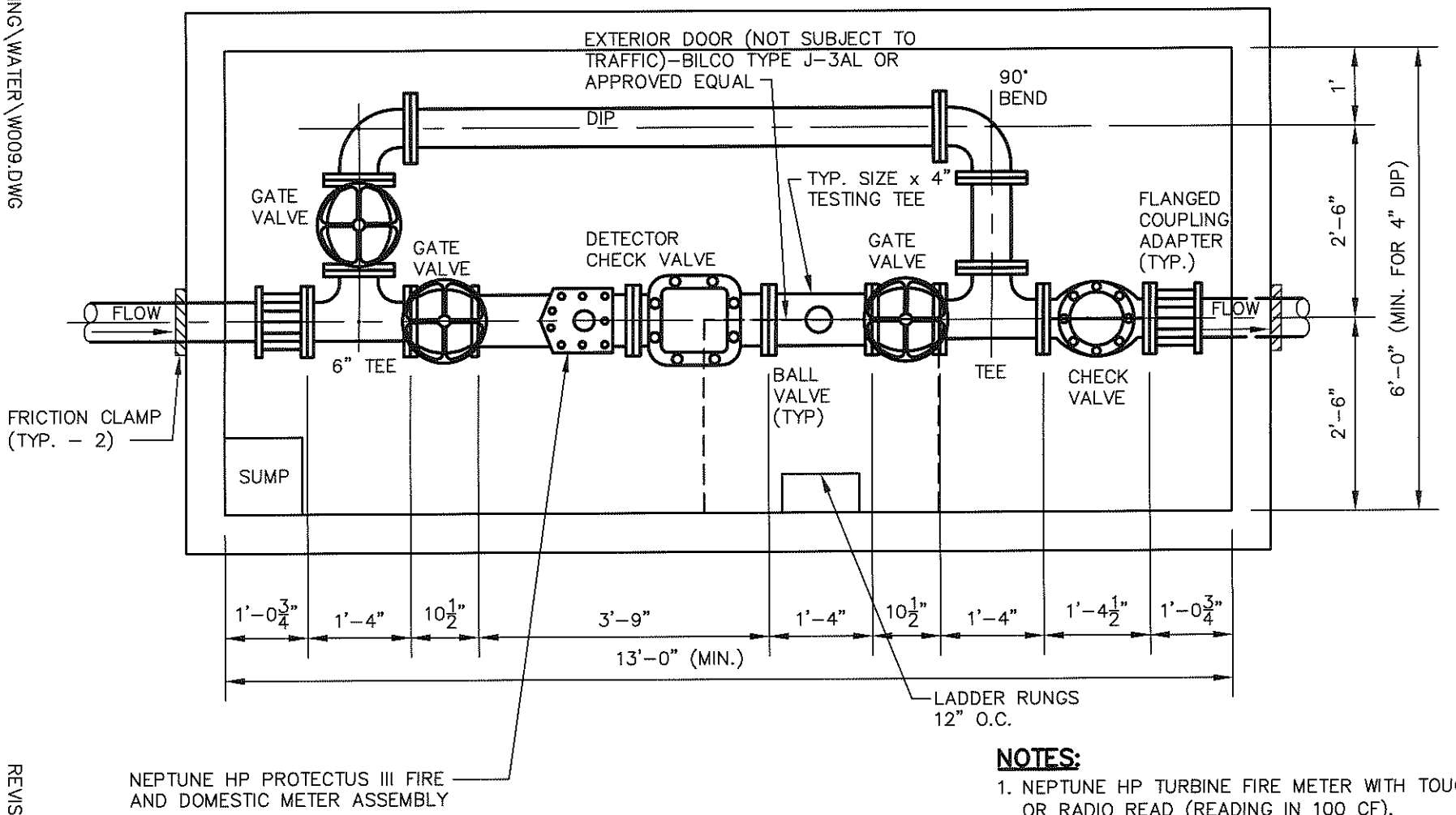
BOROUGH OF WYOMISSING

STANDARD DETAIL

TYPICAL METER PIT
4"–8" FIRE AND DOMESTIC SERVICE



PLAN VIEW

NOTES:

1. NEPTUNE HP TURBINE FIRE METER WITH TOUCH PAD OR RADIO READ (READING IN 100 CF).
2. NEPTUNE T–10 2" DOMESTIC METER WITH TOUCH PAD OR RADIO READ (READING IN 10 CF).
3. DOUBLE BACKFLOW PREVENTION EQUIPMENT MAY BE UTILIZED UPON APPROVAL OF OWNER/ENGINEER.

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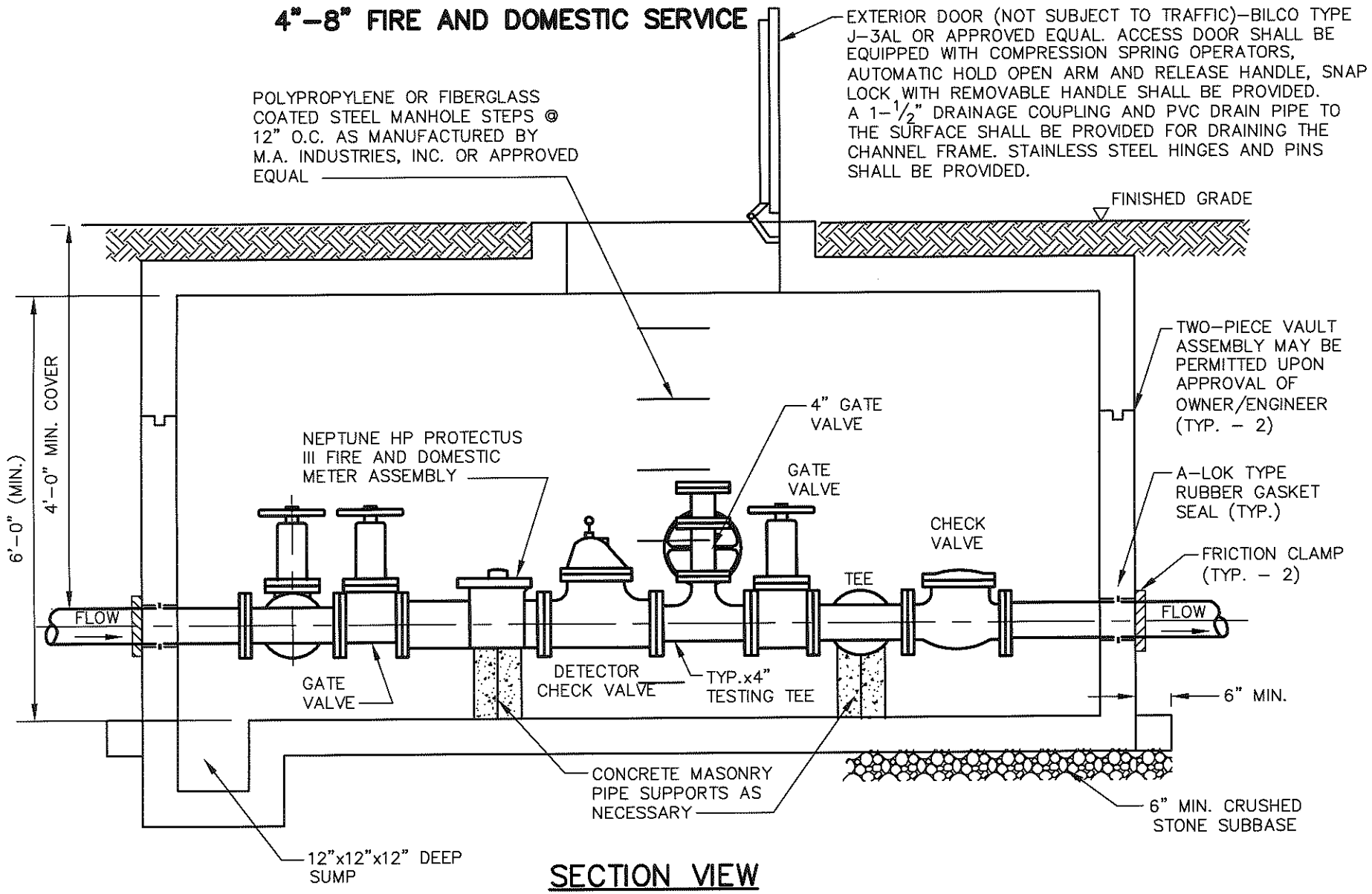
STANDARD DETAIL

TYPICAL METER PIT

4"–8" FIRE AND DOMESTIC SERVICE



SECTION VIEW

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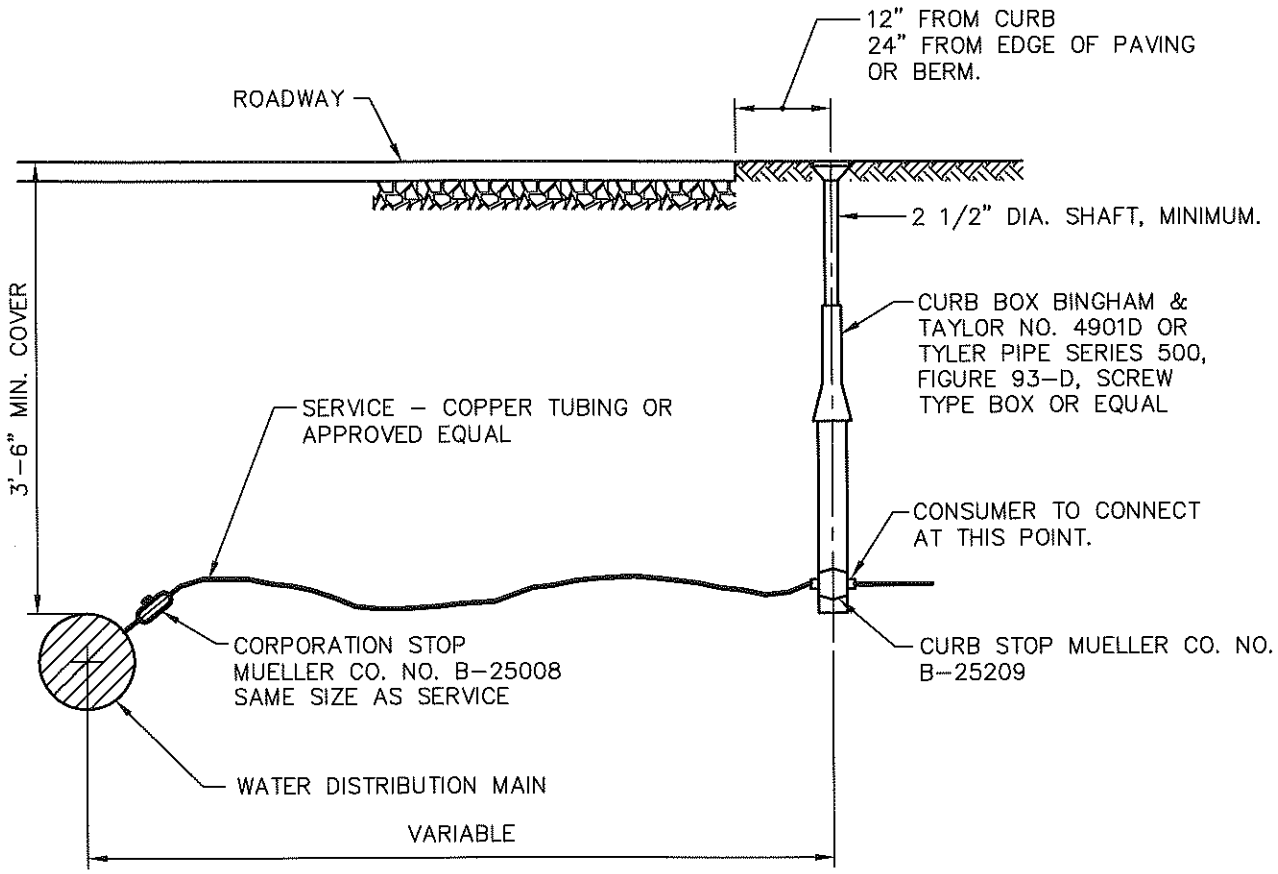
REVISED 12/13

BOROUGH OF WYOMISSING

STANDARD DETAIL



ELEVATION

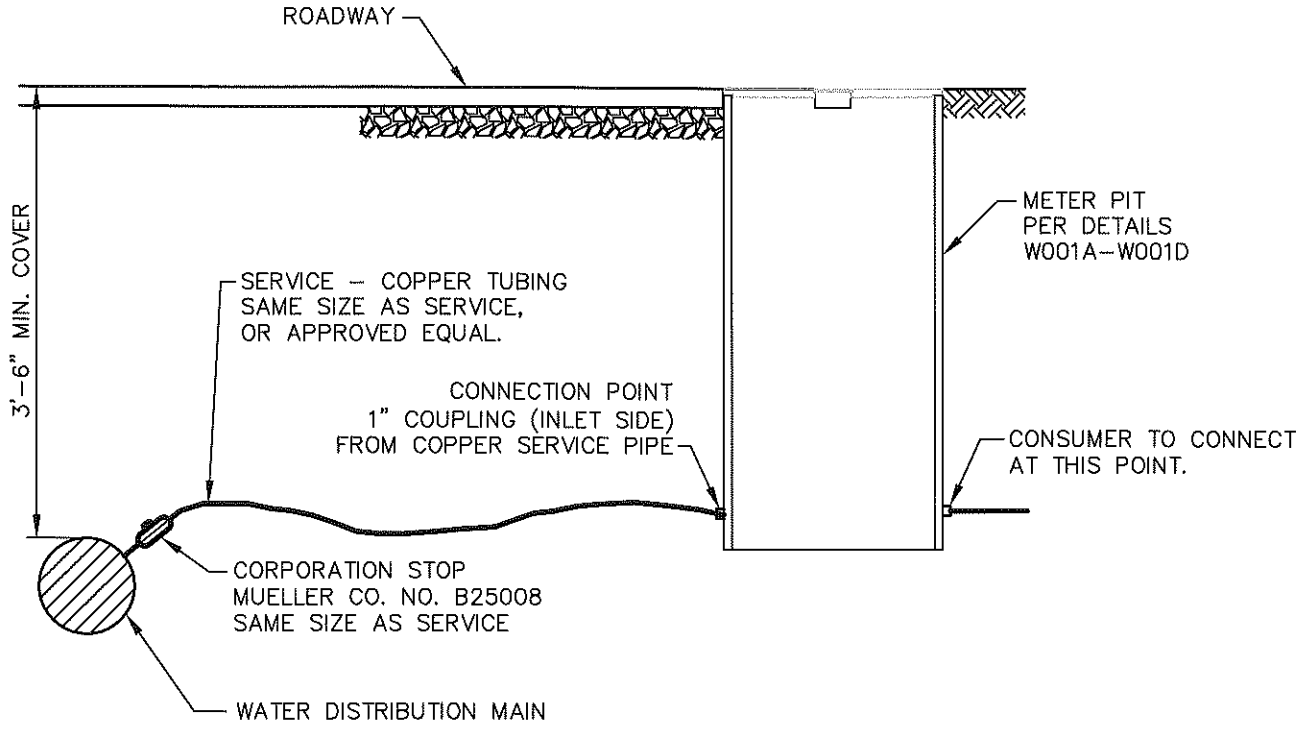
SERVICE CONNECTIONS

($^{3}/_{4}$" AND 1")

NOTE: IF DISTANCE FROM RIGHT-OF-WAY LINE TO BUILDING EXCEEDS 100 FEET, THE METER SHALL BE INSTALLED IN A METER BOX. SEE DETAILS W024, W024A, OR W024B FOR METER BOX DETAILS. METER BOX SHALL BE LOCATED WITHIN 5'-0" OF THE RIGHT-OF-WAY LINE ON THE PROPERTY OWNER'S SIDE OF SAID LINE OR AS APPROVED BY WATER AUTHORITY.

BOROUGH OF WYOMISSING

STANDARD DETAIL



ELEVATION

NOTE:

1. WHEN MAKING 1-1/2" AND 2" TAP ON 12" OR SMALLER DIP MAIN, USE MUELLER CO. H10400 SERIES SADDLES, OR APPROVED EQUAL.

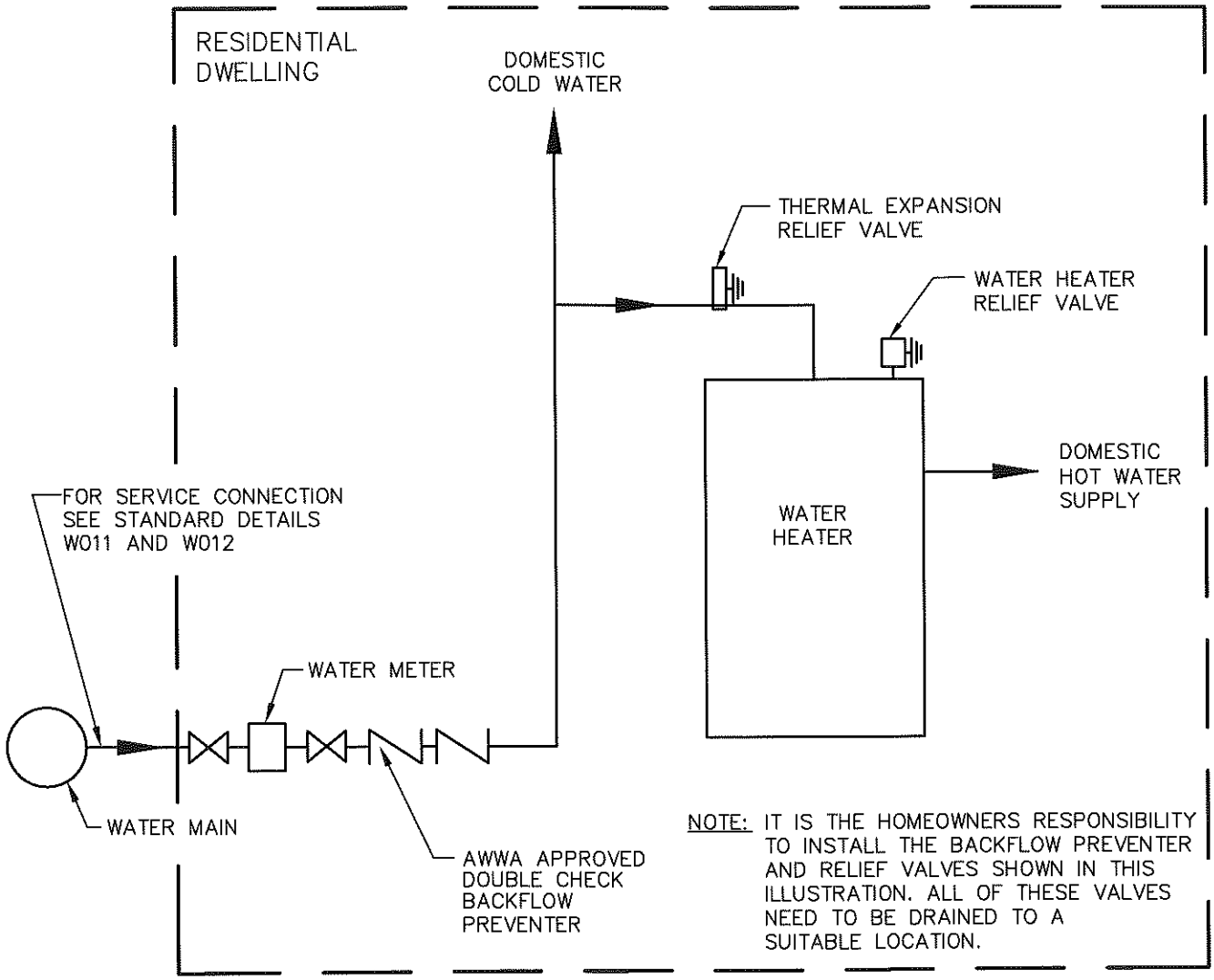
SERVICE CONNECTIONS

($1\frac{1}{2}$" AND 2")

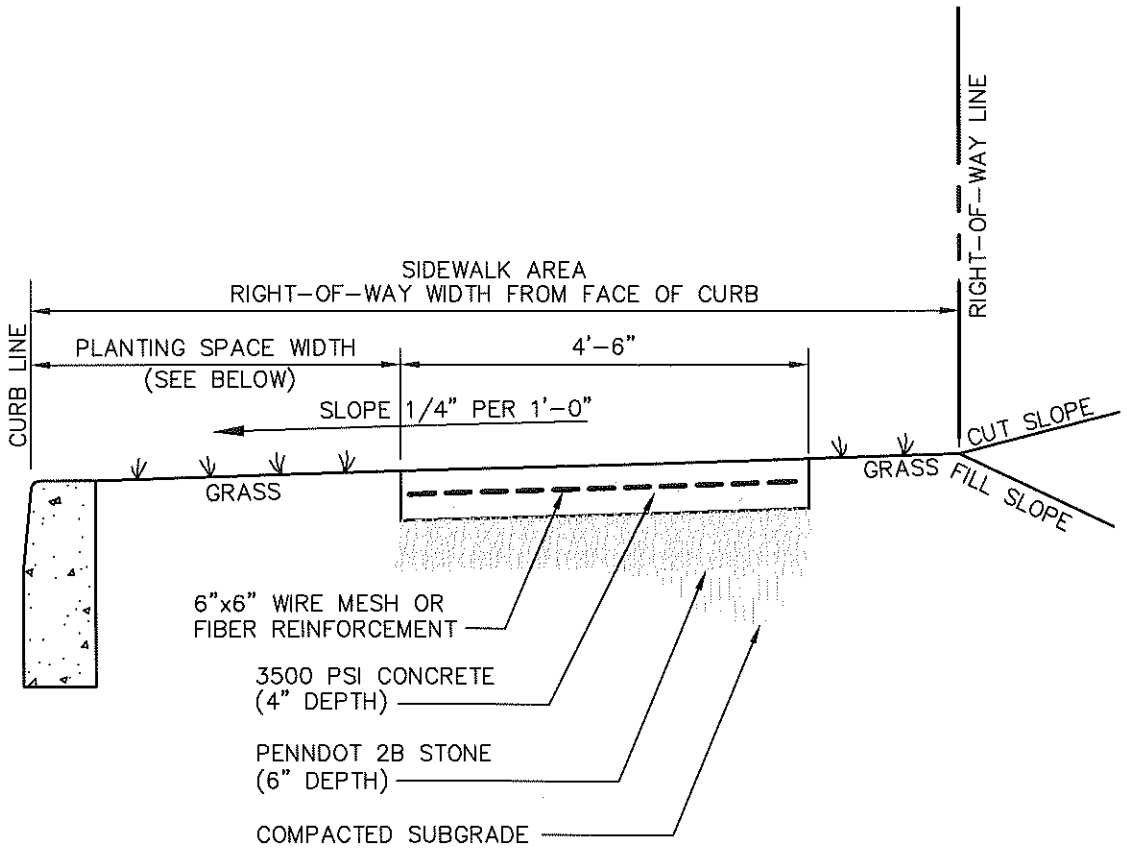
NOTE: IF DISTANCE FROM RIGHT-OF-WAY LINE TO BUILDING EXCEEDS 100 FEET, THE METER SHALL BE INSTALLED IN A METER BOX. SEE DETAIL W024C FOR METER BOX DETAILS. METER BOX SHALL BE LOCATED WITHIN 5'-0" OF THE RIGHT-OF-WAY LINE ON THE PROPERTY OWNER'S SIDE OF SAID LINE OR AS APPROVED BY WATER AUTHORITY.

BOROUGH OF WYOMISSING

STANDARD DETAIL



TYPICAL RESIDENTIAL METER INSTALLATION



RIGHT-OF-WAY WIDTH FROM FACE OF CURB	PLANTING SPACE WIDTH
10'-0" TO 11'-6"	5'-2"
12'-0" TO 16'-0"	6'-2"
OVER 16'-0"	10'-0"

SIDEWALK CROSS-SECTION

SCALE: NONE

BOROUGH OF WYOMISSING

STANDARD DETAIL CS001

11/13

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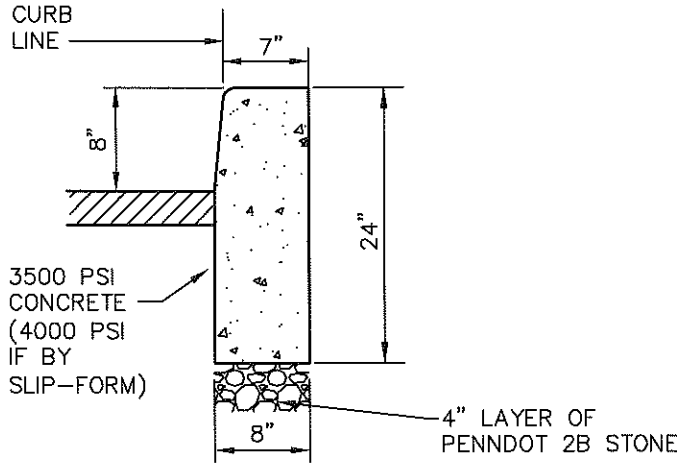
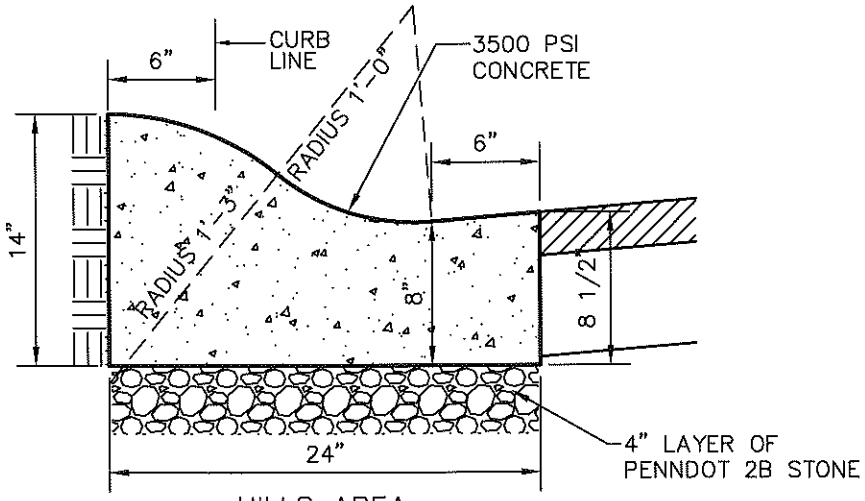
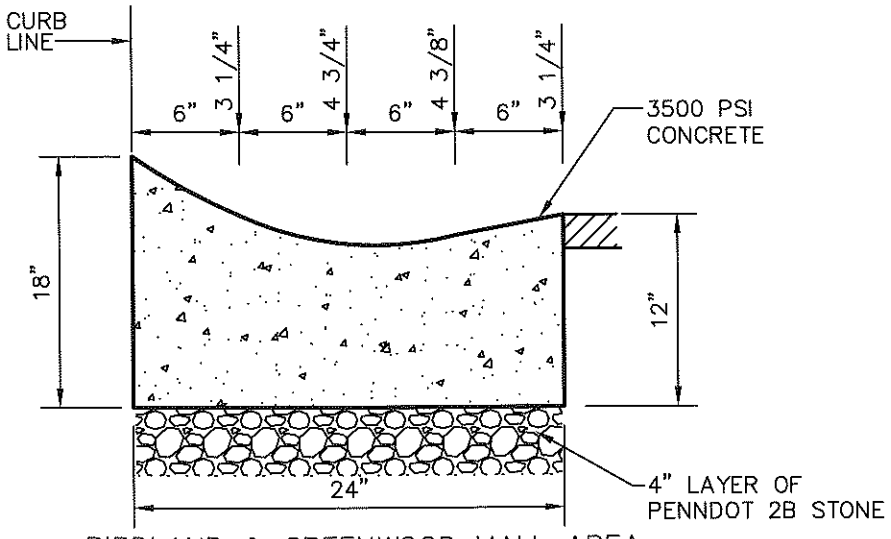


VERTICAL CURB



HILLS AREA

STANDARD ROLLED CURB



BIRDLAND & GREENWOOD MALL AREA

STANDARD ROLLED CURB

NOTE

TYPE OF CURBING SHALL MATCH THE EXISTING TYPE ALONG THE SAME STREET.

CURB CROSS-SECTIONS

SCALE: NONE

BOROUGH OF WYOMISSING

STANDARD DETAIL CS002

11/13

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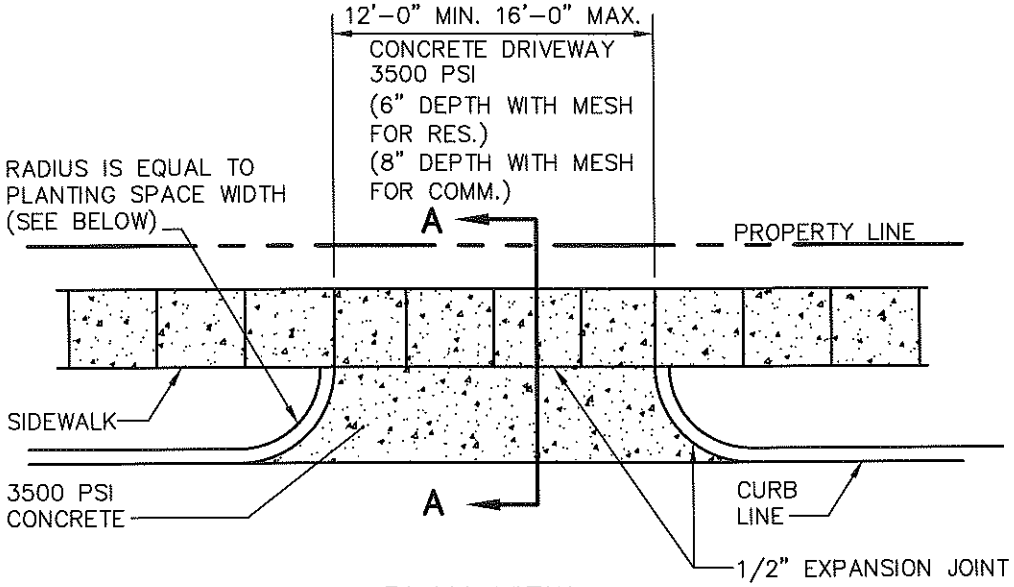
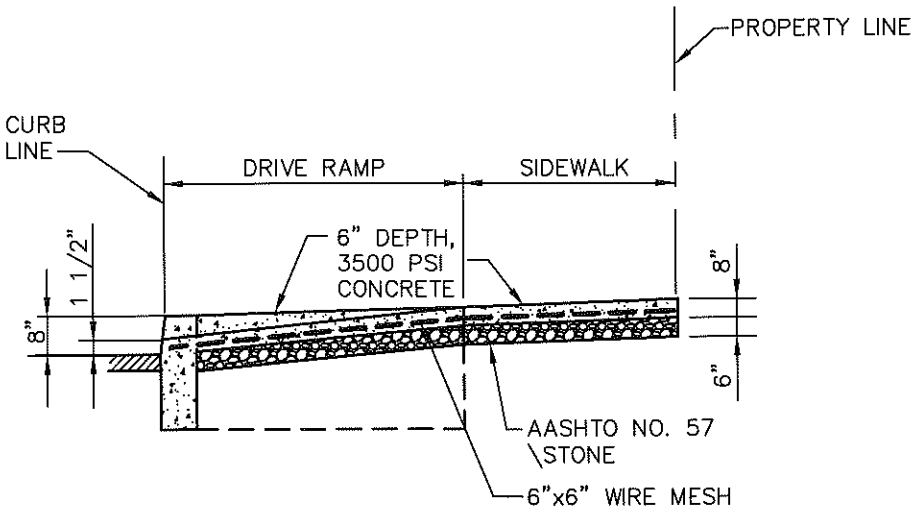


PLAN VIEW



SECTION A-A

RIGHT-OF-WAY WIDTH FROM FACE OF CURB	PLANTING SPACE WIDTH
10'-0" TO 11'-6"	5'-2"
12'-0" TO 16'-0"	6'-2"
OVER 16'-0"	10'-0"

RESIDENTIAL DRIVEWAY ENTRANCE

SCALE: NONE

BOROUGH OF WYOMISSING

STANDARD DETAIL CS003

11/13

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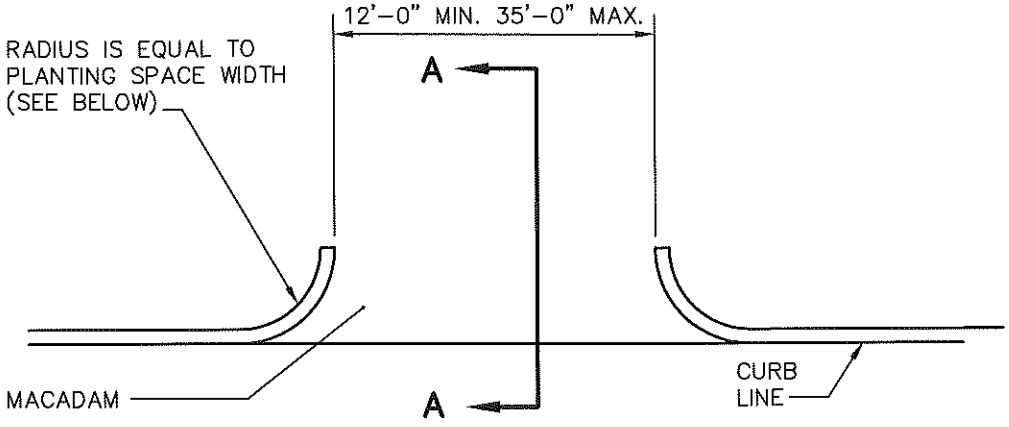
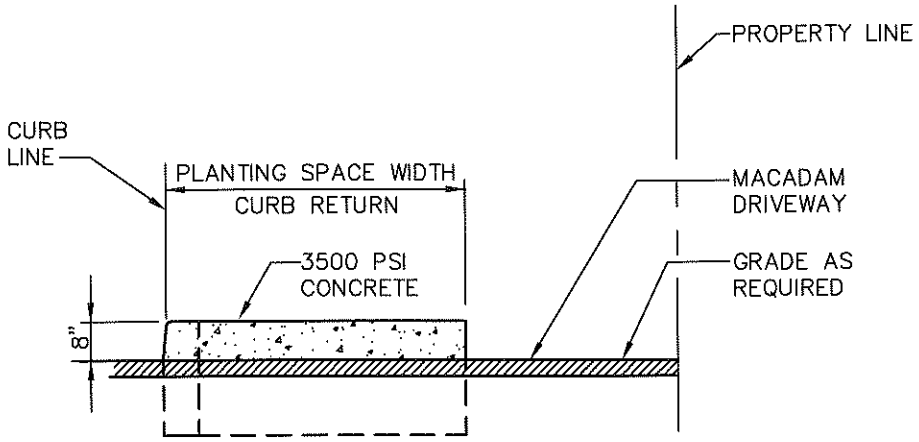


PLAN VIEW



SECTION A-A

RIGHT-OF-WAY WIDTH FROM FACE OF CURB	PLANTING SPACE WIDTH
10'-0" TO 11'-6"	5'-2"
12'-0" TO 16'-0"	6'-2"
OVER 16'-0"	10'-0"

NON-RESIDENTIAL DRIVEWAY ENTRANCE

SCALE: NONE

BOROUGH OF WYOMISSING

STANDARD DETAIL CS004

11/13

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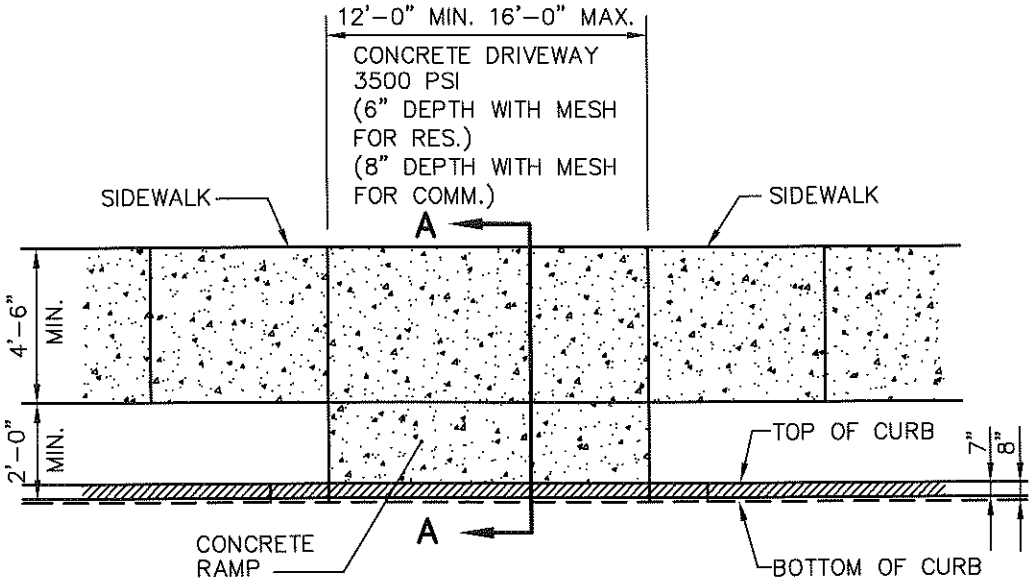
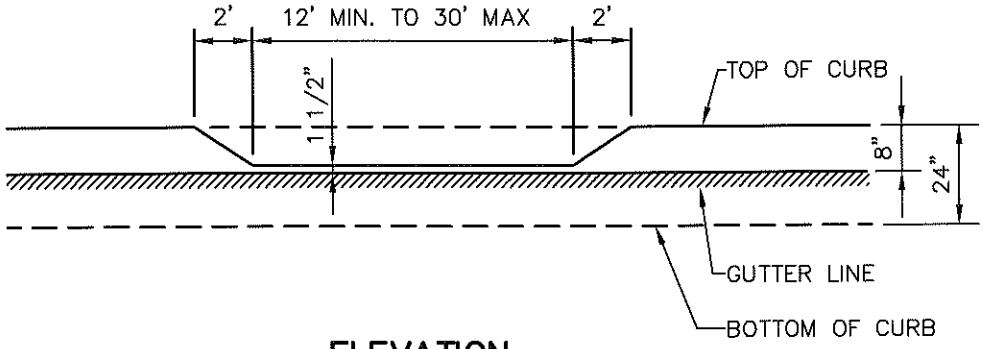
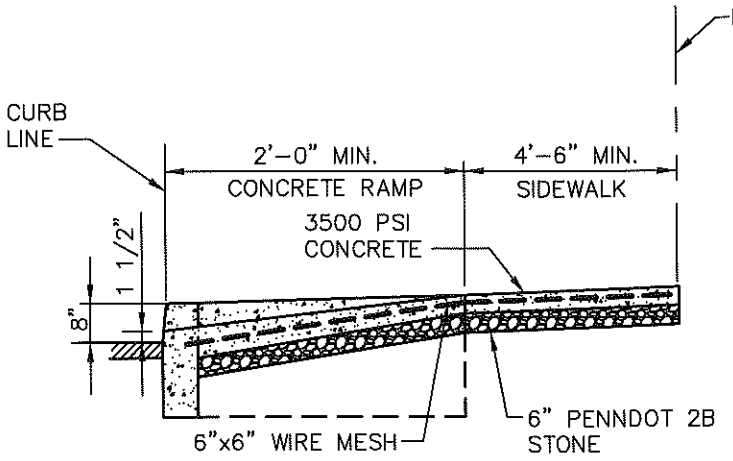


PLAN VIEW



ELEVATION



SECTION A-A

NOTE:

1. LOCATE EXPANSION JOINTS EVERY 20'-0" OR LESS.

DRIVEWAY DETAIL FOR HILLS AREA

SCALE: NONE

BOROUGH OF WYOMISSING

STANDARD DETAIL CS005

11/13

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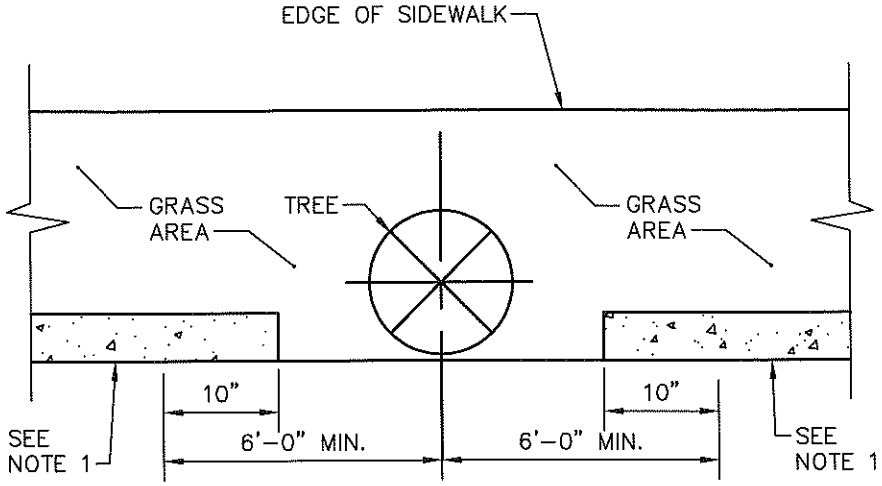
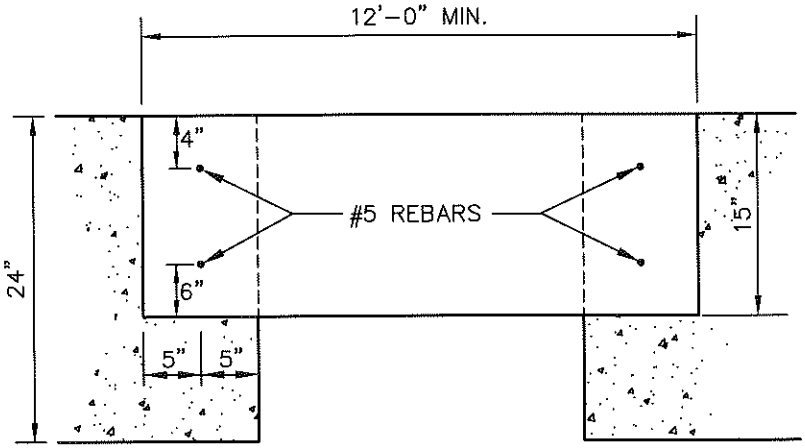


NOTES

1. CONCRETE CURB SECTIONS USED IN THE INSTALLATION OF A STEEL TREE PLATE SHALL BE A MINIMUM FIVE FEET (5') IN LENGTH.
2. LENGTH OF TREE PLATE MAY BE GREATER THAN 12' BUT MUST RECEIVE APPROVAL BY THE PUBLIC WORKS MANAGER PRIOR TO INSTALLATION.

PLAN VIEW



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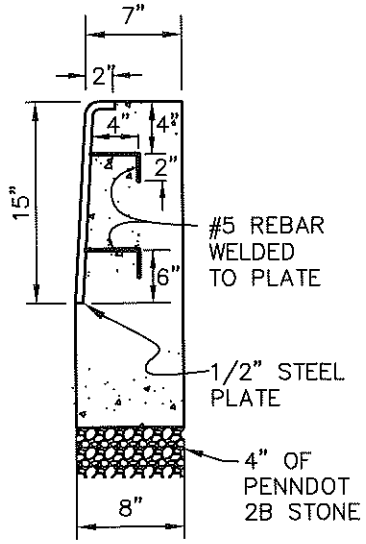

SECTION

STEEL TREE PLATE FOR CURBING

SCALE: NONE

BOROUGH OF WYOMISSING

STANDARD DETAIL CS006

11/13

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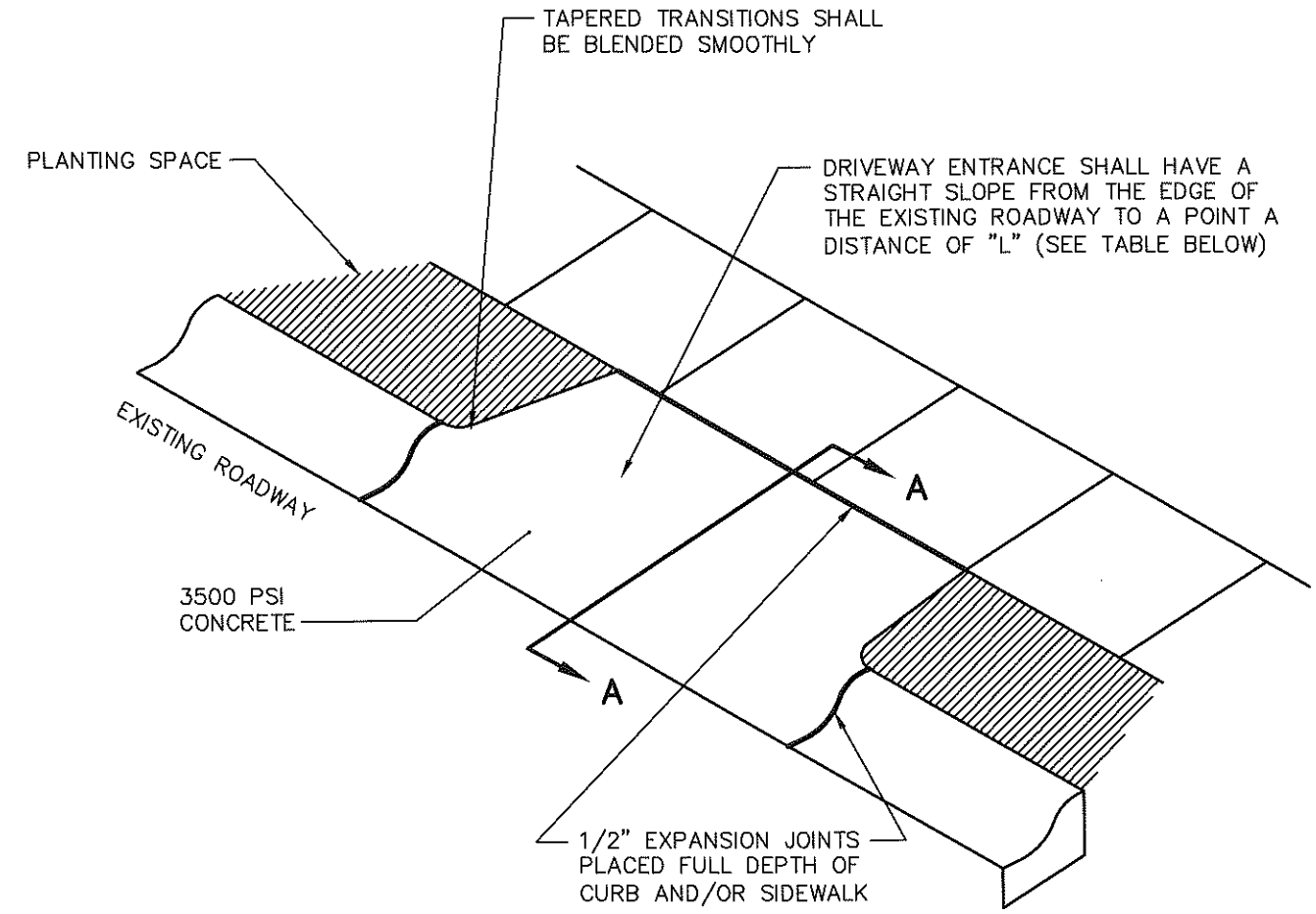

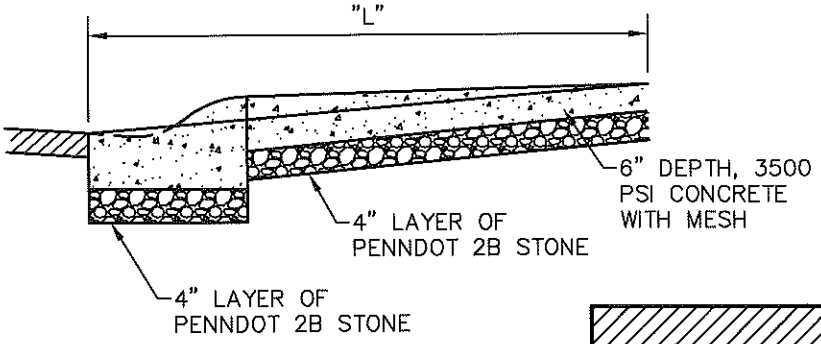

SECTION A–A

"L" VALUES

	"L"
SIDEWALK BEHIND CURB	PLANTING SPACE WIDTH
NO SIDEWALK BEHIND CURB	5'–2"

DRIVEWAY DETAIL FOR ROLLED CURB AREAS

SCALE: NONE

BOROUGH OF WYOMISSING

STANDARD DETAIL CS007

11/13

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HANDICAPPED RAMP STANDARDS

NOTES

1. CURB RAMPS SHALL COMPLY WITH ALL THE AMERICANS WITH DISABILITIES ACT, PUBLIC RIGHT-OF-WAY GUIDELINES (PROWAG), THE ADA ACCESSIBILITY GUIDELINES (ADAAG) AND PENNDOT STANDARD DRAWINGS FOR ROADWAY CONSTRUCTION RC-67M, LATEST EDITION, EXCEPTING MATERIAL AND DEPTHS OF THE BOROUGH FACILITIES AS SPECIFIED IN THE STANDARD SPECIFICATIONS.

2. THE CROSS SLOPE OF THE CURB RAMP, SIDEWALKS AND LANDING AREA SHALL BE NO GREATER THAN 1:50, OR 2.00%.

3. THE PEDESTRIAN WARNING DEVICE SHALL BE PLACED ON THE CURB RAMP SO THAT THE TRUNCATED DOMES PATTERN IS ALIGNED PARALLEL TO THE DIRECTION OF THE PEDESTRIAN TRAVEL.

4. PEDESTRIAN WARNING DEVICE SHALL BE TWENTY-FOUR INCHES (24") MINIMUM IN LENGTH IN THE DIRECTION OF THE PEDESTRIAN TRAVEL AND ACROSS THE FULL WIDTH OF THE RAMP.

5. PEDESTRIAN WARNING DEVICES SHALL BE MADE OF A POLYMER COMPOSITE MATERIAL WITH EMBEDMENT FLANGES AND ANCHORS ON ITS UNDERSIDE. INSTALLATION MUST BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS. THE COLOR MUST BE BRICK RED. SPECIFICATIONS FOR PEDESTRIAN WARNING DEVICES ARE SUBJECT TO REVIEW AND APPROVAL BY THE BOROUGH ENGINEER.

6. MODIFY CURB RAMP DETAILS TO ADAPT DIMENSIONS TO EXISTING CURB HEIGHTS WHERE THE CURB IS LESS THAN THE STANDARD EIGHT INCH (8") REVEAL.

7. RESTORATION OF ALL ADJACENT AREAS SHALL BE TO A CONDITION GREATER OR EQUAL TO THE PREEXISTING CONDITION AND IN ACCORDANCE WITH ALL OTHER APPLICABLE SECTIONS OF THE STANDARD SPECIFICATIONS.

8. ANY CHEEKWALL TO BE INSTALLED MUST BE OF THE SAME CONCRETE AS THE SIDEWALK, HAVE AN EQUIVALENT STONE SUBBASE, AND EXTEND A MINIMUM OF EIGHT INCHES (8") BENEATH THE SURFACE OF THE ADJACENT SIDEWALK IN ADDITION TO THE REQUIRED REVEAL.

9. CONCRETE MATERIAL, STONE AND DEPTHS SHALL BE IN ACCORDANCE WITH THE HANDICAPPED RAMP STANDARD CS017.

10. ANY RAMP NOT IN FULL COMPLIANCE WITH THE HANDICAPPED RAMP STANDARDS SHALL OBTAIN APPROVAL FROM THE BOROUGH OF WYOMISSING PRIOR TO ANY CONSTRUCTION ACTIVITIES.

BOROUGH OF WYOMISSING

STANDARD DETAIL CS008

11/13

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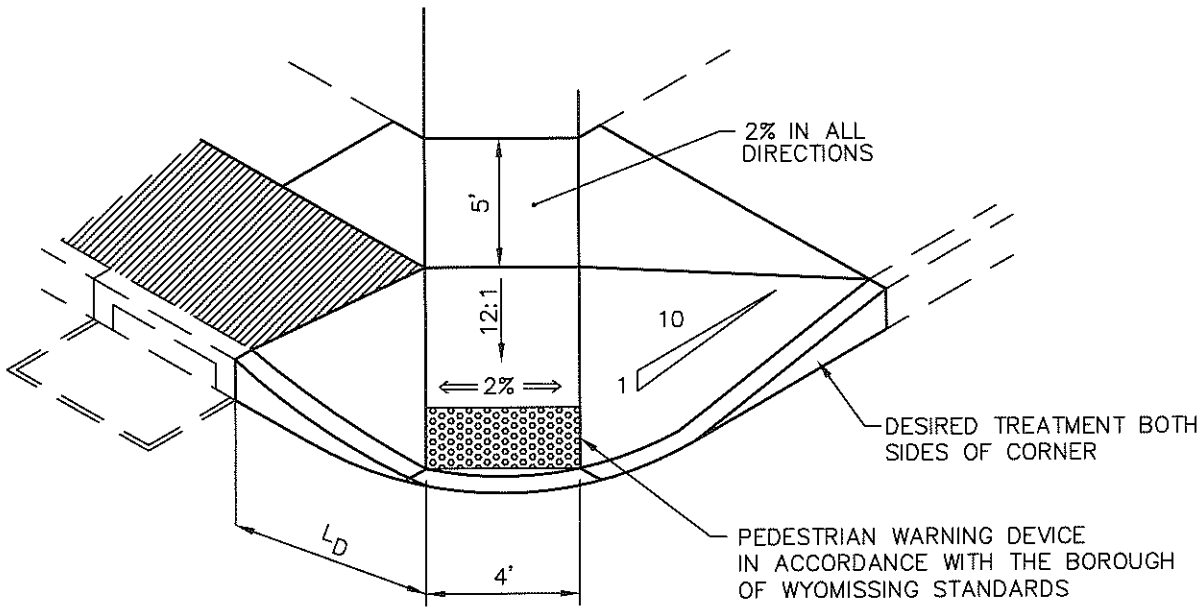

TYPE I (DIAGONAL) ADA RAMP

HANDICAPPED RAMP STANDARDS

SCALE: NONE

NOTES

1. SLOPES AS SPECIFIED ARE MAXIMUM VALUES.
2. LENGTH L_D MAY ONLY BE USED WHEN AN EXISTING STRUCTURE PROHIBITS THE REQUIRED LENGTH.

BOROUGH OF WYOMISSING

STANDARD DETAIL CS009

11/13

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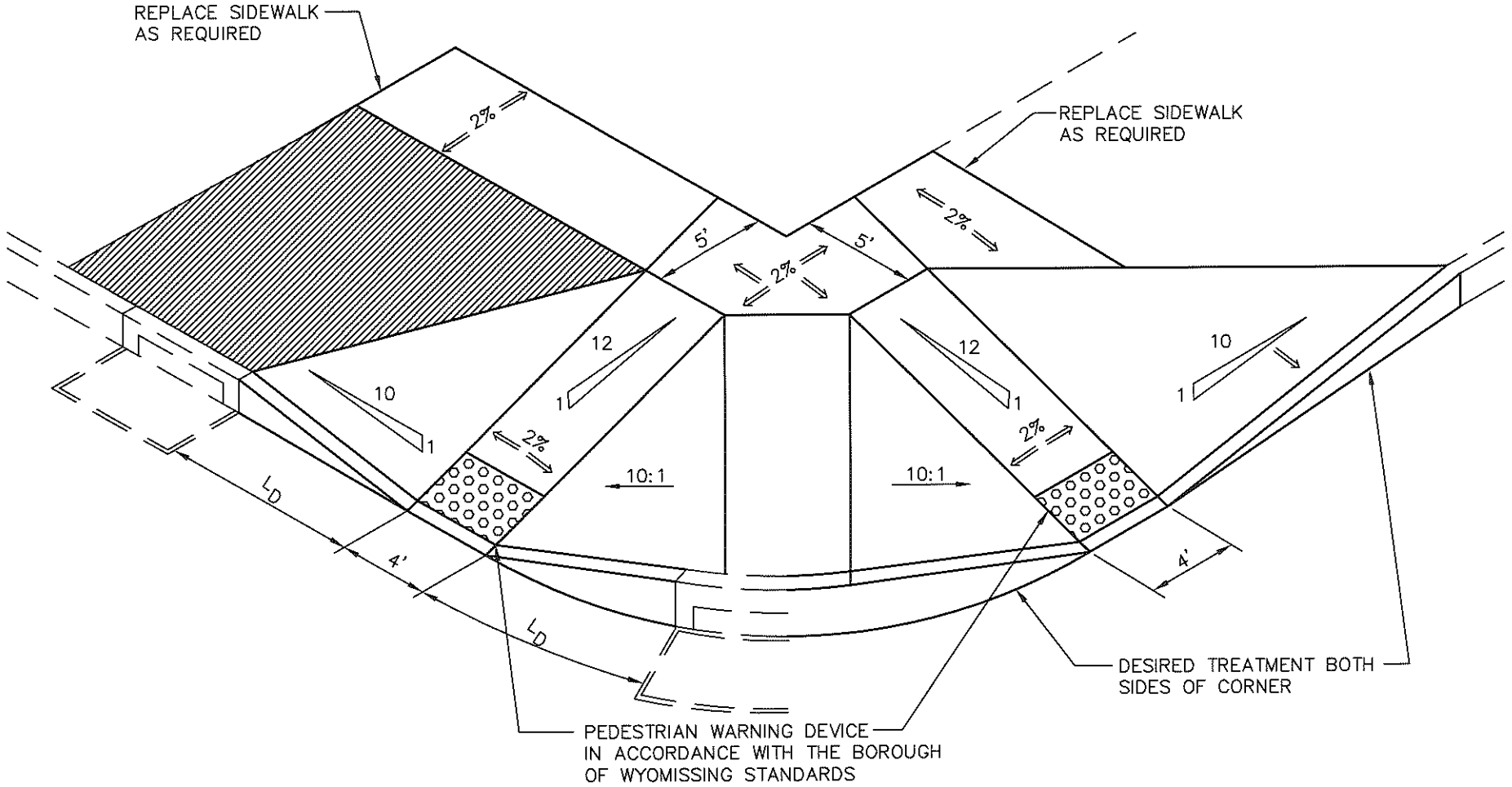

TYPE I (DOUBLE) ADA RAMP

HANDICAPPED RAMP STANDARDS

SCALE: NONE

NOTES

1. SLOPES AS SPECIFIED ARE MAXIMUM VALUES.
2. LENGTH L_D MAY ONLY BE USED WHEN AN EXISTING STRUCTURE PROHIBITS THE REQUIRED LENGTH.

BOROUGH OF WYOMISSING

STANDARD DETAIL CS010

11/13

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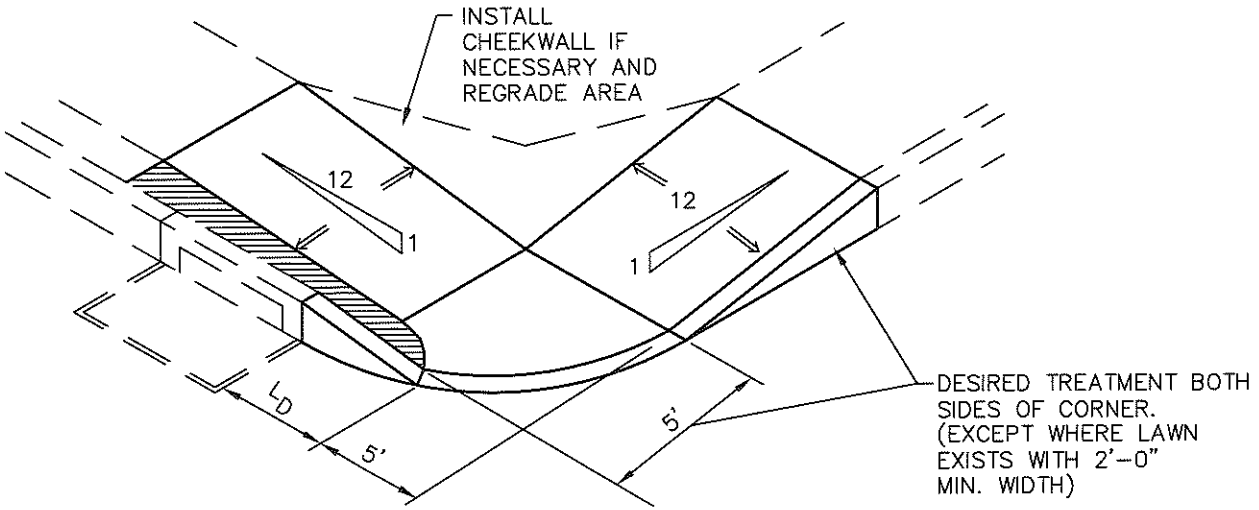

TYPE I-A ADA RAMP

HANDICAPPED RAMP STANDARDS

SCALE: NONE

NOTES

1. SLOPES AS SPECIFIED ARE MAXIMUM VALUES.
2. LENGTH L_D MAY ONLY BE USED WHEN AN EXISTING STRUCTURE PROHIBITS THE REQUIRED LENGTH.

BOROUGH OF WYOMISSING

STANDARD DETAIL CS011

11/13

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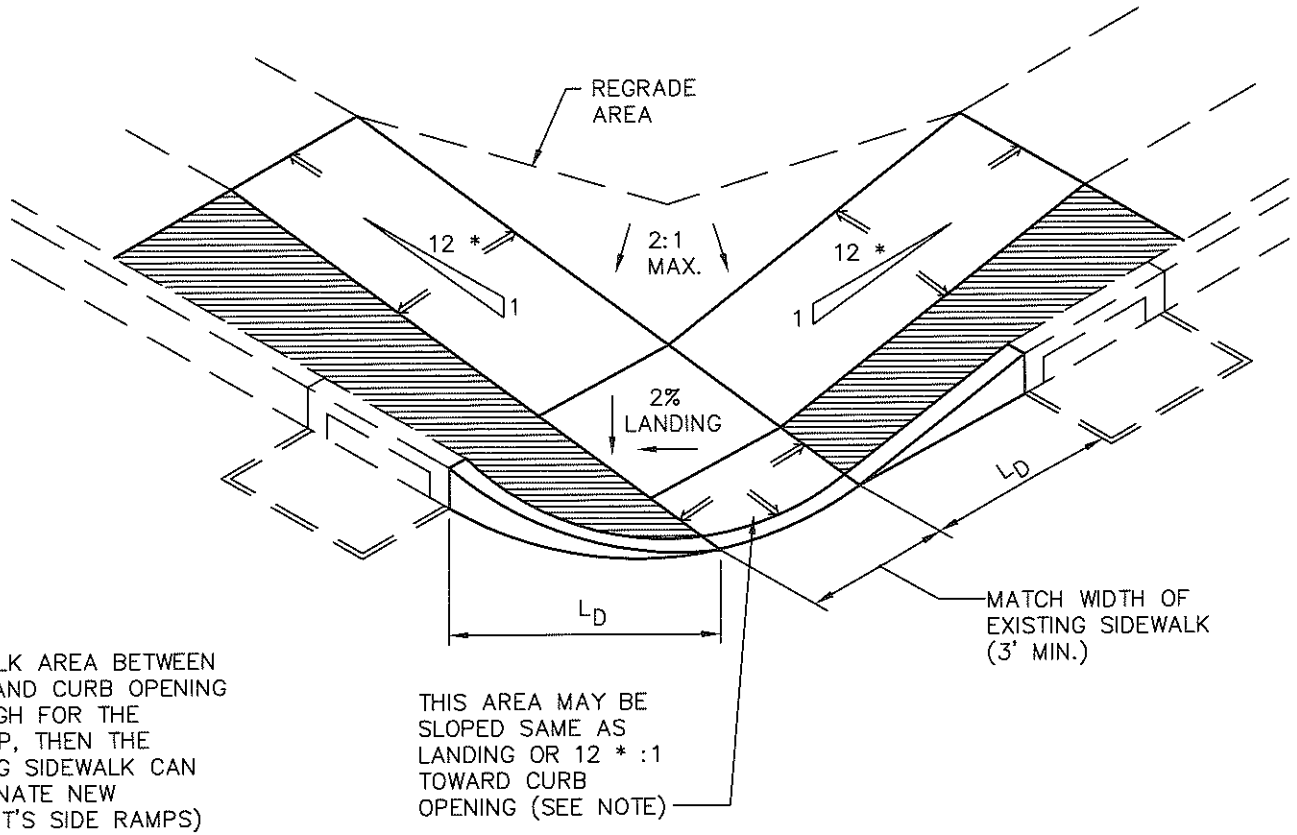

NOTE:
1. IF THE SIDEWALK AREA BETWEEN THE LANDING AND CURB OPENING IS LONG ENOUGH FOR THE REQUIRED RAMP, THEN THE OTHER EXISTING SIDEWALK CAN REMAIN. (ELIMINATE NEW LANDING AND IT'S SIDE RAMPS)

TYPE I–B ADA RAMP

HANDICAPPED RAMP STANDARDS

SCALE: NONE

NOTES

1. SLOPES AS SPECIFIED ARE MAXIMUM VALUES.
2. LENGTH L_D MAY ONLY BE USED WHEN AN EXISTING STRUCTURE PROHIBITS THE REQUIRED LENGTH.

BOROUGH OF WYOMISSING

STANDARD DETAIL CS012

11/13

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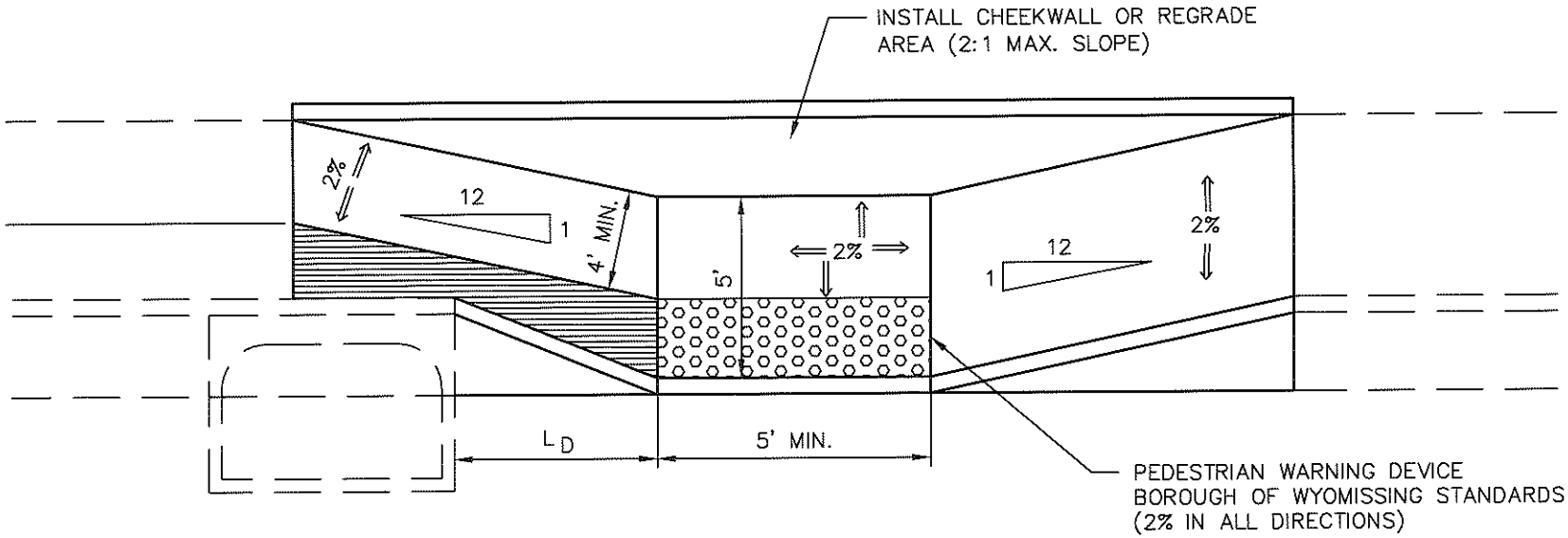

TYPE 2 ADA RAMP

HANDICAPPED RAMP STANDARDS

SCALE: NONE

NOTES

1. SLOPES AS SPECIFIED ARE MAXIMUM VALUES.
2. LENGTH L_D MAY ONLY BE USED WHEN AN EXISTING STRUCTURE PROHIBITS THE REQUIRED LENGTH.

BOROUGH OF WYOMISSING

STANDARD DETAIL CS013

11/13

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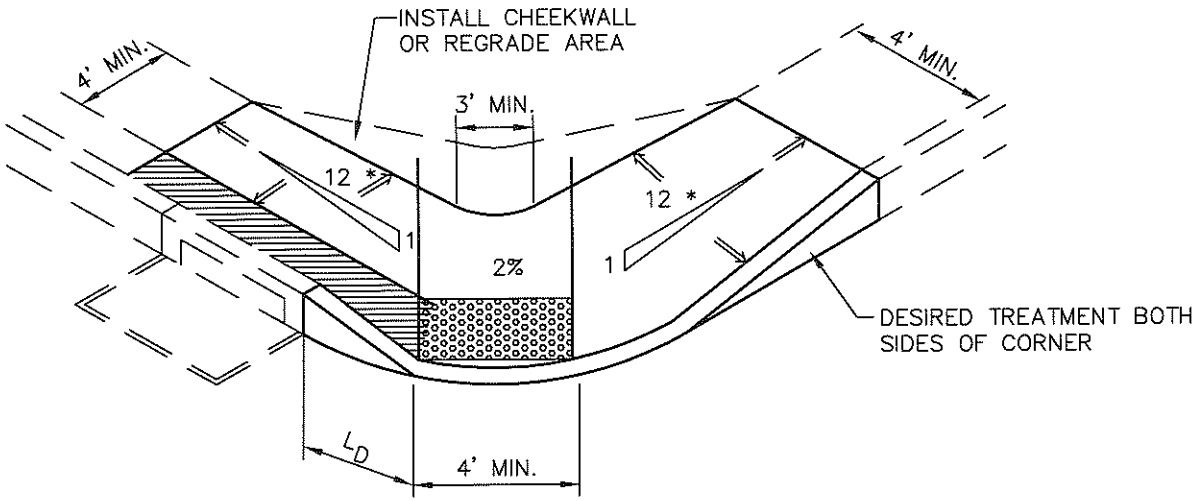

TYPE 2–A ADA RAMP

HANDICAPPED RAMP STANDARDS

SCALE: NONE

NOTES

1. SLOPES AS SPECIFIED ARE MAXIMUM VALUES.
2. LENGTH L_D MAY ONLY BE USED WHEN AN EXISTING STRUCTURE PROHIBITS THE REQUIRED LENGTH.

BOROUGH OF WYOMISSING

STANDARD DETAIL CS014

11/13

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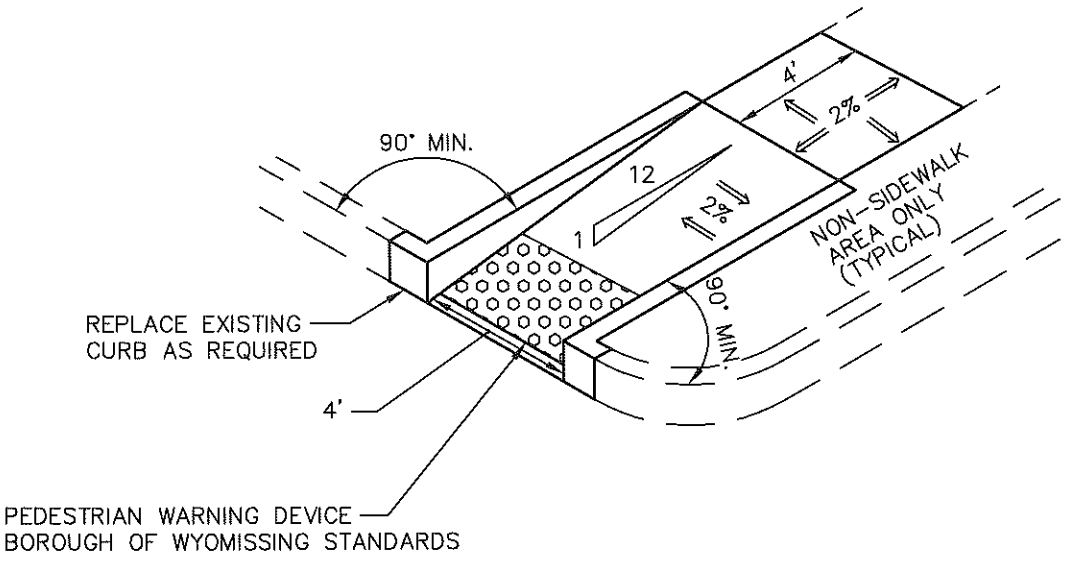
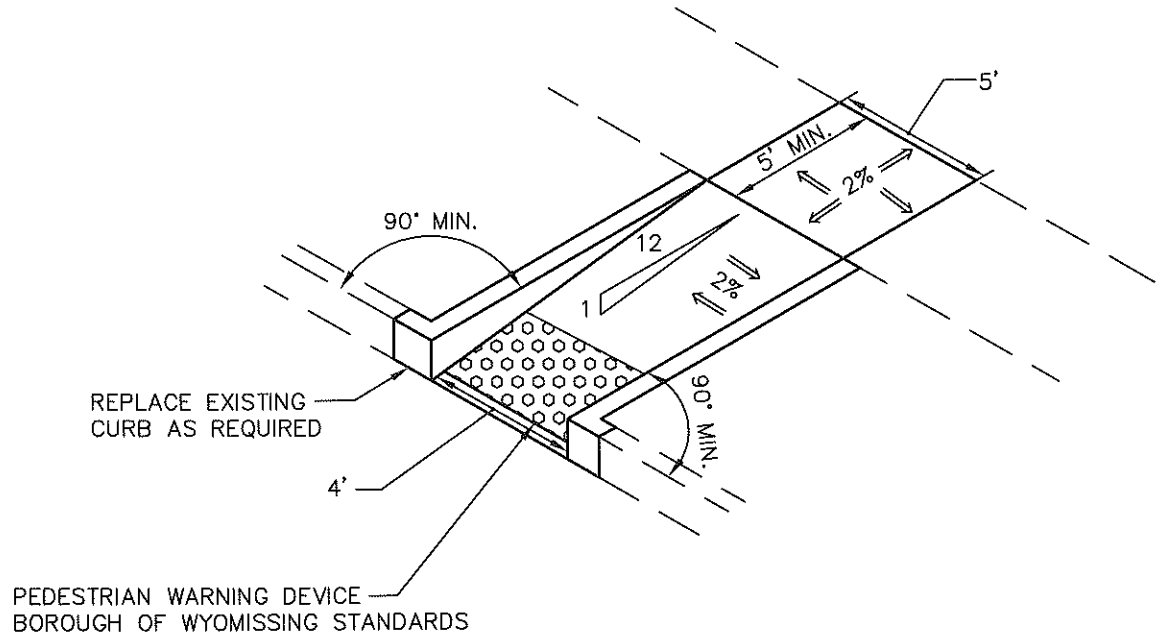


TYPE IV ADA RAMP



TYPE IV ADA RAMP

HANDICAPPED RAMP STANDARDS

SCALE: NONE

NOTES

1. SLOPES AS SPECIFIED ARE MAXIMUM VALUES.
2. LENGTH L_D MAY ONLY BE USED WHEN AN EXISTING STRUCTURE PROHIBITS THE REQUIRED LENGTH.

BOROUGH OF WYOMISSING

STANDARD DETAIL CS015

11/13

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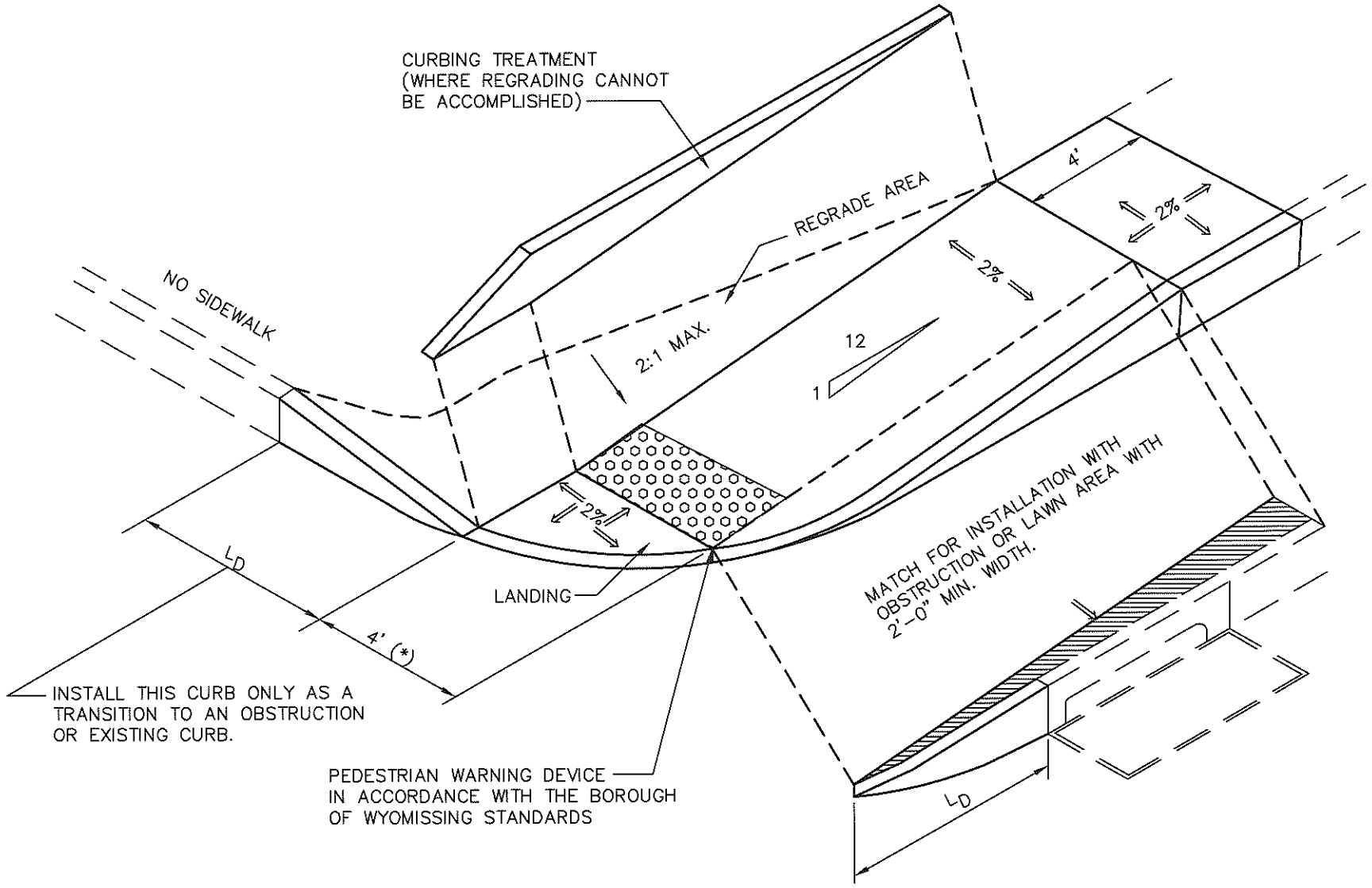

TYPE 4–A ADA RAMP

HANDICAPPED RAMP STANDARDS

SCALE: NONE

NOTES

1. SLOPES AS SPECIFIED ARE MAXIMUM VALUES.
2. LENGTH L_D MAY ONLY BE USED WHEN AN EXISTING STRUCTURE PROHIBITS THE REQUIRED LENGTH.

BOROUGH OF WYOMISSING

STANDARD DETAIL CS016

11/13

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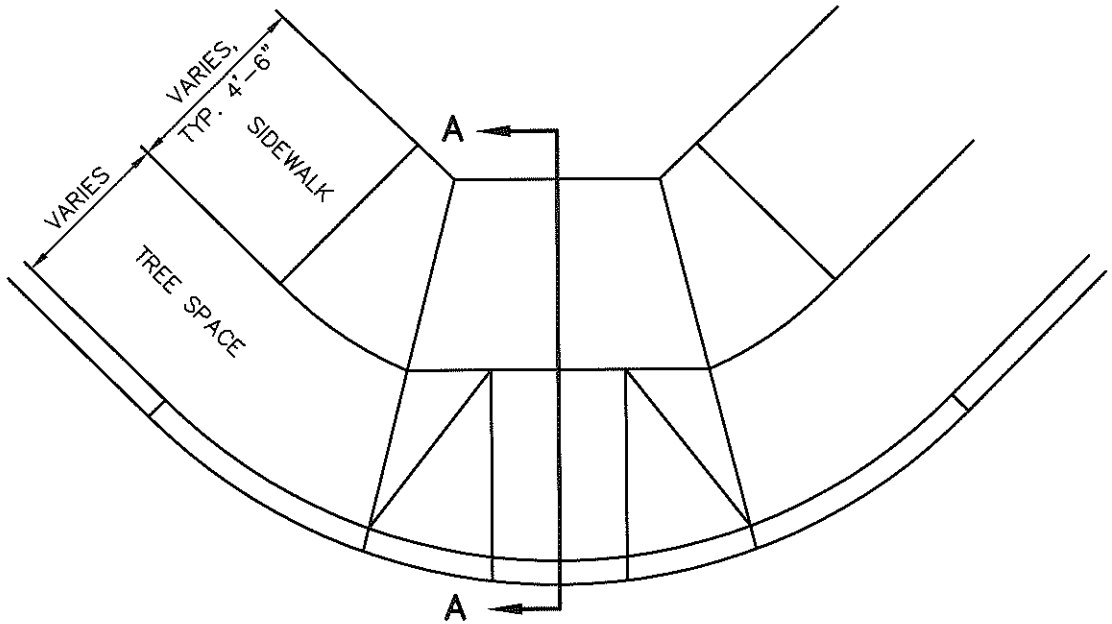
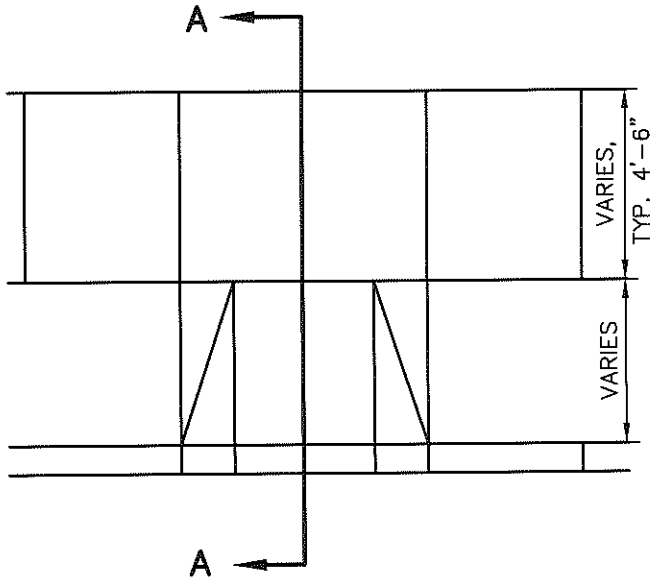
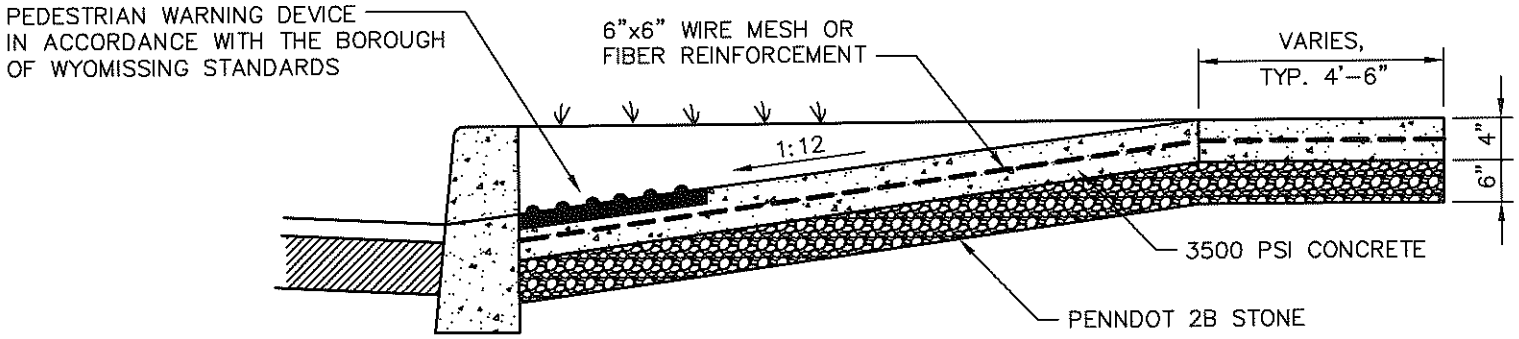


PLAN VIEW



PLAN VIEW
(TANGENT SECTION)



SECTION A-A

HANDICAPPED RAMP STANDARDS

SCALE: NONE

NOTES

1. SLOPES AS SPECIFIED ARE MAXIMUM VALUES.
2. LENGTH L_D MAY ONLY BE USED WHEN AN EXISTING STRUCTURE PROHIBITS THE REQUIRED LENGTH.

BOROUGH OF WYOMISSING

STANDARD DETAIL CS017

11/13

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