

# MANCHESTER TOWNSHIP

Construction and Materials Specifications  
For Land Development

Manchester Township  
York County, PA



Revised June, 2007

Prepared by:

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MANCHESTER TOWNSHIP  
YORK COUNTY, PENNSYLVANIA  
RESOLUTION NO. 2007-12

WHEREAS, Manchester Township Ordinance No. 75-03, the Manchester Township Subdivision and Land Development Ordinance, Chapter 22 of the Code of Ordinances of Manchester Township, as amended, provides that Manchester Township shall adopt reasonable regulations and material specifications for land development within the Township; and

WHEREAS, Manchester Township, on October 14, 1975 adopted Resolution No. 75-15 adopting Construction and Material Specifications for Land Development in Manchester Township that have been amended by Resolution No. 93-24 adopted September 14, 1993 and revised by Resolution 2002-21, adopted December 10, 2002 and further amended by Resolution 2006-16, adopted June 13, 2006; and

WHEREAS, it has become necessary to revise the Construction and Material Specifications for Manchester Township;

NOW, THEREFORE, BE IT RESOLVED and it is hereby resolved by the Board of Supervisors of Manchester Township that the revised Manchester Township Construction and Material Specifications prepared by C. S. Davidson, Inc. dated June, 2007 and attached hereto as Exhibit "A" are hereby adopted and shall be effective for all Land Development within Manchester Township from this date.

RESOLVED this 10<sup>th</sup> day of July, 2007.

ATTEST:

Secretary

SEAL

YORK COUNTY PA

MANCHESTER TOWNSHIP  
BOARD OF SUPERVISORS

John D. Ottavio, Chairman

Lisa D. Wingert, Vice Chair

Michele M. Schanbacher

Lawrence V. Young

Delmar L. Hauck



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## SECTION 00100

### TERMS AND ABBREVIATIONS

#### I. TERMS

Unless indicated otherwise, the meaning of terms used in these specifications shall be as follows:

Contract is defined as the agreement between a developer and contractor or Municipality and contractor performing the site improvements.

Contractor is defined as company performing the construction of site improvements.

Developer is defined as subdivider or potential buyer, property owner, equitable owner who has executed an agreement with contractor performing site improvements.

Drawings are defined as those land development and subdivision plans or construction documents approved by the Municipality. Drawings shall meet the requirements of the Plan Standards contained within Section 4 of the Subdivision and Land Development Ordinance.

Engineer is defined as the Municipality's appointed engineering firm.

Municipality is defined as Manchester Township and its full time employees, elected officials and appointed representative(s).

Township is defined as Manchester Township and its full time employees, elected officials and appointed representative(s).

#### II. ABBREVIATIONS

The following abbreviations are used in the text of these specifications:

AASHTO	American Association of State Highway Transportation Officials
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BCBC	Bituminous Concrete Base Course
DI	Ductile Iron
FS	Federal Specifications
HES	High Early Strength
HDPE	High Density Polyethylene
IEEE	Institute of Electrical & Electronics Engineers
IES	Illuminating Engineering Society
IPCEA	Insulated Power Cable Engineers Association
MH	Manhole
MUTCD	Manual of Uniform Traffic Control Devices
NEC	National Electric Code
NECS	National Electric Safety Code
NEMA	National Electrical Manufacturers Association

NFPA	National Fire Protection Association
OSHA	Occupational Safety & Health Administration
PA DEP	Pennsylvania Department of Environmental Protection
PennDOT	Pennsylvania Department of Transportation
Psi	pounds per square inch
PSIG	pounds per square inch gauge
PTM	Pennsylvania Test Method
PVC	Polyvinyl Chloride
SDR	Standard Dimension Ratio
SESC	Soil Erosion and Sedimentation Control
SESPC	Soil Erosion and Sediment Pollution Control
UHMW	Ultra High Molecular Weight
UL	Underwriter's Laboratories, Inc.
WWF	Welded Wire Fabric

END OF SECTION



SECTION 00160.

UTILITY CONFLICT STATEMENT

PART 1 GENERAL

1.01 DISCREPANCIES

- A. Any discrepancies between the requirements of these specifications and the requirements of any other authorized agency, such as public utilities must be resolved prior to commencement of construction activities in order to avoid delays.

1.02 REQUIREMENTS

- A. It is the responsibility of the Contractor to comply with the requirements of the PA One Call System, as required by PA Act 38 (1991), prior to commencement of construction activities in order to avoid delays.
- B. The Contractor will insure that all work is within the requirements of the Pennsylvania Underground Utility Protection Law.

END OF SECTION



## SECTION 01010

### GENERAL REQUIREMENTS

#### 1.01 WORK CONDITIONS

- A. Construct the work in stages to provide for public convenience.
  - 1. Do not close off public use of facilities until completion of one stage of construction will provide alternative usage.
- B. Conduct construction operations to ensure the least inconvenience to the general public.
- C. Take measure to control traffic when working on or near public roads and streets.
  - 1. Employ traffic control measures in accordance with the MUTCD and Pennsylvania Department of Transportation Publication No. 213, "Work Zone Traffic Control Guidelines", or latest revision.
- D. Restore existing paving outside the limits of the work, that is damaged by the Developer's operations, to its original condition at the expense of the Developer.
- E. Continuously keep rights-of-way, storage areas, streets, roads, highways and adjacent properties free from accumulation of waste materials, excess excavation, rubbish and windblown debris resulting from construction operations.
- F. Protection of Existing Utilities and Structures:
  - 1. Take all precautions and utilize all facilities required to protect existing utilities and structures.
  - 2. In compliance with Act 38 of General Assembly of Pennsylvania, advise each Utility Company at least 3 working days in advance of intent to excavate, do demolition work or use explosives and give the location of the job site. Request cooperative steps of the Utility Company and suggestions for procedures to avoid damage to its lines.
  - 3. Advise each person, in physical control of powered equipment or explosives used in excavation or demolition work, of the type and location of utility lines at the job site, the Utility Company assistance to expect and procedures to follow to prevent damage.
  - 4. Immediately report to the Utility Company, the Municipality and its Engineer any break, leak or other damage to the lines or protective coatings made or discovered during the work and immediately alert the occupants of affected premises of any emergency created or discovered.
  - 5. Allow free access of Utility Company personnel at all times for purposes of maintenance, repair and inspection.
  - 6. Protect all storm sewer systems from the introduction of any mud, debris, polluted water or foreign material.

1.02 PENNDOT HIGHWAY OCCUPANCY PERMIT

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

1.03 PERMITS

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

1.04 MUNICIPAL ROAD OCCUPANCY PERMIT

- A. Developer/Contractor must obtain a road occupancy permit prior to commencing work, within the right-of-way of an adopted Township road.
  - 1. Employ traffic control measures only after approval from the Municipality in accordance with 2<sup>nd</sup> Class Township Code. Refer to the 2<sup>nd</sup> Class Township Code Section 2308 for proper procedures.
  - 2. Notify York County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to existing traffic patterns.

1.05 SEWAGE PUMPING STATIONS

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

1.06 GRINDER PUMPING STATIONS

- A. Developer/Contractor must apply for a grinder pump permit if access to the Municipal sewer system by gravity flow is not available. Design of grinder pumping stations will be in accordance with the Municipal Engineer's recommendations. The details of the station to be designed will be decided upon in a meeting with the Municipal Engineer prior to commencing design on the station.

1.07 WATER BOOSTER STATION

- A. Design of water booster stations will be in accordance with The York Water Company's recommendations. The type of station including details of pumping equipment, materials of construction and control features will be decided upon by The York Water Company.

## 1.08 SUBMITTALS AND CERTIFICATIONS

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

## PART 2 EXECUTION

### 2.01 PROCEDURE

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

### 2.02 DEVELOPER'S USE OF PREMISES

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

### 2.03 SEWER AND WATER MAIN SEPARATION

#### A. Horizontal Separation:

- 1. Sewers, including manholes, should be separated at least 10 feet, horizontally, from any existing or proposed water mains. Should local conditions prevent a lateral separation of 10 feet, a sewer may be closer than 10 feet to a water main if:
  - a. It is laid in a separate trench; and

- b. The elevation of the top (crown) of the sewer is at least 18 inches below the bottom (invert) of the water main; or
- c. Based upon recommendations from the Municipal Engineer.

B. Vertical Separation:

1. Whenever sewers cross under the water mains, the top of the sewer shall be at least 18 inches below the bottom of the water main. Water main should be constructed of slip-on mechanical-joint ductile iron pipe or protected steel pipe. Both sewer and water main services shall be pressure tested to assure water tightness prior to backfilling.
2. When the elevation of the sewer cannot be varied to provide the required 18" vertical separation, relocate the water main, for a distance of 10 feet extending on each side of the sewer, with one full length of water main centered over the sewer so that both joints will be as far from the sewer as possible.
3. Where a water main crosses under a sewer, provide adequate structural support for the sewer to prevent damage to the water main. Provide at least 18 inches vertical separation.

C. Special Conditions:

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

2.04 UTILITY MARKING TAPE

- A. Tape shall consist of minimum 5-mil (0.005") overall thickness, with no less than a 35 gauge (0.00035") solid aluminum foil core a minimum of 2" width . The foil must be visible from BOTH sides. The layers shall be laminated together with the extrusion lamination process, not adhesives. Further, there shall be NO inks or printing extending to the edges of the tape. The adhesive will NOT contain any dilutants, pigments or contaminants and is specially formulated to resist degradation by all known alkalis, acids, chemical reagents and solvents normally encountered in the soil. All printing shall be encased to avoid ink rub-off.

B. Test Data:

<u>Property</u>	<u>Method</u>	<u>Value</u>
Thickness	ASTM D2103	5.0 mils
Tensile strength	ASTM D882	25 lbs./inch (5500 psi)
Elongation	ASTM D 882-88	<50% at break
Printability	ASTM D2578	>50% dynes/cm <sup>2</sup>
Flexibility	ASTM D 671-81	Pliable hand

Inks	Mfg. Specs .	Heat set Myles
Message repeat	Mfg. Specs.	Every 20"
Foils	Mfg. Specs.	Dead soft/annealed
Top Layer	Mfg. Specs	Virgin PET
Bottom Layer	Mfg. Specs	Virgin LDPE
Adhesives	Mfg. Specs.	>30%, solid 1.5#/R
Bond strength	Boiling H <sup>2</sup> O @ 100° C	5 hours w/o peel
Colors	APWA code	See below

C. Color Code shall be as follows:

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

2.05 SOIL EROSION AND SEDIMENTATION CONTROL PLAN

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

2.06 FIELD OBSERVATION

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

## 2.07 PRECONSTRUCTION MEETING

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

## 2.08 RECORD DRAWINGS

- A. The Contractor is required to keep an up-to-date set of Record Drawings (As-Constructed Drawings) for the project. Up-to-date is defined as containing modifications for work performed within the past 30 days.
- B. The Contractor shall identify the location of all newly installed, existing to remain, and piping to be abandoned pipe and conduit as it is installed or uncovered during the construction period.
- C. No trenching for pipe or conduit shall be backfilled until the piping has been located and recorded by the Contractor.
- D. The Contractor shall verify As-Constructed elevations of sanitary sewer and storm sewer inverts and road profiles.
- E. At the end of the project, the Contractor's record drawings shall be turned over to the Engineer in AutoCAD format or as indicated in the Subdivision and Land Development Ordinance, or directed by the Municipal Engineer.
- G. The Engineer will review the Contractor's record drawings. If the record drawings do not meet the requirements stated above, final adoption of the improvements will not be approved.
- H. The Contractor shall provide detailed locations of all sanitary sewer locations, depth and length. The Contractor shall provide detailed lateral locations of all water service locations, including depth and length. Sewer laterals shall be located using manholes as a reference point and stationary from that point. Water service curb stops shall be located using distance from property lines.

## 2.09 FINAL ACCEPTANCE

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

END OF SECTION



SECTION 02100

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Clearing
2. Grubbing
3. Stripping and stockpiling topsoil
4. Debris disposal

B. Related Work Specified Elsewhere:

- |                                                    |               |
|----------------------------------------------------|---------------|
| 1. Utility Conflict Statement:                     | Section 00160 |
| 2. Site excavation and placement of fill material: | Section 02210 |
| 3. Trenching, backfilling and compacting:          | Section 02221 |
| 4. Roadway excavation, fill, and compaction:       | Section 02230 |
| 5. Soil erosion & sedimentation pollution control: | Section 02270 |
| 6. Finish grading, seeding, and sodding:           | Section 02485 |

C. Definitions:

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

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE - Section Not Used

1.03 SUBMITTALS

A. Permits:

1. For off-site disposal, submit two copies of the agreement with each property owner releasing the Municipality from responsibility in connection with the disposal of the debris, and permits or approvals from regulatory agencies.

## 1.04 JOB CONDITIONS

### A. Control of Traffic

1. The Contractor may clear all obstructions within the construction limits or permanent and construction rights-of-way except those specifically designated on the drawings or specifications to be saved or restored.
2. Employ traffic control measures only after requesting traffic alterations, in writing to the Municipality, and receiving approval at a regularly scheduled Board of Supervisor's meeting.
3. The Contractor will employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.
4. Notify York County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to existing traffic patterns.

### B. Coordination With Utilities

1. The Contractor shall insure all work complies with the requirements of the Pennsylvania Underground Utility Protection Law.

## PART 2 PRODUCTS

### 2.01 MATERIALS

#### A. Temporary Fencing:

1. Undamaged picket snow fence, 4' high, formed of wooden slats, tightly woven with wire cable.
2. Soil-set fence posts, studded "T" type, 6' high.
3. Undamaged temporary construction fencing, 4' high, formed of plastic, orange colored.

#### B. Tree Wound Dressing:

1. Antiseptic and waterproof, asphalt base.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Notify the Municipality, the PA One Call System, and regulatory agencies at least 3 business days prior to beginning any clearing work.

- B. Contractor's work should meet the requirements of the Soil Erosion and Sedimentation Control Plan for the site, as approved by the York County Conservation District.
- C. Protect benchmarks, utilities, existing trees, shrubs and other landscape features designated for preservation with temporary fencing or barricades satisfactory to the Municipality. No material shall be stored or construction operation carried on within 4-feet of any tree to be saved or within the tree protection fence.
- D. When a private enclosure fence encroaches on the work area, notify the property owner at least 5 days in advance of the clearing/grubbing operations to permit the owner to remove it, construct a supplemental fence, or make such other arrangements as may be necessary for security purposes. Upon failure of the property owner to reasonably proceed with the work required to secure his property, carefully remove the fence, in whole or in part, and neatly pile the materials onto the owner's property.

### 3.02 UTILITY RELOCATIONS

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

### 3.03 CLEARING

- A. Confine clearing to within the construction limits.
- B. Clear in a manner that will avoid damage to trees, shrubs, structures, and other installations which are to be retained.
- C. Comply with the requirements of Pennsylvania Underground Utility Protection Law.
- D. Where stumps are not required to be grubbed, flushcut with ground elevation.

### 3.04 GRUBBING

- A. Grub areas within the construction limits to remove roots and other objectionable material to a minimum depth of 24".
- B. Remove all stumps within the cleared areas.

### 3.05 STRIPPING AND STOCKPILING TOPSOIL

- A. Strip topsoil to whatever depth it may occur from areas to be excavated, filled, or graded and stockpile.
- B. Topsoil shall not be used as backfill.

- C. Topsoil should be protected through implementation of a Soil Erosion Sedimentation Pollution Control Plan to prevent discharge to any storm sewer system.

### 3.06 DEBRIS DISPOSAL

- A. Trees, logs, branches, brush, stumps, and other debris resulting from clearing and grubbing operations shall become the property of the Contractor and shall be legally disposed of.
- B. Burning of debris is prohibited.

### 3.07 RESTORATION

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

END OF SECTION

SECTION 02150

BORING AND JACKING

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Approach trench excavation
2. Installation of casing pipe
3. Installation of carrier pipe

B. Related work specified elsewhere:

1. Utility Conflict Statement: Section 00160
2. Trenching, backfilling and compacting: Section 02221

C. Definitions: NONE

D. Applicable Standard Details:

MT2150-1 Casing Installation

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Comply with applicable federal, state and local ordinances, codes, statutes, rules and regulations, and affected jurisdictional bodies.
2. Pennsylvania Department of Transportation Publication 408 Specifications.

B. Contractor Qualifications:

1. Construction operations shall be undertaken only by a contractor well experienced with a minimum of five operations of similar magnitude and condition.

1.03 SUBMITTALS

- A. Submit history of previous work completed of equivalent nature and scope. Include qualification and experience of key personnel.
- B. Submit description of proposed construction methods, including methods to establish and maintain vertical and horizontal alignment.

C. Manufacturers' Literature

1. Submit manufacturers' catalog information for each type of pipe, fittings, couplings, adapters, gaskets, casing spacers, and assembly of joints for approval by the Municipality. Include manufacturers' recommendations for deflection in pipe joints.

D. Certificates:

1. Submit 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.

1.04 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 or jacking under state highways and railroads, comply with applicable right-of-way occupancy permits, including requirements for maintenance and protection of traffic.

C. Control of Traffic:

1. Employ traffic control measures only after requesting traffic alterations, in writing to the Municipality, and receiving approval at a regularly scheduled Board of Supervisor's meeting.
2. The Contractor will employ traffic control measured in accordance with the MUTCD and with PennDOT Publication 213.
3. Notify York County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to existing traffic patterns.

- D. If boring is obstructed, relocate or jack or tunnel crossing as approved by the Municipality.

E. Coordination With Utilities:

1. The Contractor shall insure all work complies with the requirements of the Pennsylvania Underground Utility Protection Law.

PART 2 PRODUCTS

2.01 STEEL CASING PIPE

- A. ASTM A53; 35,000 psi minimum yield strength, new materials only.
- B. Full circumference welded joints.

- C. Diameter and wall thickness as shown on the drawings.
- D. 1 mil thick standard bituminous coating, interior and exterior.

## 2.02 CASING SPACERS

### A. Timber Skids:

- 1. Pressure treated, cut to a cross-sectional size to allow placement of the carrier pipe in the casing and to support the barrel of the carrier pipe.
  - a. Provide with notches to accommodate fastening.

### B. Bolt On:

- 1. Stainless steel shell with PVC liner, stainless steel hardware, and UHMW polymer runners. Centered Type. Cascade Waterworks Manufacturing Company, Yorkville, Illinois, or equal.

### C. Non-Metallic:

- 1. HDPE with no metal bolts or attachments. Spacers shall strap onto carrier pipe and slide easily into casing but shall not move during installation.
- 2. RACI type spacers as manufactured by RACI Spacers of North America or approved equal.

## 2.03 STEEL STRAPPING: ASTM A36

## 2.04 SAND (Fine aggregate)

- A. Section 703.1, PennDOT Publication 408 Specifications. Type A.

## 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 FLOWABLE FILL - See Section 02221.

# PART 3 EXECUTION

## 3.01 APPROACH TRENCH

- A. Excavate approach trench using methods as site conditions require.
- B. Ensure pipe entrance face 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 02221.

### 3.02 CASING PIPE INSTALLATION METHODS

#### A. Boring:

1. Install casing pipe with the determined vertical and horizontal alignment prior to installation of the carrier pipe.
2. 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.
3. Do not overcut excavation by more than 1" greater than the outside diameter of the casing pipe.
4. If voids should develop greater than the outside diameter of the pipe by approximately one inch, grout to fill voids.

#### B. 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 cutter 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 CARRIER PIPE INSTALLATION WITHIN CASING PIPE

- A. All provisions regarding cleaning, inspection and handling specified under pipe material sections apply to this work.
- B. Place the carrier as shown on Standard Detail MT2150-1. 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 at 6' on centers, minimum 2 per pipe section.
- D. Close ends of casing by sealing with brick masonry bulkheads, water-plug, or other approved hydraulic cement. The downstream bulkhead shall have a 2" diameter weep hole (stainless steel).
- E. Completely fill annular space between carrier pipe and casing pipe with limestone screenings or sand. If in a State Highway, fill annular space with flowable fill.

3.04 CARRIER PIPE WITHOUT CASING PIPE

- A. Install a carrier pipe without using a casing pipe only with prior approval of the Municipality and appropriate State agency.

END OF SECTION



PUMP GROUT BETWEEN CASING AND EXCAVATION IF GREATER THAN 1"

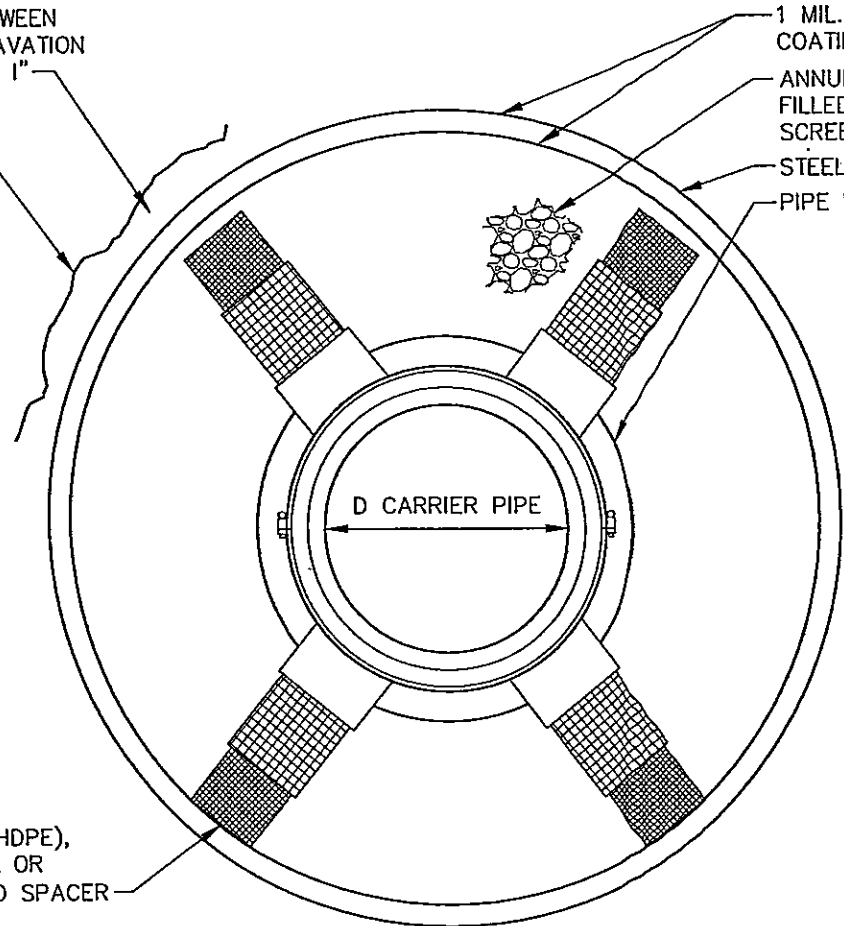
EXCAVATION

1 MIL. BITUMINOUS COATING, BOTH SIDES

ANNULAR SPACE TO BE FILLED WITH LIMESTONE SCREENINGS \*

STEEL CASING PIPE

PIPE BELL



NON-METALLIC (HDPE), STAINLESS STEEL OR OTHER APPROVED SPACER

D CARRIER PIPE

**NOTE:**  
DO NOT SUPPORT CARRIER PIPE ON BELLS

\* IF IN STATE HIGHWAY RIGHT-OF-WAY, USE FLOWABLE FILL.

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REVISED: 12/27/06

NOTE: NOT TO SCALE

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



*Excellence in Civil Engineering*

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**CASING INSTALLATION**

DATE:	12/14/95
DRAWN BY:	BAM/JLD
CHK. BY:	
NO.	MT2150-1



SECTION 02210

SITE EXCAVATION AND PLACEMENT OF FILL MATERIAL

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Excavation
2. Blasting
3. Placement and compaction of fill material

B. Related work specified elsewhere:

- |                                             |               |
|---------------------------------------------|---------------|
| 1. Utility Conflict Statement:              | Section 00160 |
| 2. Clearing and grubbing:                   | Section 02100 |
| 3. Trenching, backfilling and compacting:   | Section 02221 |
| 4. Roadway excavation, fill and compaction: | Section 02230 |
| 5. Finish grading, seeding, sodding:        | Section 02485 |

C. Definitions: NONE

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

Publication 19, Field Test Manual  
Publication 408, Specifications  
Publication 213, Work Zone Traffic Control Guidelines  
Publication RR-459, Occupancy of Highways by Utilities

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

D698 Tests for Moisture-Density Relations of Soils  
D2922 Test for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)  
D1557 Modified Proctor Compaction Test

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

Designation T89 Determining Liquid Limit of Soils  
Designation T90 Determining Plastic Limit and Plasticity Index of Soils

B. Testing Agency:

1. Compaction testing shall be performed by a PennDOT approved Soils Testing Laboratory engaged and paid for by the Contractor and approved by the Municipality.

C. Compaction Testing:

1. Determine compaction by the testing procedure contained in ASTM D698 or ASTM D1557 at the locations and frequencies specified by the Municipality.

1.03 SUBMITTALS

A. Certificates:

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

1.04 JOB CONDITIONS

A. Classification of Excavation:

1. All site excavation work includes excavation and removal of all soil, shale, rock, boulders, fill, and all other materials encountered of whatever nature.

B. Control of Traffic:

1. Employ traffic control measures only after requesting traffic alterations, in writing to the Municipality, and receiving approval at a regularly scheduled Board of Supervisor's meeting.
2. The Contractor shall employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.
3. Notify York County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to exiting traffic patterns.

C. Protection of Existing Utilities and Structures:

1. Take all precautions and utilize all facilities required to protect existing utilities and structures in compliance with Pennsylvania Act 187. Request cooperative steps of the Utility and suggestions for procedures to avoid damage to its lines.
2. Allow free access to Utility personnel at all times for purposes of maintenance, repair and inspection.

PART 2 PRODUCTS

2.01 ACCEPTABLE MATERIALS

For purposes of construction control, the following materials may be deemed acceptable for use in placement of fills:

- A. Soil. Soil shall include all inorganic material having a maximum size that can be readily placed and compacted in loose 8 inch layers and of which more than 35 percent shall pass the No. 200 sieve. Soil shall have a minimum dry weight density of 98 pounds per cubic foot as determined in accordance with PTM No. 106, Method B and a maximum liquid limit of 65 as determined in accordance with AASHTO Designation T89. The plasticity index, as determined by AASHTO Designation T90 for soils having liquid limits of 41 to 65 inclusive, shall be not less than that determined by the formula: Plasticity Index = Liquid Limit - 30.
- B. Granular Material. Granular material shall include all natural or synthetic mineral aggregates having a maximum size that can be readily placed and compacted in loose 8 inch layers and of which 35 percent or less shall pass the No. 200 sieve.
- C. Shale. Shale shall include all rock-like materials formed by the natural consolidation of mud, clay, silt and fine sand and usually thinly laminated, comparatively soft and easily split, having a maximum size that can be readily placed and compacted in loose 8 inch layers.
- D. Rock. Rock shall include all igneous, metamorphic and sedimentary rock having a maximum size that can be readily placed and compacted in loose 8 inch layers and which generally has sufficient fines to normally fill all the voids in each layer.
- E. Random Materials. Random material shall include any combination of the above classifications and may include old concrete, brick, etc., from demolition having a maximum size that can be readily placed and compacted in loose 8 inch layers, and which have been approved by the Township.
- F. Flowable Fill. See Section 02221.

### PART 3 EXECUTION

#### 3.01 MAINTENANCE AND PROTECTION OF TRAFFIC

- A. Coordinate the work to ensure the least inconvenience to traffic and maintain traffic on one or more unobstructed lanes unless closing of the roadway is authorized.
- B. Maintain access to all streets and private drives and for emergency vehicles.
- C. When streets must be closed, provide and maintain signs, flashing warning lights, barricades, markers, and other protective devices as required to conform with construction operations and to keep traffic flowing with minimum restrictions.
- D. Comply with State and local codes, permits and regulations.

#### 3.02 SALVAGE TOPSOIL

- A. Within the areas indicated for grading, strip topsoil to the depth of suitable topsoil material and stockpile for subsequent topsoiling operations. See Section 02100.

### 3.03 PLACEMENT OF FILL MATERIAL

- A. After removal of topsoil, areas to receive fill shall be thoroughly rolled, and any soft spots disclosed by rolling shall be excavated and the unsuitable material removed and disposed of in a waste area. The excavated area shall be filled with suitable fill material approved by the Municipality and recompacted. Suitable fill material shall be spread in layers of not more than 8 inches (loose) over the full area of the fill, and compacted to the required density by the use of compaction equipment. All fill material shall be compacted to not less than 95% of its maximum dry weight density at its optimum moisture content, plus or minus 2%, as determined by ASTM D698, under roadways, shoulders, driveways, curbs, sidewalks, and all parking areas and not less than 90% in yards and fields. When the material is too coarse to satisfactorily use these methods, compaction will be determined by the Municipality based on nonmovement of the material under the compaction equipment.
- B. Fill material placed in areas inaccessible to the compaction equipment shall be placed in uniform loose layers not exceeding 4 inches in depth and compacted by means of approved mechanical tampers to the density requirements herein specified.
- C. When a previously constructed fill requires additional material to bring it to required elevation, the top of the fill shall be thoroughly scarified before the required additional material is placed.
- D. Material containing moisture in excess of that percentage which will ensure satisfactory compaction shall not be placed in the fill and fill material shall not be placed on material that has become unstable due to excessive moisture.
- E. Frozen fill material shall not be placed in fills, and fill material shall not be placed on frozen material. If during construction the top of the fill freezes, all frozen material shall be removed before additional material is placed.
- F. Wet or frozen materials which would be suitable when dried or when thawed and dried, may be wasted by the Contractor for his convenience only with the written permission of the Municipality, and subject to replacement in equivalent volume, at the expense of the Contractor. However, in no case shall waste material be disposed of in the flood channel area of any stream. In all cases the filling must be in compliance with all Federal and State requirements.
- G. Shale and random material containing an excessive quantity of large fragments shall be so placed that the coarser material is in areas where no building foundations or utility trenches are to be located. The large pieces shall then be broken down by the use of approved equipment until all voids are filled. Mixtures of shale and rock shall be placed in accordance with the requirements for placing shale.
- H. Where fill is to be constructed on a slope, the slope shall be benched to the width and depth shown on the drawings or as approved by the Municipality.



### 3.04 EXCAVATION

- A. Perform excavation of borrow material in a manner satisfactory to the Municipality. Strip borrow pits of brush, trees, roots, grass and other vegetation prior to removal of material for use in fill. During the excavation operation, grade the borrow area to ensure free drainage of water from the area. Place and maintain erosion control devices after completion of the excavation, grade the excavated area, including side slopes, to drain and present a uniformly trim appearance merging into the surrounding terrain. After borrow excavation operations are complete, regrade area, if necessary, to prevent erosion.

### 3.05 BLASTING

- A. No blasting is permitted without a State permit and advance notice to the Manchester Township Fire Chief.
- B. Blasting is the sole responsibility of the Contractor and no duty is assumed or to be exercised by the Municipality relative thereto.
- C. Blasting work shall be supervised by licensed and experienced personnel and performed in conformance with applicable Federal, State and local codes.
- D. Provide Municipality with a copy of the blasting permit and notify emergency services.

### 3.06 CONTROL OF EXCAVATED MATERIAL

- A. Provide temporary barricades to prevent excavated material from encroaching on private property, walks, gutters, and storm drains.
- B. Maintain accessibility to all fire hydrants, valve pit covers, valve boxes, curb boxes, fire and police call boxes, and other utility controls at all times. Keep gutters clear or provide other satisfactory facilities for street drainage. Do not obstruct natural water courses. Where necessary, provide temporary channels to allow the flow of water either along or across the site of the work.
- C. All excavated material shall be controlled in accordance with the Soil Erosion & Sedimentation Pollution Control plan, as approved by the York County Conservation District.

### 3.07 DEWATERING

- A. Keep excavations dry and free of water. Dispose of precipitation and subsurface water clear of the work.
- B. 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.
- C. Comply with Federal and State requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.
- D. All work to be outlined in an erosion and sedimentation plan reviewed and approved by the York County Conservation District.

3.08 TOPSOILING

- A. Topsoiling shall be as specified in Section 02485.

3.09 DISPOSAL OF EXCAVATED MATERIAL

- A. Excavated material remaining after completion of placement of fills shall remain the property of the Contractor, removed from the construction area, and properly disposed of.

3.10 FOREIGN BORROW MATERIAL

- A. Foreign borrow consists of excavation, placement and compaction in fill areas of approved material obtained from sources outside the project limits.
- B. The Contractor shall make his own arrangements for obtaining all foreign borrow material and pay all costs involved, including an approved erosion and sedimentation control plan for the borrow excavation site.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Cutting paved surfaces
2. Blasting
3. Trench excavation, backfill and compaction
4. Support of excavation
5. Pipe bedding requirements
6. Control of excavated material
7. Rough grading
8. Restoration of unpaved surfaces

B. Related work specified elsewhere:

- |                                               |               |
|-----------------------------------------------|---------------|
| 1. Clearing and grubbing:                     | Section 02100 |
| 2. Boring and jacking:                        | Section 02150 |
| 3. Soil erosion & sediment pollution control: | Section 02270 |
| 4. Finish grading, seeding and sodding:       | Section 02485 |
| 5. Trench paving & restoration:               | Section 02575 |

C. Definitions: NONE

D. Applicable Standard Details:

- MT2221-1 Pipe Bedding Details
- MT2221-2 Flowable Backfill Detail
- MT2221-3 Stream Crossing Detail
- MT2221-4 Clay Dike Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

Regulations Governing Occupancy of Highways by Utilities (67 PA Code, Chapter 459)  
Publication 408, Specifications  
Publication 213, Work Zone Traffic Control Guidelines  
Publication 72M, Standards for Roadway Construction  
Publication 19, Field Test Manual

- PTM No. 106 – Moisture-Density Relations of Soils (using 5.5 lb. Rammer and 12 inch drop)
- PTM No. 402 – Determining-in-Place Density and Moisture Content of Construction Materials by Use of Nuclear Gauges

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

- C33 Specifications for Concrete Aggregates
- D698 Tests for Moisture-Density Relations of Soils
- D1557 Modified Proctor Compaction Test
- D2922 Test for Density of Soil and Soil Aggregate in Place by Nuclear Methods

B. Testing Agency:

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

C. Inspections:

1. Inspection by Municipality will, at a minimum, be made of bearing material, backfill material, and pipe installation.

1.03 SUBMITTALS

A. Certificates:

1. Submit certification attesting that the composition analysis of pipe bedding, select material stone backfill materials and flowable fill meet specification requirements.
2. Submit certified compaction testing results from the soils testing laboratory, if required.

B. Compaction Equipment List:

1. Submit a list of all equipment to be utilized for compacting, including manufacturers' lift thickness limitations.

C. Permits:

1. Municipal Road Occupancy Permit.
2. PennDOT Highway Occupancy Permit

D. Flowable Backfill:

1. Submit a mix design and test results (density and strength) to the Engineer, at least three (3) weeks before construction. Use Table 1 as a guideline for the mix design or submit an alternate design based on density guidelines and conforming to the strength requirements of Table 1. Base the submitted mix design on an absolute volume of one cubic yard.

1.04 JOB CONDITIONS

A. Classification of Excavation:

1. Excavation work includes excavation and removal of all soil, shale, rock, boulders, fill, and other materials encountered of whatever nature.

B. Compaction of Backfill:

1. The degree of compaction required at each location is indicated in Article 3.10.

C. Control of Traffic:

1. Employ traffic control measures only after requesting traffic alterations, in writing to the Municipality, and receiving approval at a regularly scheduled Board of Supervisor's meeting.
2. The Contractor will employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.
3. Notify York County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to exiting traffic patterns.

D. Protection of Existing Utilities and Structures:

1. Take all precautions and utilize all facilities required to protect existing utilities and structures. Comply with the requirements of the Pennsylvania Underground Utility Protection Law. Request cooperative steps of the Utility and suggestions for procedures to avoid damage to its lines.
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 Municipality 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. Type III and Type IV Bedding Material:

1. AASHTO No. 57 coarse aggregate, or AASHTO No. 8, Table C, Section 703.2, Publication 408. Do not use slag or cinders.

B. Type V Bedding:

1. AASHTO No. 10 coarse aggregate conforming to Section 703, Publication 408. Do not use slag or cinders.

2.02 BACKFILL MATERIAL

A. Select Material Backfill:

1. Crushed stone or gravel aggregate conforming to Select Granular Material (2RC), Section 703.3, Publication 408 Specifications. Do not use slag or cinders.

B. Suitable Backfill Material (highways, driveways, and shoulders):

1. From top of pipe bedding material to subgrade elevation:
  - a. Select Material Backfill, Section 2.02.A or Flowable Backfill Material, Section 202.D where directed or approved.

C. Suitable Backfill Material (unpaved areas)

1. From top of pipe bedding material to 24" over top of pipe:
  - a. Material excavated from the trench if free of stones larger than 2" in size and free of wet, frozen, or organic materials.
2. From 24" above pipe to subgrade elevation:
  - a. Material excavated from the trench if free of stones larger than 8" in size and free of wet, frozen, or organic materials.

D. Flowable Backfill (roadways and shoulders) - conforming to material in Table 1:

Table 1 - Mix Design

Properties & Criteria	Type A	Type B	Type C	Type D
Mix Design ( /CY)				
Cement (lbs)*	100	50	150-200	300-700
Pozzolans (lbs)*	2000	300	300	100-400
Bottom Ash (lbs)*	0	2600	2600	**
or Coarse Aggregate or Fine Aggregate Air Generating Admixture*				
Slump (inches) AASHTO T 121, C 136	7 min ****	7 min ****	7 min ****	(7) min ****
Density (pcf) AASHTO T 121, C 136	N/A	N/A	N/A	30-70 or as specified ***
Water Absorption of Aggregate, AASHTO T 85	--	--	--	20 (max %)
Compressive Strength (psi) PTM No. 604 28 Days	125 max	125 max	800 min.	90-400

- \* Quantities may be varied or alternate designs submitted to adapt mix to conform to density and strength requirements or to adapt to specific site conditions.
- \*\* Requires using a suitable lightweight aggregate or air entraining admixture. Provide a mix design that achieves the specified strength and density requirements.
- \*\*\* Approximate Value. Use of air entraining agent may reduce these values.
- \*\*\*\* Some applications may require containing flowable backfill if constructing dikes from the mix by using less water to produce a 3-inch minimum slump, if approved by the Representative. Thickening of the mix in other areas is allowed if approved by the Representative.

### PART 3 EXECUTION

#### 3.01 MAINTENANCE AND PROTECTION OF TRAFFIC

- A. Coordinate the work to ensure the least inconvenience to traffic and maintain traffic on one or more unobstructed lanes unless closing of the roadway is authorized.
- B. Maintain access to all streets and private drives and for emergency vehicles.
- C. When streets must be closed, provide and maintain signs, flashing warning lights, barricades, markers, and other protective devices as required to conform with construction operations and to keep traffic flowing with minimum restrictions.
- D. Comply with State and local codes, permits and regulations.

#### 3.02 CUTTING PAVED SURFACES PRIOR TO TRENCHING

- 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.

#### 3.03 BLASTING

- A. No blasting is permitted without a State permit, copy provided to Municipality, and 72-hour advance notice to the Manchester Township Fire Chief and other emergency services.
- B. Blasting is the sole responsibility of the Contractor and no duty is assumed or to be exercised by the Municipality relative thereto.
- C. Blasting work shall be supervised by licensed and experienced personnel and performed in conformance with applicable Federal, State and local codes.

### 3.04 TRENCH EXCAVATION

#### A. Depth of Excavation:

##### 1. Gravity Pipelines:

- a. Excavate mainline trenches to the required depth and grade for the invert of the pipe plus that excavation necessary for placement of pipe bedding material.
- b. Excavation for laterals shall provide a straight uniform grade of 1/4" per foot from the main pipeline to the right-of-way line, plus that excavation necessary for placement of pipe bedding material.

##### 2. Pressure Pipelines:

- a. Excavate trenches to the minimum depth necessary to place required pipe bedding material and to provide a minimum of 42" from the top of the pipe to the finished ground elevation, except where specific depths are otherwise shown on the drawings.

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 can be placed. If no concrete cradle is to be installed, refill the trench to required pipeline grade with pipe bedding material.

4. 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.

#### 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" or more than 24" plus the pipe outside diameter from the bottom of the trench to a point 12" above the crown of the pipe.

2. Shape trench walls completely vertical from trench bottom to at least 2' above the top of the pipe. Trench walls from 2' above the top of the pipe to grade to be benched and sloped, or shaved, to comply with Federal and State laws and codes.

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 100' ahead of completed pipeline, except as specified in the State Highway Occupancy Permit.

### 3.05 SUPPORT OF EXCAVATION

- A. Excavation support is the sole responsibility of the Contractor and no duty is assumed or to be exercised by the Municipality relative thereto.



- B. Support excavations with sheeting, shoring, and bracing or a "trench box" as required to comply with Federal and State laws and codes.
- C. Install adequate excavation supports to prevent ground movement or settlement of 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 no expense to the Municipality.
- D. Withdraw sheeting, shoring, and bracing as backfilling proceeds unless otherwise approved by the Municipality.

### 3.06 CONTROL OF EXCAVATED MATERIAL

- A. Keep the ground surface on both sides of the excavation free of excavated material to comply with Federal and State laws and codes.
- B. Provide temporary barricades to prevent excavated material from encroaching on private property, walks, gutters, and storm drains.
- C. Maintain accessibility to all fire hydrants, valve pit covers, valve boxes, curb boxes, fire and police call boxes, and other utility controls at all times. Keep gutters clear or provide other satisfactory facilities for street drainage. Do not obstruct natural water courses. Where necessary, provide temporary channels to allow the flow of water either along or across the site of the work.
- D. In areas where pipelines parallel or cross streams, ensure that no material slides, is washed, or is dumped into the stream course. Remove cofferdams immediately upon completion of pipeline construction.
- E. Comply with the requirements of the Soil Erosion & Sedimentation Control Pollution plan, as approved by the York County Conservation District.

### 3.07 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.

### 3.08 PIPE BEDDING REQUIREMENTS

#### A. Flowable Backfill Bedding:

1. Depth of pipe bedding aggregate and flowable fill as shown on Standard Detail MT2221-2.
2. Provide flowable fill bedding when installing all types of pipe under existing roadways.

#### B. Type III Bedding:

1. Depth of pipe bedding aggregate as shown on Standard Detail MT2221-1.
2. Provide Type III bedding when installing reinforced concrete storm drain pipe.

#### C. Type IV Bedding:

1. Depth of pipe bedding aggregate as shown on Standard Detail MT2221-1.
2. Provide Type IV bedding when installing all other pipe larger than 2" diameter.

#### D. Type V Bedding:

1. Depth of pipe bedding aggregate as shown on Standard Detail MT2221-1.
2. Provide Type V bedding when installing piping 2" diameter and smaller.

E. Shape recesses for the joints or bell of the pipe by hand. Assure that the pipe is supported on the lower quadrant (under haunches) for the entire length of the barrel. Fill all voids below the pipe.

F. Pipe embankment material shall be placed, worked by hand or compacted until a minimum density of 90% in yards and 95% under roadways and sidewalks is achieved (at optimum moisture content,  $\pm 2\%$ , standard proctor).

### 3.09 PIPE LAYING

A. Provide required pipe bedding placed in accordance with the Standard Detail MT2221-1 or MT2221-2.

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

#### C. Stream Crossing and Compacted Clay Dike:

1. Prior to the commencement of work involving a pipe crossing a stream, or water of the Commonwealth, appropriate permitting and approval must be obtained from all applicable regulatory agencies.
2. Stream crossings and compacted clay dikes should be in accordance with Standard Details MT2221-3 and MT2221-4, respectively, unless otherwise directed by the Municipal Engineer or other regulation agency.

3. Provide encasement for pipeline in accordance with Section 03050.

### 3.10 THRUST RESTRAINT

- A. Provide pressure pipe with concrete thrust blocking (See Section 03050) or use restrained joint fittings at all bends, tees, valves, and changes in direction.

### 3.11 BACKFILLING TRENCHES

- A. After pipe installation and inspection, backfill trenches to 12" above the crown of the pipe with flowable backfill or pipe bedding material (crushed aggregate) except for reinforced concrete pipe. Backfill the remainder of the trench with flowable backfill or specified backfill material (compacted). Place and carefully compact crushed aggregate with approved compaction equipment in layers of suitable thickness as stated in 3.11.B. Under permanent vegetative surfaces, backfill shall be compacted to 90% of maximum dry weight density ( $\pm 2\%$ ) at optimum moisture content. Under all stone or paved sidewalks and parking lots, and under proposed roadways, compact crushed aggregate to 95% of maximum dry weight density ( $\pm 2\%$ ). Under existing roadways, flowable fill shall be placed conforming to procedures defined within Section 220 of PennDOT Publication 408.

#### B. Lift Thickness Limitations For Crushed Aggregate:

1. Submit a list of the compaction equipment to be utilized on the project, the recommendations of the equipment manufacturer as to the maximum lift thickness which can be placed, and the method of compaction to be used with this equipment to achieve the required compaction. In no case shall maximum lift thickness placed exceed the maximum limits specified by the manufacturer's recommendations. However, if the equipment manufacturer's lift thickness recommendation is followed and the specified compaction is not obtained, the 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, or embankments shall govern over the compaction equipment manufacturer's recommendations.

#### C. Jetting:

1. When approved by the Municipality in writing, jetting methods may be used to consolidate backfill. Quality assurance methods to verify adequate compaction will be a condition of the approval by the Municipality.

#### D. Uncompacted Backfill:

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

E. Unsuitable Backfill Material:

1. Where the Municipality deems backfill material to be unsuitable and rejects all or part thereof due to conditions prevailing at the time of construction, remove the unsuitable material and replace with select material backfill.

F. Compaction Testing:

1. Conduct compaction tests as directed by the Municipality during backfilling operations.
2. Determine compaction in state highways and shoulders by the testing procedure contained in Pennsylvania Test Method, PTM 106, Method B or PTM 402.
3. Determine compaction in areas other than state highways and shoulders by the testing procedure contained in ASTM D698 or ASTM D2922.

3.12 DISPOSAL OF EXCAVATED MATERIAL

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

3.13 ROUGH GRADING

- A. Rough subgrade areas disturbed by construction to a uniform finish. Form the bases for terraces, banks, and lawns.
- B. Grade areas to be paved to depths required where placing subbase and paving materials.
- C. Rough grade areas to be topsoiled and seeded to 4" below indicated finish contours.

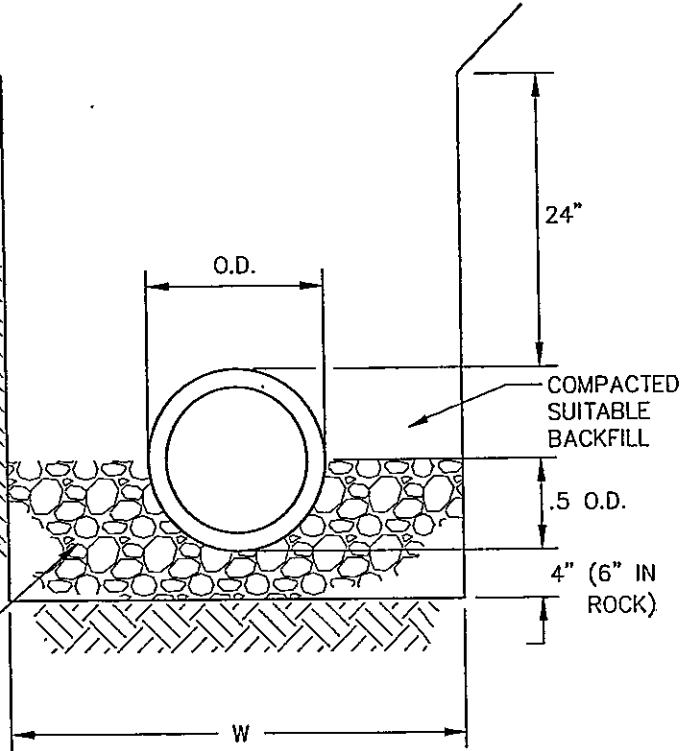
3.14 RESTORATION OF UNPAVED SURFACES

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

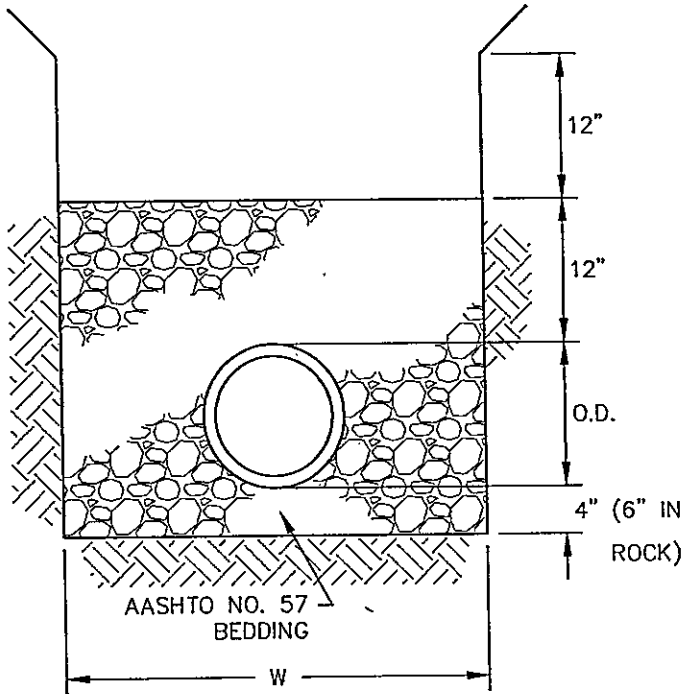
END OF SECTION

W MIN. = O.D. + 16"  
 W MAX. = O.D. + 24"

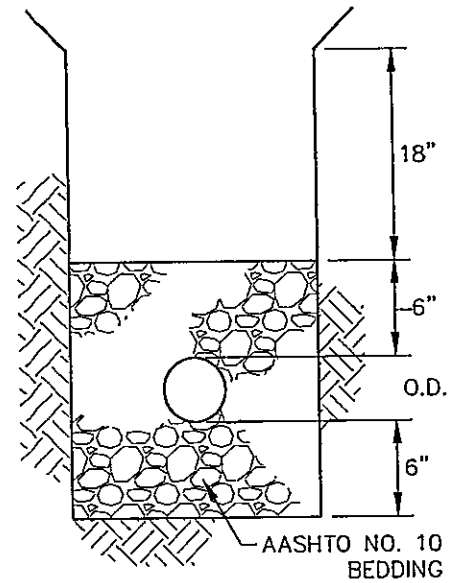
AASHTO NO. 57  
 BEDDING



**TYPE III**  
 (RCP ONLY)



**TYPE IV**



**TYPE V**  
 (2" DIA. AND SMALLER)

NOTE: NOT TO SCALE  
 NOTE: TYPE I AND II NOT PERMITTED.

REVISED: 12/27/06

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



*Excellence in Civil Engineering*

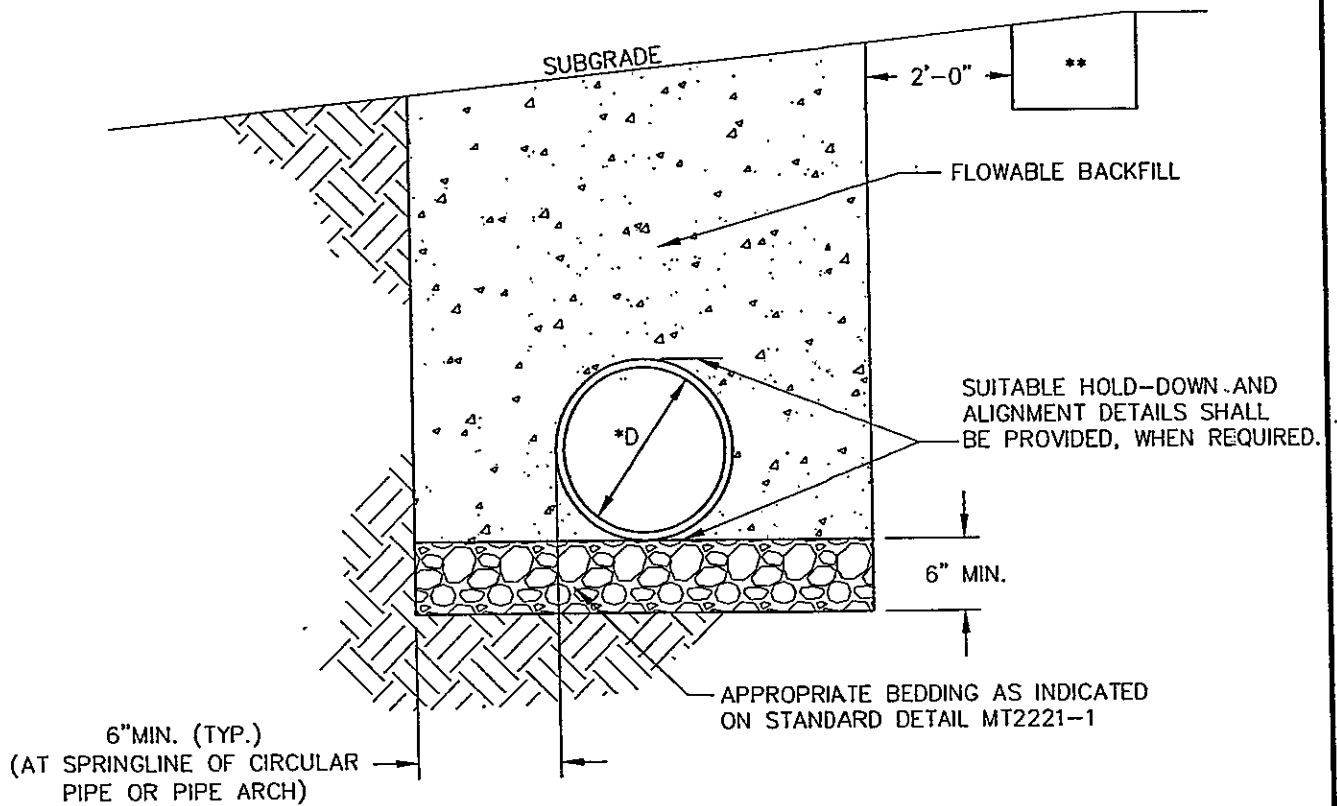
38 N. DUKE STREET YORK, PA • PHONE (717) 846-4805 • FAX (717) 846-5811  
 50 WEST MIDDLE ST. GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782  
 315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-0690  
 WWW.CSDAVIDSON.COM

**PIPE BEDDING DETAILS**

DATE:	12/14/95
DRAWN BY:	BAM/JLD
CHK. BY:	
NO.	MT2221-1

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\*D = 3'-0" MAXIMUM DIAMETER OR RISE.

\*\* IF DRAINAGE IS REQUIRED TO MAINTAIN POSITIVE FLOW OF WATER AWAY FROM THE TRENCH, IT MUST BE PROVIDED BY USE OF PROPERLY DESIGNED GRANULAR OR SYNTHETIC DRAINS.

**NOTES:**

1. PROVIDE MATERIALS AND WORKMANSHIP IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 40B, SECTIONS 601 AND 220.
2. FLOWABLE BACKFILL WILL ENVELOP THE LAST SECTION OF PIPE OR END SECTION. CONSTRUCT DIKE OF FLOWABLE BACKFILL MATERIAL AS SPECIFIED IN SPECIAL PROVISION OR PROVIDE FORMWORK TO CONTAIN FLOWABLE BACKFILL.

NOTE: NOT TO SCALE

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



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 315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8890  
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**FLOWABLE BACKFILL  
DETAIL**

DATE: 04/03/07

DRAWN BY: JLD

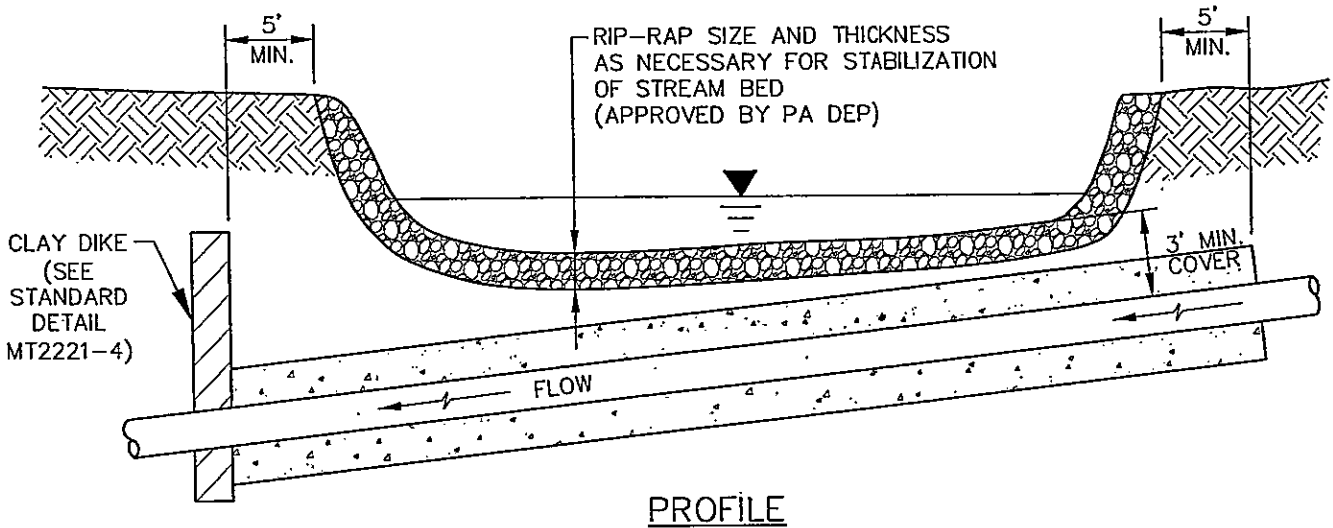
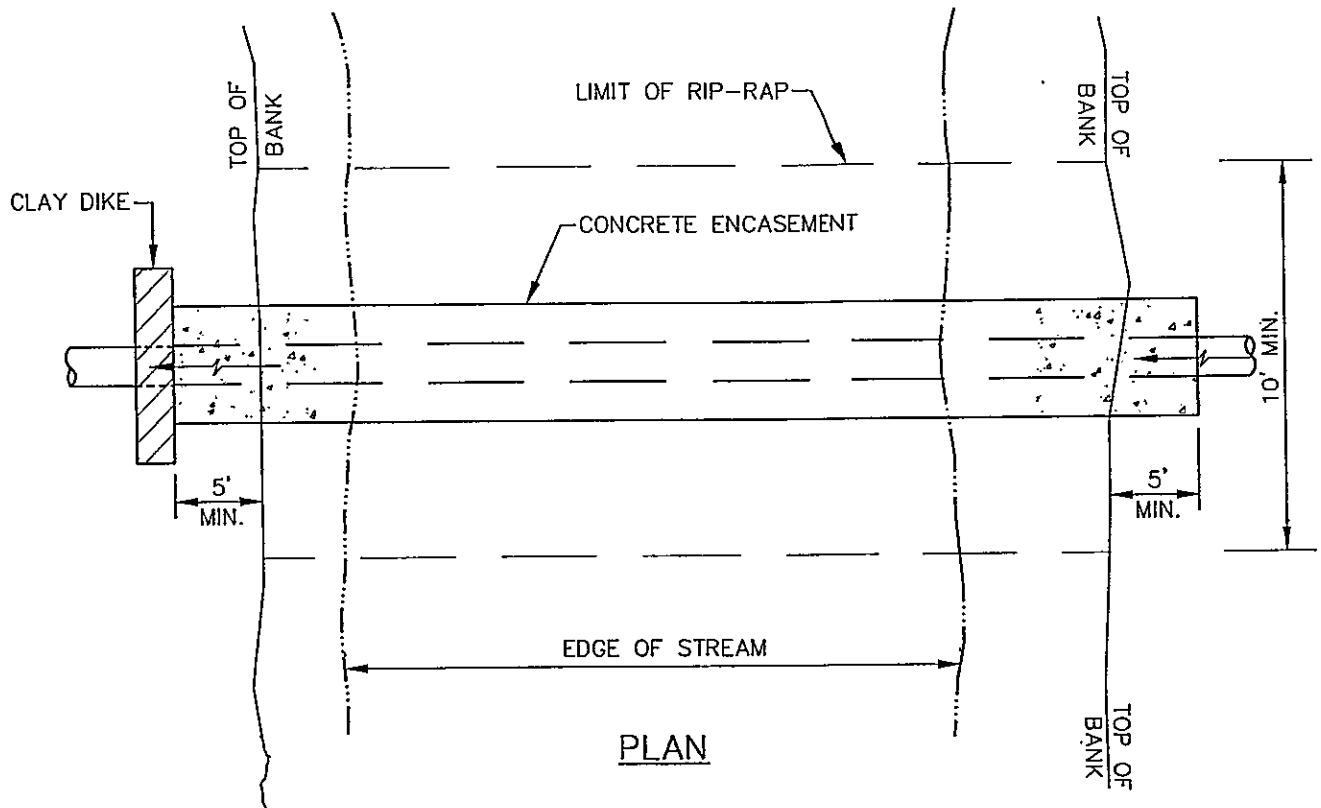
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NO. MT2221-2

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REVISED 12/27/2006

NOTE: NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



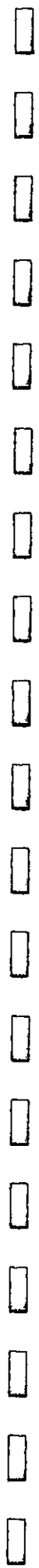
Excellence in Civil Engineering

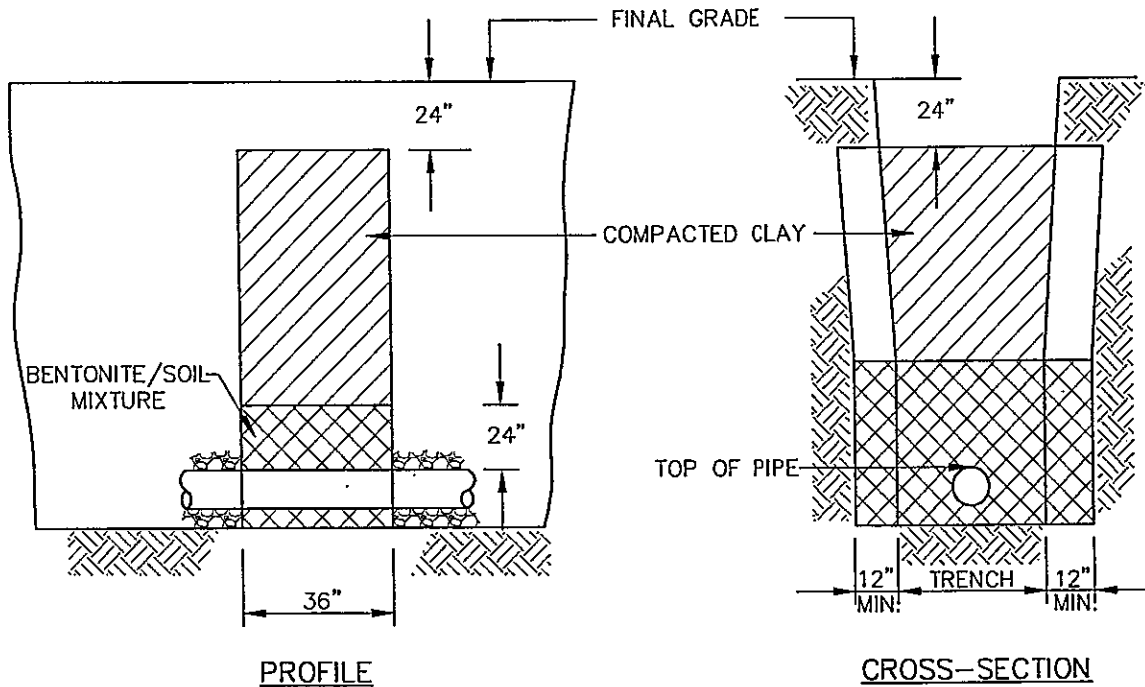
38 N. DUKE STREET YORK, PA • PHONE (717) 846-4805 • FAX (717) 846-5811  
 50 WEST MIDDLE ST. GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782  
 315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690  
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STREAM CROSSING  
DETAIL

DATE:	12/14/95
DRAWN BY:	BAM/JLD
CHK. BY:	
NO.	MT2221-3

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**NOTES:**

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

REVISED 12/27/2006

NOTE: NOT TO SCALE

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



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**CLAY DIKE DETAIL**

DATE:	12/14/95
DRAWN BY:	BAM/JLD
CHK. BY:	
NO.	MT2221-4

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SECTION 02230

ROADWAY EXCAVATION, FILL AND COMPACTION

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Excavation
2. Compaction
3. Fill
4. Subgrade Preparation
5. Base Preparation

B. Related Work Specified Elsewhere:

- |                                                    |               |
|----------------------------------------------------|---------------|
| 1. Utility Conflict Statement:                     | Section 00160 |
| 2. Clearing and grubbing:                          | Section 02100 |
| 3. Site excavation and placement of fill material: | Section 02210 |
| 4. Finish grading, seeding and sodding:            | Section 02485 |
| 5. Bituminous paving and surfacing:                | Section 02500 |

C. Definitions:

1. Roadway: Area under and within ten feet of the edge of paving.
2. Roadway Subgrade: The prepared earth surfaces on or over which additional roadway materials will be placed or work is to be performed.

D. Applicable Standard Details: See Section 02500.

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

T99 Moisture-Density Relations of Soils, Using a 5.5-lb. Rammer and a 12-in. Drop.  
T191 Standard Method of Test for Density of Soil In-Place by the Sand Cone Method.

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

D2167 Density of Soil in Place by the Rubber-Ballon Method.  
D2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

3. Pennsylvania Department of Transportation Publication 408 Specifications - Section 703.2  
Coarse Aggregate.

B. Inspections:

1. Inspection by the Municipality will, at a minimum, be made of materials upon delivery to the job site; of the subgrade prior to placement of the base course; of the completed base course prior to placement of the binder surface; of the completed binder course prior to placement of the wearing course; and of the completed wearing course.

1.03 SUBMITTALS

A. Certificates:

1. Submit certification from aggregate suppliers attesting that materials conform to specifications herein. Certification shall be provided with each load of crushed aggregate delivered to the job site.
- B. One copy of the approved Soil Erosion & Sedimentation Pollution Control plan, including approval letter.

1.04 JOB CONDITIONS

- A. As specified in Section 02210.

PART 2 PRODUCTS

2.01 ACCEPTABLE MATERIALS

- A. Roadway Fill Areas: As specified previously under Site Excavation and Placement of Fill Material, Section 02210.
- B. Embankment Fill Areas: As specified previously under Site Excavation and Placement of Fill Material, Section 02210.
- B. Excavated Areas: Suitability of material for subgrade purposes shall be determined by non-movement of the material under compaction equipment.

2.02 STONE BASE

- A. Coarse aggregate – hard, tough, durable and uncoated inert particles reasonably free from clay, silt, vegetation and other deleterious substances. Coarse aggregate shall be obtained from an approved source.

2.03 GEOTEXTILES

- A. For all areas of wet subgrade – Class 4 Type A or B as defined in PennDOT Publication 408, Specifications, Section 735, and as approved by the Municipal Engineer.
- B. For pavement base drains – Class 1 as defined by PennDOT Publication 408 Specifications, Section 735, and as approved by the Municipal Engineer.

PART 3 EXECUTION

3.01 SUBGRADE

- A. Perform soil erosion control work in accordance with requirements of approved Soil Erosion and Sedimentation Control Plan.
- B. Roadway Excavation. Excavate or otherwise remove and satisfactorily dispose of materials located within the limits indicated on the drawings for roadways.
1. Excavate to roadway subgrade depths required, and cut drainage channels and waterways as detailed on the drawings.
  2. Remove rock encountered in roadway excavation to a depth six inches below finished subgrade elevation.
  3. Excavate unsuitable subgrade material. Refill such areas to required elevation with acceptable materials.
- C. Roadway Grading. Shape subgrade of roadways, intersections, approaches, entrances and adjoining pedestrian walkways to no more than 0.10 foot above or below the design elevations.
- D. Roadway Fill. Construction requirements for roadway fill shall be as follows:
1. Form the roadway fill with acceptable materials.
  2. Compact material to a minimum final density of not less than 95% of the maximum dry weight density at its optimum moisture content plus or minus 2%. Proof roll roadway fill to the satisfaction of the Municipality.
- E. Roadway Embankment. Construction requirements for roadway embankment shall be as follows:
1. Break up shale and other rock-like materials formed by natural consolidation of mud, clay, silt and fine sand into a maximum size that can be readily placed and compacted in loose eight inch layers.
  2. Place rock to form the base of roadway embankments. Place in uniform loose layers not exceeding in depth the approximate average size of the larger rock, but not exceeding 8 inches deep.
  3. Smooth and level each layer adding soil or granular material conforming to Section 02210, in sufficient quantity to supplement the smaller rock pieces, filling the voids and pockets.
  4. Form the top 18 inches of roadway embankments with soil or granular material conforming to Section 02210.
  5. Compact embankment material to a minimum final density of not less than 95% of the maximum dry weight density at its optimum moisture content plus or minus 2%. Proof roll embankments to the satisfaction of the Municipality.

6. During foreign borrow excavation operations, keep the borrow area graded to ensure free water drainage. Following completion of work in the borrow area, grade the area to present a uniformly trim appearance merging into the surrounding terrain and to prevent erosion.

### 3.02 BASE COURSES

#### A. Subbase Course

1. Compact subgrade material to a minimum final density of not less than 95% of the maximum dry weight density at its optimum moisture content plus or minus 2%. Perform finish rolling on roadway subgrade just prior to installation of aggregate subbase or base course.
2. When indicated on the drawings or directed by the Municipal Engineer, construct subbase in accordance with PennDOT Publication 408 Specifications, Section 350.
3. Construct pavement base drains at sag vertical curves as described in 3.02.E and at the direction of the Municipal Engineer.

#### B. Crushed Aggregate Base Course (Type A)

1. On prepared subgrade (or subbase if required), spread AASHTO No. 10 (limestone screenings) to a depth of one inch and compact. Construct stone base of AASHTO No. 1 aggregate to an 8" compacted depth.
2. Compaction shall be achieved by means of approved static or vibratory equipment as specified in PennDOT Publication 408. If static roller is used, base course of more than 8 inches shall be constructed in two lifts. If approved vibratory roller is used, base course up to 10 inches in compacted thickness may be constructed in one course.
3. Spreading Coarse Material. The coarse material shall be spread uniformly on the initial layer of fine material by approved mechanical stone spreaders to the full width of the base unless otherwise specified for part-width construction. Spreaders shall be adjusted to spread the loose material to obtain a layer of the required depth after compaction. In areas inaccessible to spreading equipment, the material may be spread directly from trucks provided the distribution is equivalent to that achieved by the spreader. All segregated material shall be removed and replaced with well graded material. The coarse material shall not be spread for a distance of more than an average day's work ahead of choking and compacting.
4. Compacting Coarse Material. Immediately after surface corrections have been made to the spread coarse material, it shall be thoroughly compacted. The rolling shall begin at the sides and progress to the center, except on superelevated curves where the rolling shall begin on the low side and progress to the high side. The rolling shall be parallel with the centerline of the roadway, uniformly lapping each preceding track, covering the entire surface with the rear wheels ahead of the roller wheels. After each layer of material has been spread and compacted, it shall be checked with approved templates and straightedges, and all irregularities shall be satisfactorily corrected. Red flags shall be placed at the limits of satisfactorily compacted coarse material. The flags shall be moved ahead as additional material is compacted, and no filler shall be applied to the coarse material in advance of the flag-marked sections.



5. Application of Fine Material. After the coarse material has been set and keyed by compaction, dry limestone screenings (AASHTO No. 10.), in an amount equal to approximately 50% of that required to fill the voids in the coarse material, shall be spread uniformly over the surface. The vibratory compaction equipment shall then be operated over the surface to cause the screenings to settle into the voids. The remaining screenings shall be spread and vibrated in one or more applications to satisfactorily fill the voids; however, the quantity of screenings used and the operation of filling shall not cause floatation of the coarse aggregate. Areas not completely filled, in the foregoing operations, shall be filled by manual methods and need not be further vibrated.
  
6. Compacting and Bonding. After completing the vibration of the fine material, the surface of single-layer construction, or the surface of each layer of multi-layer construction, shall be sprinkled with water and rolled. All excess screenings forming in piles or cakes upon the surface shall be loosened and scattered by sweeping, exercising care that the fine material is not removed below the top of the coarse aggregate. On the surface of single-layer construction or the top layer of multi-layer construction, the sprinkling and rolling shall be continued and additional screenings applied where necessary until all voids are filled and until a slight wave of grout forms in front of the roller wheels. Brooms attached to the roller, and hand brooms, shall be used to distribute the grout uniformly into the unfilled voids. After the wave of grout has been produced over the entire section of the base course, this portion shall be left to dry. The surface shall be sprinkled and re-rolled as required to bond it thoroughly and to secure a satisfactory surface. The quantity of screenings and water used shall be sufficient to produce a smooth, hard monolithic surface.
  
7. Maintenance and Traffic. The Contractor shall maintain the completed base course until the placement of the surface course. No traffic shall be allowed on the base course other than necessary local traffic and that developing from the operation of essential construction equipment. Any defects which may develop in the construction of the base course or any damage caused by the operation of local or job traffic is the responsibility of the Contractor and shall be immediately repaired or replaced at no expense to the Municipality.

C. Crushed Aggregate Base Course (Alternate)

1. On prepared subgrade (or subbase if required), construct stone base of PennDOT 2A or 3A Modified coarse aggregate to an 8" compacted depth.

3A Modified - gradation as follows:

Sieve	2-1/2"	1"	3/8"	No. 4	No. 10	No. 40	No. 100
% passing	100	50-100	25-90	20-65	10-50	8-30	0-20

2. Compaction shall be achieved by means of approved static or vibratory equipment. If static roller is used, base course of more than 8 inches shall be constructed in two lifts. If approved vibratory roller is used, base course up to 10 inches compacted thickness may be constructed in one course.

3. Spreading Coarse Material. The aggregate material shall be spread uniformly by approved mechanical stone spreaders to the full width of the base unless otherwise specified for part-width construction. Spreaders shall be adjusted to spread the loose material to obtain a layer of the required depth after compaction. In areas inaccessible to spreading equipment, the material may be spread directly from trucks provided the distribution is equivalent to that achieved by the spreader. All segregated material shall be removed and replaced with well graded material. The aggregate material shall not be spread for a distance of more than an average day's work ahead of compacting.
4. Compacting Coarse Material. Immediately after surface corrections have been made to the spread material, it shall be compacted. The rolling shall begin at the sides and progress to the center, except on superelevated curves where the rolling shall begin on the low side and progress to the high side. The rolling shall be parallel with the centerline of the roadway, uniformly lapping each preceding track, covering the entire surface with the rear wheels and continuing until the material does not creep or wave ahead of the roller wheels. After each layer of material has been spread and compacted, it shall be checked with approved templates and straightedges, and all irregularities shall be satisfactorily corrected. Red flags shall be placed at the limits of satisfactorily compacted material. The flags shall be moved ahead as additional material is compacted.
5. Maintenance and Traffic. The Contractor shall maintain the completed base course until the placement of the surface course. No traffic shall be allowed on the base course other than necessary local traffic and that developing from the operation of essential construction equipment. Any defects which may develop in the construction of the base course or any damage caused by the operation of local or job traffic is the responsibility of the Contractor and shall be immediately repaired or replaced at no expense to the Municipality.

D. Crushed Aggregate Shoulders

1. As specified in Section 02230, Article 3.02.C.

E. Pavement Base Drain

1. Construct 6" diameter underdrains upon completion of stone base material placement. Provide at low points 50 feet each way, each side in accordance with the requirements set forth in Section 610, PennDOT Publication 408 Specifications and as shown on Standard Detail MT2500-7.

3.03 FIELD QUALITY CONTROL

A. Surface Tolerance.

1. After the base course has been completed as specified, the surface smoothness shall be checked with approved templates, string lines, or straightedges.
  - a. Templates. The Contractor shall furnish and use approved templates of required length and cut to the required crown of the finished surface of the base course, for checking the crown and contour thereof. The templates shall be equipped with metal or other approved vertical extensions attached to each end, so that the bottom of the template will be at the elevation of the top of the aggregate. At least 3 such templates shall be furnished, and used at intervals of not more than 25 feet.

- b. String Lines. String lines, for controlling the finished elevation of the proposed base course, shall be furnished with ample supports and offset along each side of the base course, and shall be maintained until all irregularities have been satisfactorily corrected.
  - c. Straightedges. Approved straightedges 10 feet in length shall also be furnished and used for testing longitudinal irregularities in the surface of the base course.
2. Any surface irregularities that exceed  $\frac{1}{2}$  inch shall be remedied by loosening the surface and removing or adding material as required, after which the entire area, including the surrounding surface, shall be rolled until satisfactorily compacted.
- B. Tests for Depth of Finished Base Course. During the progress of the work, the depth of the base course will be measured by the Municipality and unsatisfactory work shall be repaired, corrected, or replaced. The initial layer of fine material placed as a bed and filler will be measured and considered as part of the base course in determining the compacted depth of the finished base course.
1. The depth will be determined by cutting or digging holes to the full depth of the completed base course. One depth measurement shall be made for each 3000 square yards, or less, of completed base course. Any section in which the depth is  $\frac{1}{2}$  inch or more deficient in specified depth, shall be satisfactorily corrected.
  2. All test holes shall be backfilled with similar material and satisfactorily compacted. This operation shall be performed under the observation of Municipality personnel who will check the depth for record purposes.
- C. Field Moisture-Density Tests.
1. Conduct such tests as specified under Site Excavation and Placement of Fill Material: Section 02210.

END OF SECTION



SECTION 02270

SOIL EROSION AND SEDIMENT POLLUTION CONTROL

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Installation of soil erosion and sediment pollution control (SESPC) measures as per approved plan.
2. Maintenance of SESPC measures.
3. Restoration of area and removal of any interim SESPC measures placed to protect areas from erosion during stabilization period.

B. Related work specified elsewhere:

- |                                                    |               |
|----------------------------------------------------|---------------|
| B. Clearing and grubbing:                          | Section 02100 |
| 2. Site excavation and placement of fill material: | Section 02210 |
| 3. Finish grading, seeding, sodding:               | Section 02485 |
| 4. Storm drain pipe:                               | Section 02618 |

C. Applicable Standard Details:

- |           |                                             |
|-----------|---------------------------------------------|
| MT2270-1  | Rock Barrier Detail                         |
| MT2270-2  | Rock Basin Detail                           |
| MT2270-3  | Rock Lining Detail                          |
| MT2270-4  | Typical Soil Erosion Control for Structures |
| MT2270-5  | Silt Barrier Fence Detail                   |
| MT2270-6  | Super Silt Barrier Fence Detail             |
| MT2270-7  | Temporary Diversion Swale Detail            |
| MT2270-8  | Storm Inlet Protection Detail               |
| MT2270-9  | Straw Bale Barrier Detail                   |
| MT2270-10 | Stabilized Construction Entrance Detail     |

In the event of a conflict between these details and PA DEP/York County Conservation District details, the current PA DEP and York County Conservation District Standard Details shall govern work.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation (PennDOT), latest revision:  
  
Publication 408, Specifications  
Publication 72M, Roadway Construction Standards
2. Pennsylvania Department of Environmental Protection (PA DEP):

Soil Erosion and Sedimentation Control Manual

3. Asphalt Institute Specifications

1.03 SUBMITTALS

- A. A Soil Erosion and Sediment Pollution Control plan for this project must be approved by the York County Conservation District. This plan may not be adjusted by the Contractor without prior approval of the York County Conservation District and other regulatory agencies as applicable.
- B. A PA DEP and/or U.S. Army Corps of Engineers permit must be acquired if work will impact a water of the Commonwealth or wetland. The plan may not be adjusted by the Contractor without prior approval of the appropriate regulatory agencies.

1.04 JOB CONDITIONS: Section Not Utilized.

PART 2 MATERIALS

2.01 STONE FOR RIP-RAP

- A. Stone used shall be the type and size of rip-rap shown on the drawings and shall meet the requirement of Publication 408, Section 850.

2.02 MATTING FOR EROSION CONTROL

- A. The Contractor shall furnish a certification from the manufacturer that the matting conforms to the requirements prescribed hereinafter.
- B. Jute matting for erosion control:
  - 1. As specified in Publication 408, Section 806.2(a).
- C. Excelsior matting:
  - 1. As specified in Publication 408, Section 806.2(b).
- D. Nylon matting:
  - 1. As specified in Publication 408, Section 806.2(d).

2.03 EROSION CONTROL DEVICES

- A. Silt Barrier Fence:
  - 1. Geotextiles, Class 3: As specified in Publication 408, Section 735.1 (a) (b) (c) (d) and Section 865.2 (a).
  - 2. Mesh Support: As specified in Publication 408, Section 865.2(b).

3. Post:

- a. Wood or steel or acceptable plastic with equivalent section and sufficient length for height of fence required.
- b. As specified in Publication 408, Section 865.2 (c).

4. Fasteners: As specified in Publication 408, Section 865.2(d).

5. Ground Anchors, Guy Wires: As specified in Publication 408, Section 865.2 (e) (f).

2.04 TEMPORARY COVER

- A. Seed: As specified in Section 02485.
- B. Seed Mixtures: As specified in Section 02485.
- C. Inoculant: As specified in Section 02485.

2.05 SOIL SUPPLEMENT MATERIALS

- A. Fertilizer: As specified in Section 02485.
- B. Agricultural Lime: As specified in Section 02485.

2.06 MULCHING MATERIALS

- A. Straw: As specified in Section 02485.
- B. Wood Cellulose Fiber: As specified in Section 02485.
- C. Mulching Binder:
  - 1. Emulsified Asphalt: SS-1, CSS-1, CMS-1, MS-2, RS-1, RS-2, CRS-1, or CRS-2. Designations from Asphalt Institute Specifications.
- D. Wood Chips: Wood chips, recovered from clearing and grubbing operation will be acceptable as mulch for seeding and shall be used at a rate of 35 cubic yards per acre.

2.07 STORM DRAIN PIPE

- A. As specified in Section 02618.

2.08 PUMPED SEDIMENT CONTROL DEVICE

- A. Nonwoven geotextile fabric bag that collects silt from pumped water, such as Dirtbag manufactured by ACF Environmental, Inc., Richmond, VA, or approved equal.

- B. Bag must be sized to accommodate flow rates and maintained as recommended by the manufacturer.

#### 2.09 INLET SEDIMENT CONTROL DEVICE

- A. Woven polypropylene fabric bag such as Siltsack, as manufactured by ACF Environmental, Inc., Richmond, VA, or approved equal, sized to fit inlet.

### PART 3 EXECUTION

#### 3.01 NOTIFICATION

- A. At least seven (7) days before earthmoving will begin, the developer, by telephone or certified mail, shall notify PA DEP or its designee of the date for beginning of construction and invite the County Conservation District Representative to attend a preconstruction conference with the developer's Contractor.
- B. When erosion control measures and facilities are completed, the developer shall notify PA DEP and the York County Conservation District so that an inspection of the measures and facilities may be made by a representative of the County Conservation District.

#### 3.02 SOIL EROSION & SEDIMENTATION POLLUTION CONTROL PLAN

- A. A copy of the SESPC Plan must be available at the site of earthmoving activity during construction and until the site is stabilized.

#### 3.03 CONTROL MEASURES

- A. SESPC measures shall be implemented by the Contractor before earthmoving activities are started. The plan shall be strictly adhered to, and the Contractor shall maintain all SESPC measures until permanent soil cover has been established.
- B. The following minimum control measures shall be employed by the Contractor:
  1. Reduce by the greatest extent practicable the area and duration of exposure of readily erodible soils;
  2. Protect soils by use of temporary vegetation, or by seeding and mulching, or by accelerating the establishment of permanent vegetation and completing disturbed areas of work as rapidly as is consistent with construction schedules;
  3. Retard the rate of runoff from the construction site and control the disposal thereof;
  4. Trap sediment from the construction site in silt basins, including pump discharges from dewatering operations;
  5. Sprinkle or apply dust suppressors to keep dust within tolerable air quality limits on haul roads and at the construction site;



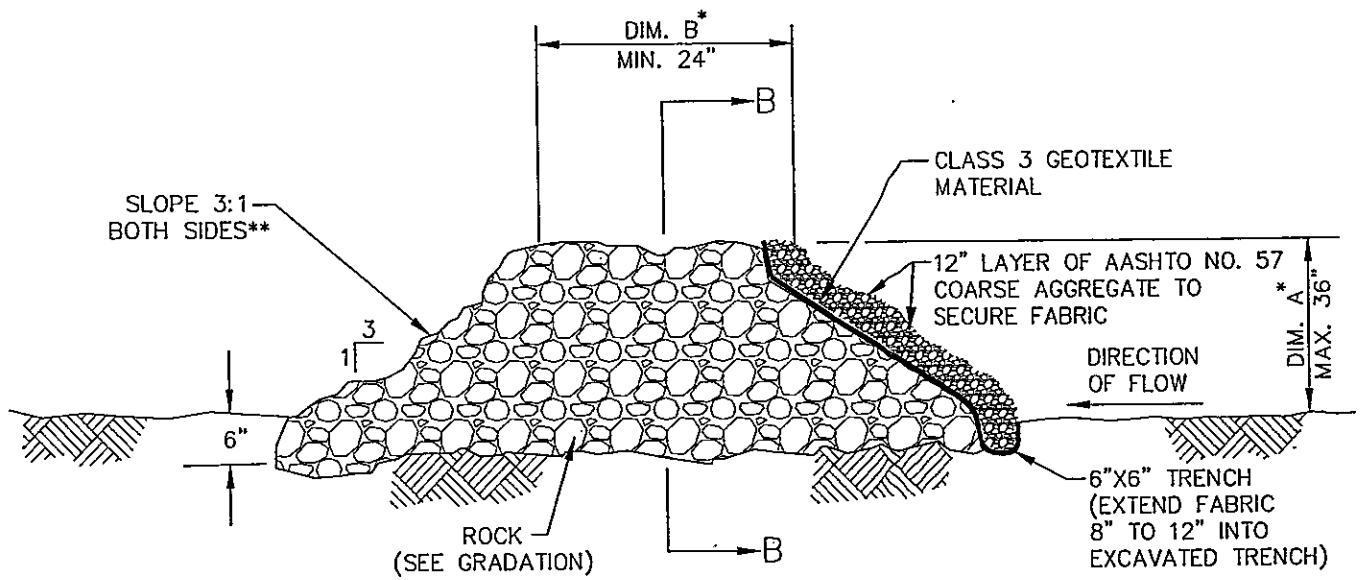
6. Utilize temporary measures to control soil erosion on construction operations suspended for more than 20 calendar days;
  7. Provide protection against discharge of pollutants such as chemicals, fuel, lubricants, sewage, etc. into streams or storm water facilities;
  8. All sediment spilled, dropped, washed or tracked onto existing roadways, must be removed immediately;
  9. Keep all construction debris, excavated material, rocks, and refuse incidental to the work out of any stream channel, gutter lines and drainage channels;
  10. Do not permit mud or silt-laden water to leave the construction site, and is responsible for any and all damages to downstream properties as a result of his failure to prevent such damages;
  11. Temporary control measures must be maintained, including disposal and replacement of damaged or filled devices.
- C. If at any time the erosion and sedimentation activities undertaken pursuant to this permit or the discharge of the effluent there from is causing or contributing to pollution of the waters of the Commonwealth, the developer shall forthwith adopt such remedial measures as are acceptable to the department.

#### 3.04 MAINTENANCE

- A. The responsibility of carrying out the permit conditions shall rest with the developer or other responsible manager of earthmoving that affects the approved erosion controls. Such responsibility passes with each control succession.
- B. The developer shall be responsible to implement, without charge, any additional soil erosion and sedimentation control measures as may be directed by the County Soil Conservation District.

END OF SECTION





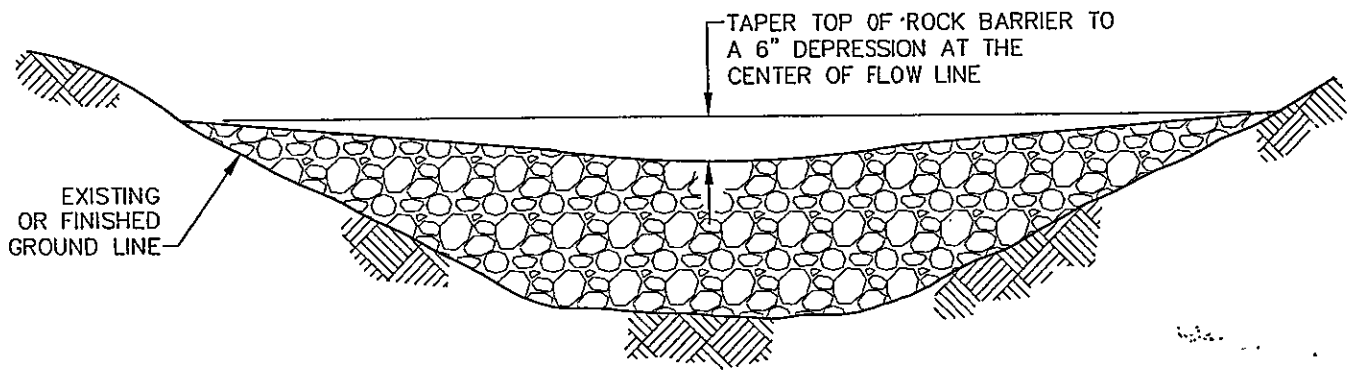
TYPICAL SECTION

\* REFER TO CONTRACT DRAWINGS FOR INDIVIDUAL BARRIER DIMENSIONS AND LOCATIONS.

\*\* SLOPE SHALL BE 1:1 WHEN USED AS ROCK FILTER OUTLET

DIM. A = 5/6 HEIGHT OF SILT BARRIER FENCE WHEN USED AS ROCK FILTER OUTLET.

NOTE: SEDIMENT MUST BE REMOVED WHEN ACCUMULATIONS REACH 1/2 HEIGHT OF ROCK BARRIER.



SECTION B-B

HEIGHT (DIM. A)	ROCK
3' OR LESS	R-4
2'-3'	R-3
1'-2'	R-2

NOTE: NOT TO SCALE

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**ROCK BARRIER  
DETAIL**

DATE: 12/27/2006

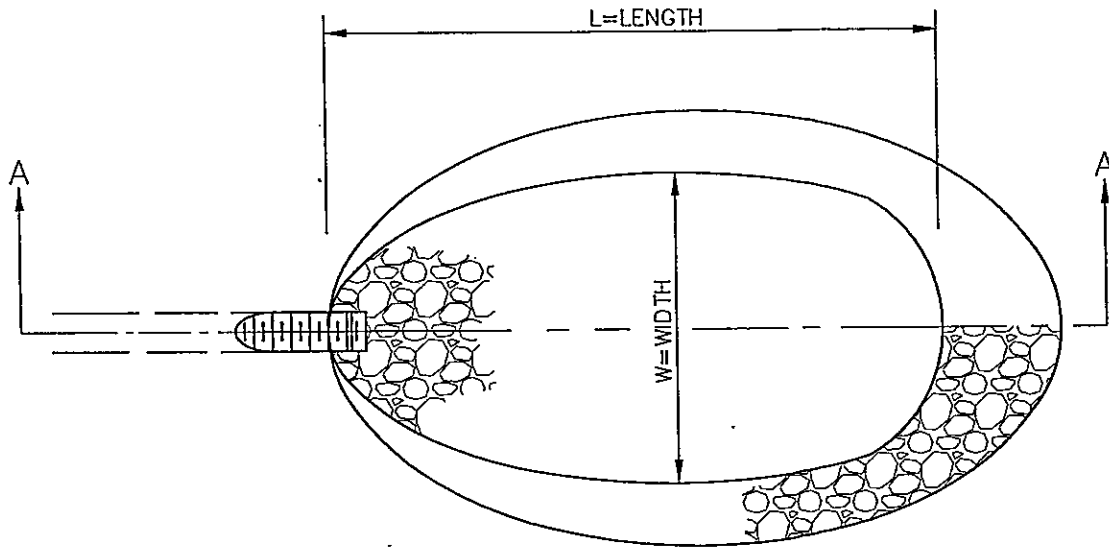
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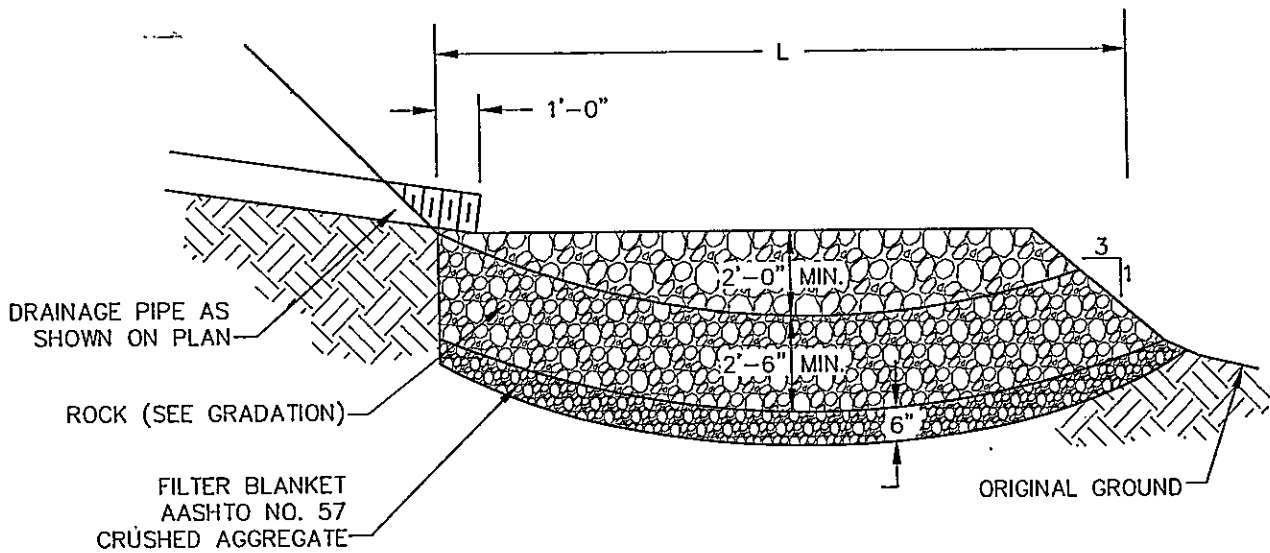
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PLAN



SECTION A-A

ROCK GRADATION

ROCK SIZE	MAX. % OF TOTAL WEIGHT SMALLER THAN GIVEN SIZE
36"	100%
24"	50%
12"	10%

"L" AND "W" AS SHOWN ON DRAWINGS

NOTE: NOT TO SCALE

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ROCK BASIN DETAIL

DATE: 12/27/2006

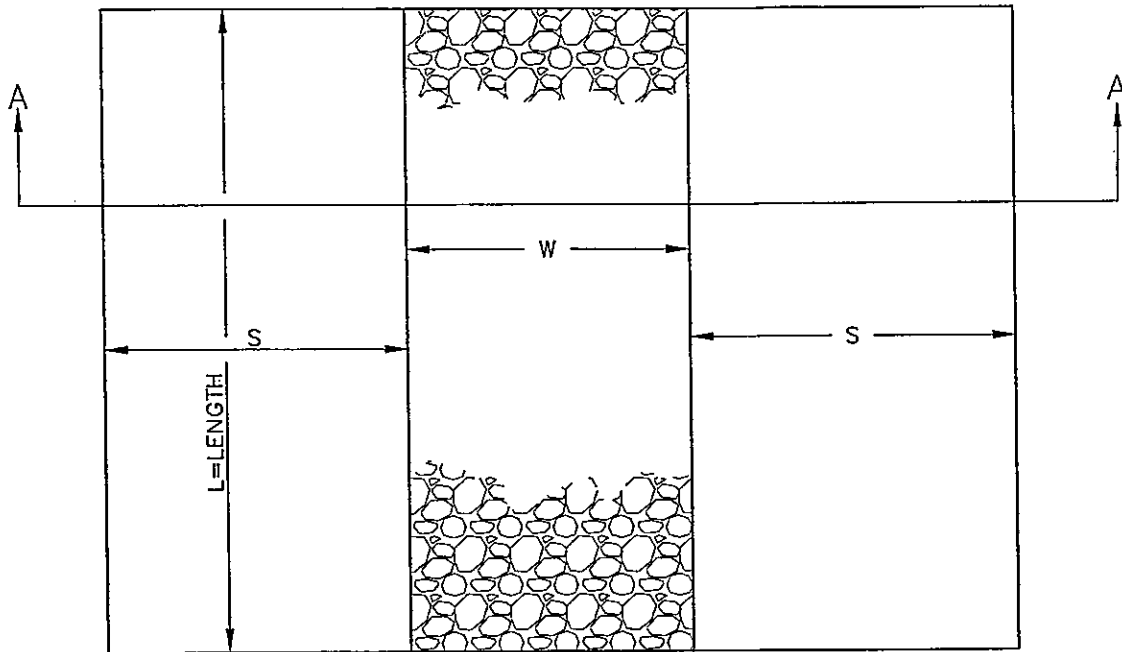
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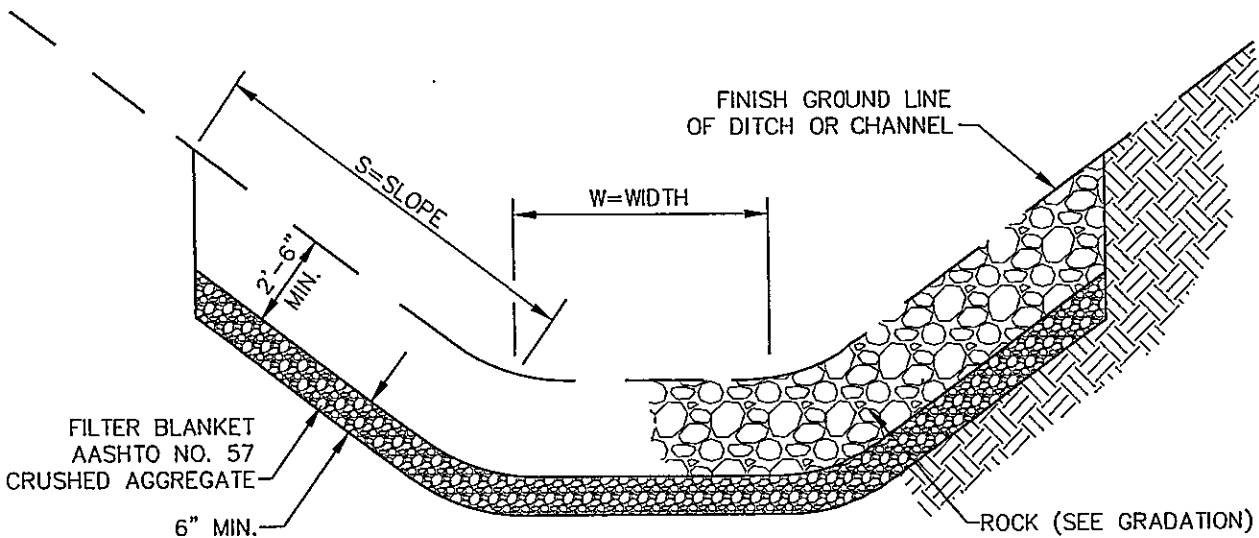
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PLAN



SECTION A-A

ROCK GRADATION

<u>ROCK SIZE</u>	<u>MAX. % OF TOTAL WEIGHT SMALLER THAN GIVEN SIZE</u>
36"	100%
24"	50%
12"	10%

"S", "L" AND "W" AS SHOWN  
ON DRAWINGS

NOTE: NOT TO SCALE

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**ROCK LINING DETAIL**

DATE: 12/27/2006

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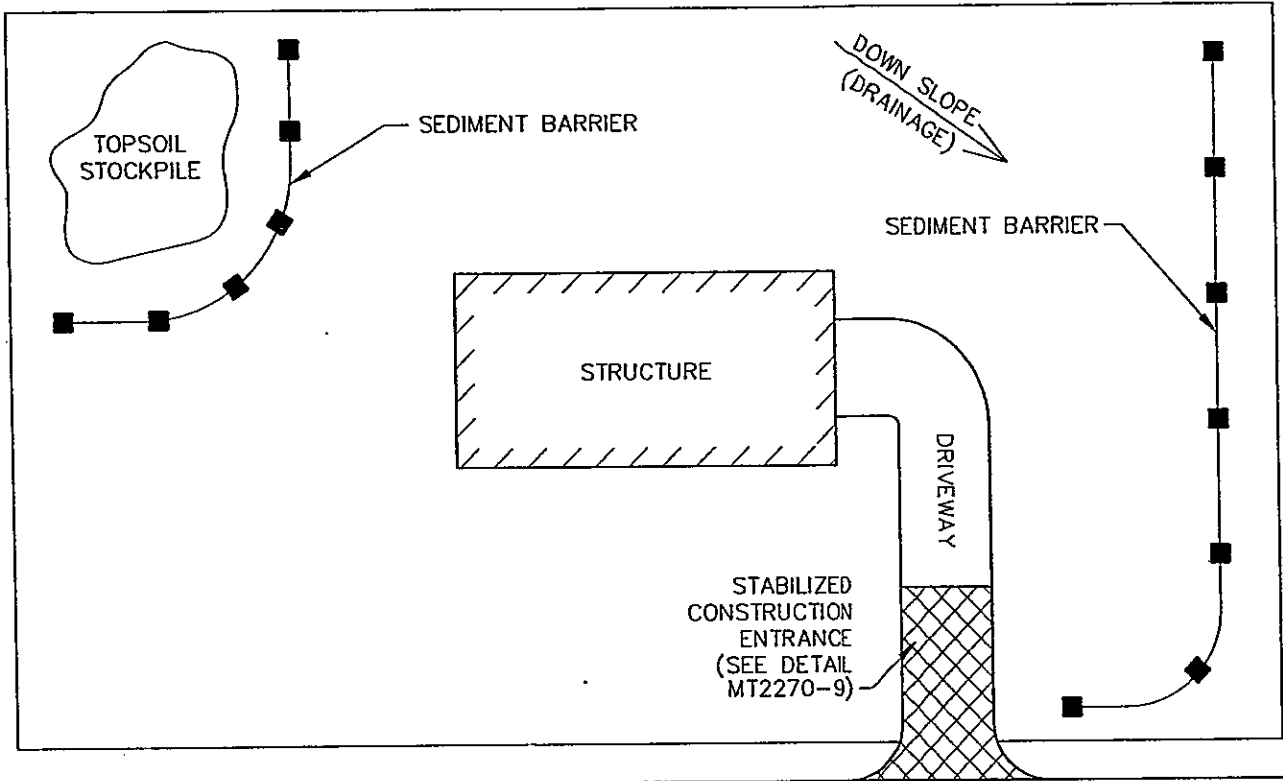
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EXISTING ROADWAY

TYPICAL CONSTRUCTION SEQUENCE

1. INSTALL STABILIZED CONSTRUCTION ENTRANCE.
2. INSTALL ACCEPTABLE SEDIMENT BARRIERS ALONG THE DOWNSLOPE EDGE OF THE PROPERTY.
3. STRIP TOPSOIL AND STOCKPILE ON UPSLOPE PORTIONS OF THE AREA.
4. ROUGH GRADE THE AREA.
5. SEED AND MULCH ALL DISTURBED AREAS. TEMPORARY COVER SHALL BE ANNUAL RYE GRASS APPLIED AT A SEEDING RATE OF 10 POUNDS PER 1000 SQUARE YARDS.
6. INSPECT AND MAINTAIN EROSION AND SEDIMENTATION CONTROLS ON A REGULAR BASIS. EROSION AND SEDIMENTATION CONTROLS SHALL NOT BE REMOVED UNTIL THE DISTURBED AREAS ARE STABILIZED.
7. ENSURE ALL VEHICLES LEAVING THE SITE HAVE MUD REMOVED FROM TIRES AND UNDERCARRIAGES.

NOTE: NOT TO SCALE

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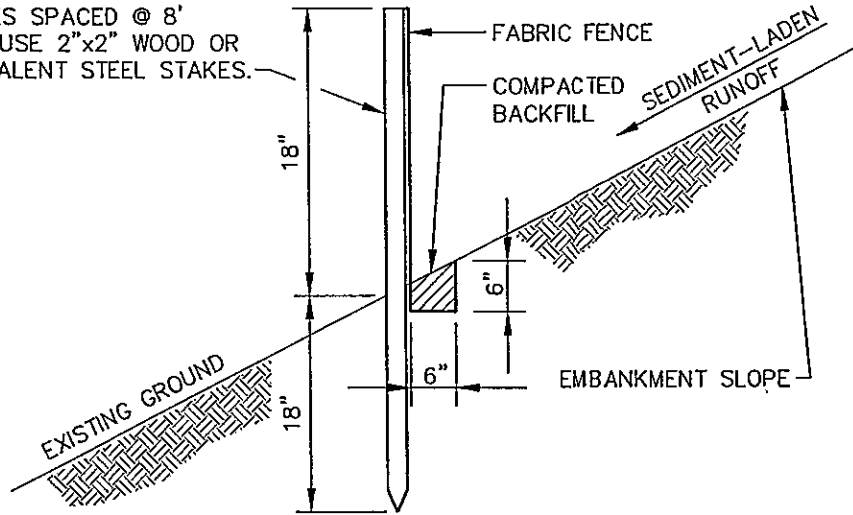
TYPICAL  
 SOIL EROSION CONTROL  
 FOR STRUCTURES

DATE:	12/27/2006
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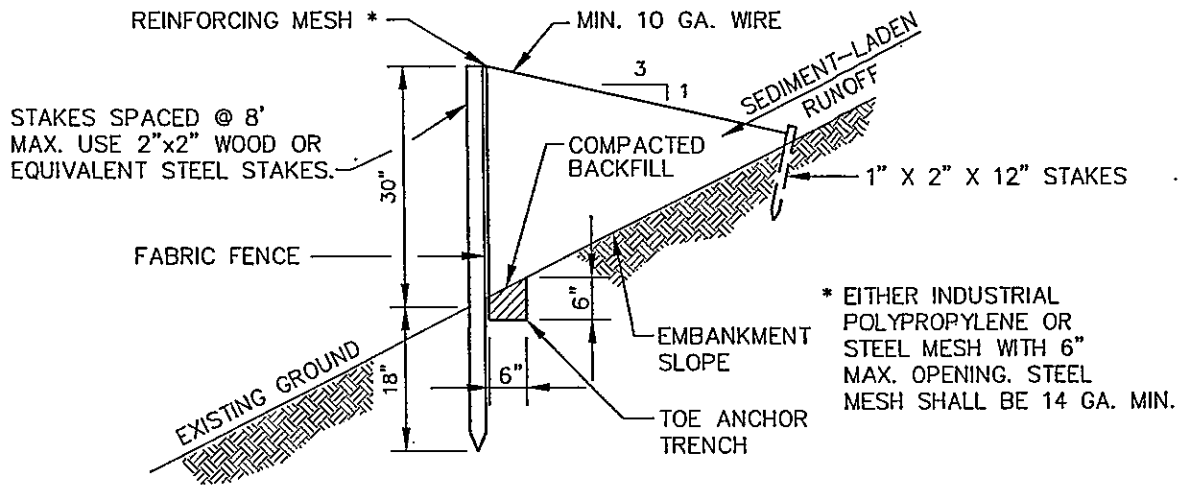
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STAKES SPACED @ 8'  
MAX. USE 2"x2" WOOD OR  
EQUIVALENT STEEL STAKES.



**18" SILT FENCE DETAIL**



FILTER FABRIC FENCE MUST BE INSTALLED AT LEVEL GRADE. BOTH ENDS OF EACH FENCE SECTION MUST BE EXTENDED AT LEAST 8' UPSLOPE AT 45° TO THE MAIN FENCE ALIGNMENT.

SEDIMENT MUST BE REMOVED WHERE ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FENCE.

ANY FENCE SECTION WHICH HAS BEEN UNDERMINED OR TOPPED MUST BE IMMEDIATELY REPLACED WITH A ROCK FILTER OUTLET. SEE DETAIL, MT2270-1.

**30" SILT FENCE DETAIL**

NOTE: NOT TO SCALE

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



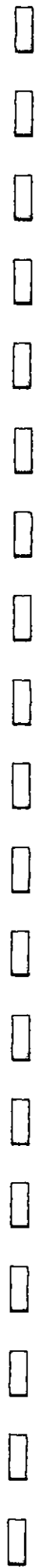
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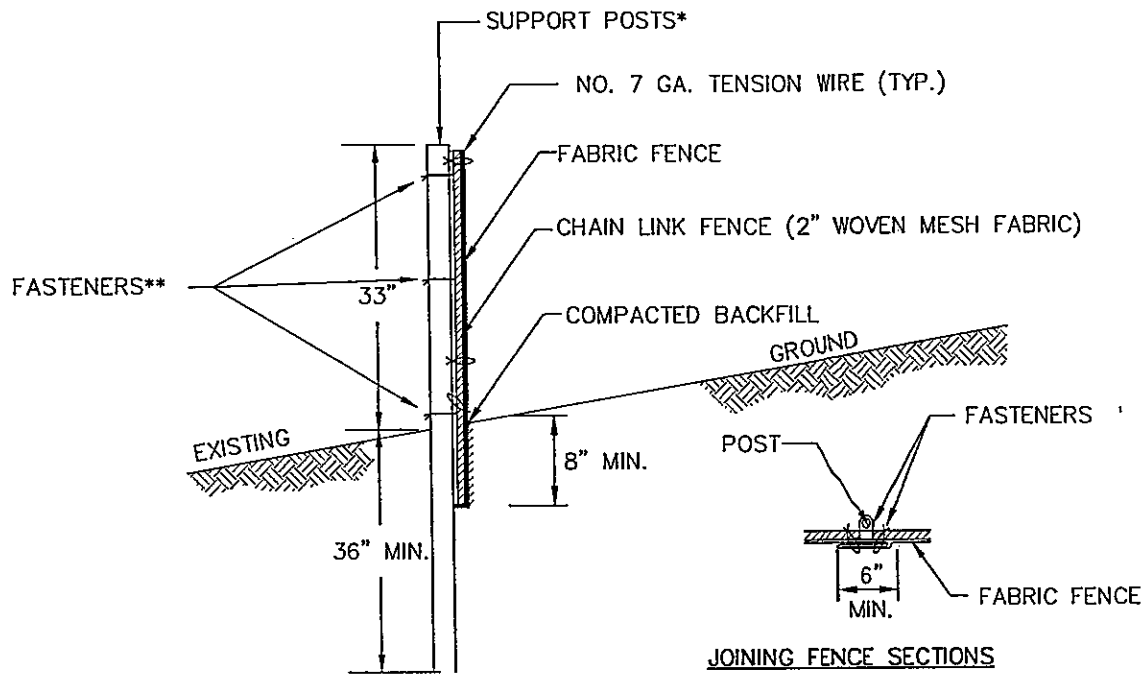
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**SILT BARRIER FENCE  
DETAIL**

DATE:	12/27/2006
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NO.	MT2270-5

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\* POSTS SPACED @ 10' MAX. USE 2 1/2" DIA. GALVANIZED OR ALUMINUM POSTS.

\*\* CHAIN LINK TO POST FASTENERS SPACED @ 14" MAX. USE NO. 6 GA. ALUMINUM WIRE OR NO. 9 GALVANIZED STEEL PRE-FORMED CLIPS. CHAIN LINK TO TENSION WIRE FASTENERS SPACED @ 60" MAX. USE NO. 10 GA. GALVANIZED STEEL WIRE. FABRIC TO CHAIN FASTENERS SPACED @ 24" MAX. C to C.

NO. 7 GA. TENSION WIRE INSTALLED HORIZONTALLY AT TOP AND BOTTOM OF CHAIN-LINK FENCE.

FILTER FABRIC FENCE MUST BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER MUST BE EXTENDED AT LEAST 8 FEET UPSLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT.

SEDIMENT MUST BE REMOVED WHEN ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FENCE.

NOTE: NOT TO SCALE

## MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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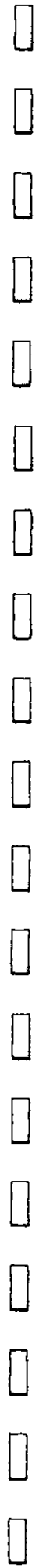
SUPER SILT  
 BARRIER FENCE  
 DETAIL

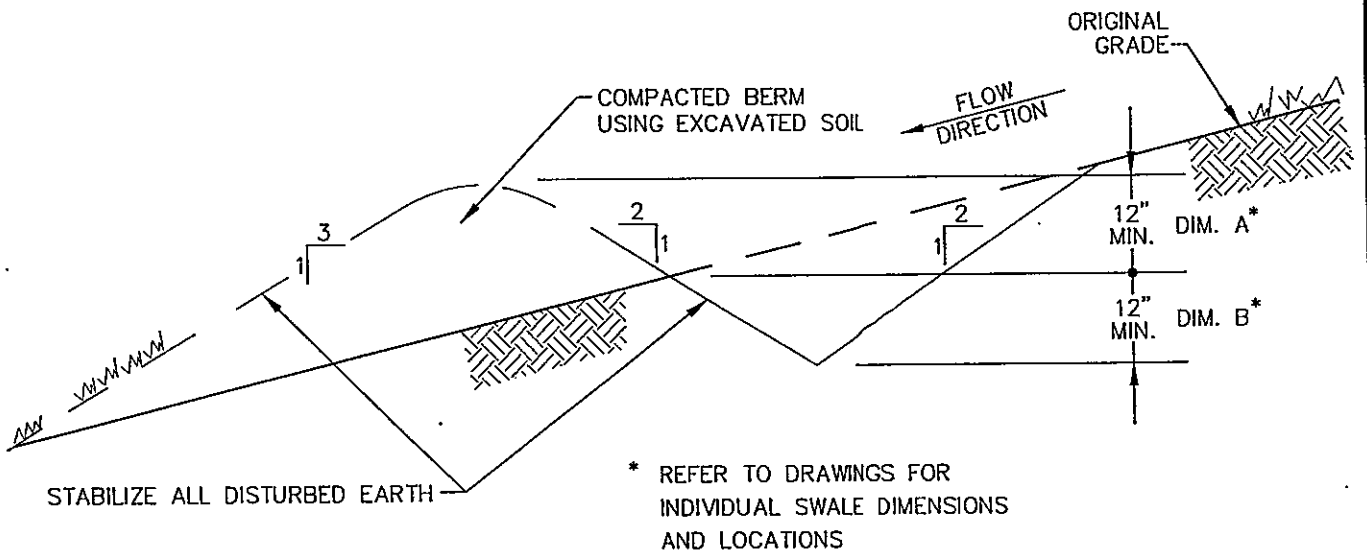
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NO. MT2270-6





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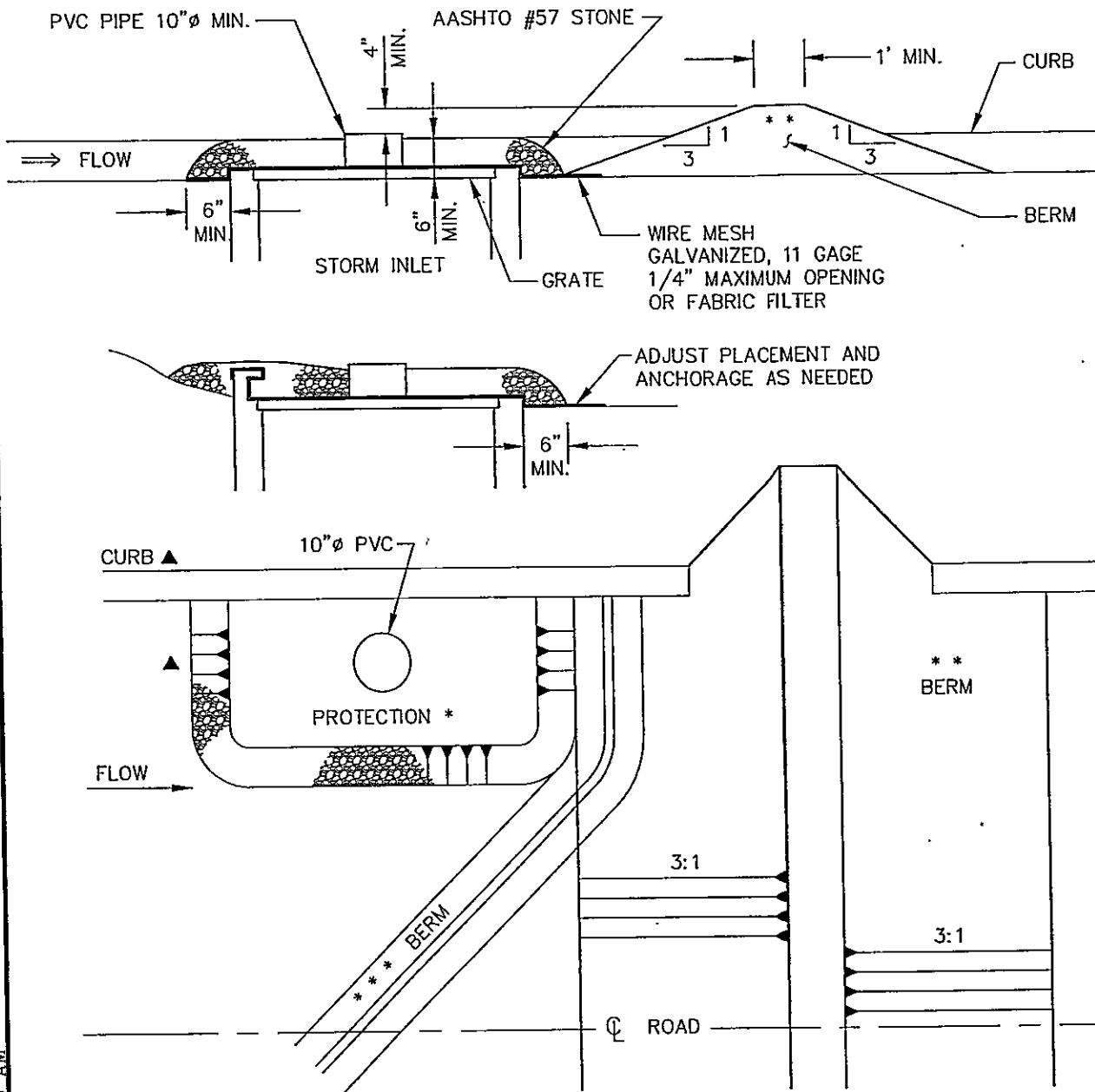
TEMPORARY DIVERSION  
 SWALE DETAIL

DATE:	12/27/2006
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NO.	MT2270-7

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NOTE- MAXIMUM DRAINAGE AREA = 1 ACRE.

- \* STONE PROTECTION IS NOT REQUIRED FOR INLETS TRIBUTARY TO SEDIMENTATION BASINS AND SEDIMENT TRAPS. BERMS ARE REQUIRED FOR ALL INSTALLATIONS.
- \*\* EARTHEN BERM TO BE MAINTAINED UNTIL ROADWAY IS STONED. ROAD SUBBASE BERM TO BE MAINTAINED UNTIL ROADWAY IS PAVED.
- \*\*\* SIX INCH MINIMUM HEIGHT ASPHALT BERM TO BE MAINTAINED UNTIL ROADWAY SURFACE RECEIVES FINAL COAT.
- ▲ IF NOT CURBED, CONSTRUCT BERM ON ALL SIDES OF INLET.

NOTE: NOT TO SCALE

## MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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### STORM INLET PROTECTION DETAIL

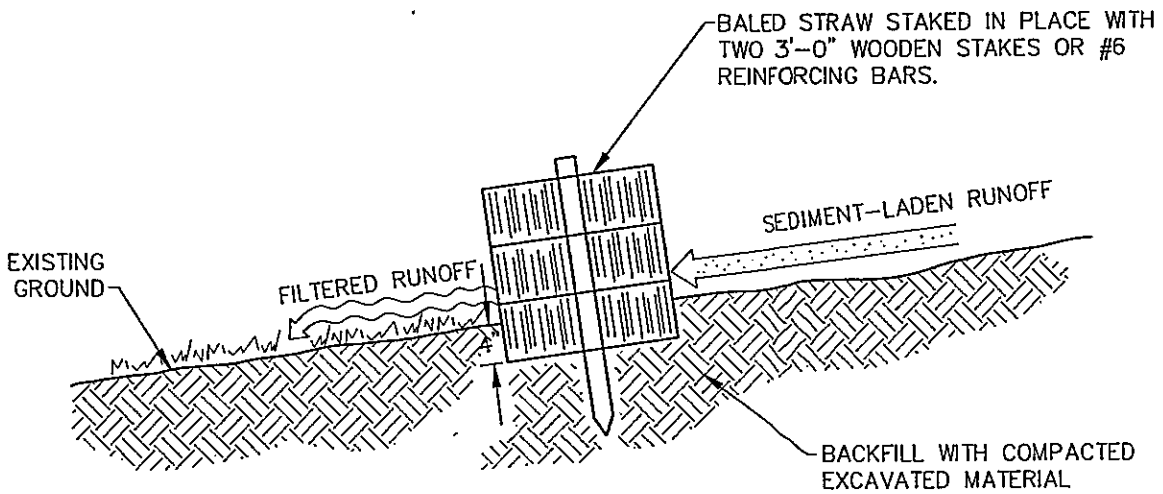
DATE: 12/27/2006

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CHK. BY:

NO. MT2270-8





**CROSS-SECTION OF PROPERLY  
INSTALLED STRAW BALE**

**NOTES:**

STRAW BALE BARRIERS SHOULD NOT BE USED FOR MORE THAN 3 MONTHS.

STRAW BALE BARRIERS MUST BE PLACED AT LEVEL GRADES. BOTH ENDS OF THE BARRIER MUST BE EXTENDED AT LEAST 8 FEET UPSLOPE AT 45 DEGREES TO MAIN BARRIER ALIGNMENT.

SEDIMENT MUST BE REMOVED WHERE ACCUMULATIONS REACH 1/3 THE ABOVE GROUND HEIGHT OF THE BARRIER.

ANY SECTION OF STRAW BALE BARRIER WHICH HAS BEEN UNDERMINED OR TOPPED MUST BE IMMEDIATELY REPLACED WITH A ROCK FILTER OUTLET. SEE ROCK FILTER OUTLET DETAIL.

NOTE: NOT TO SCALE

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



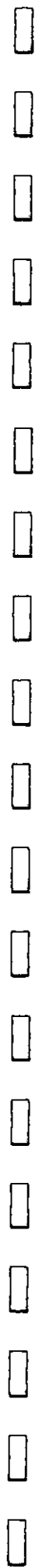
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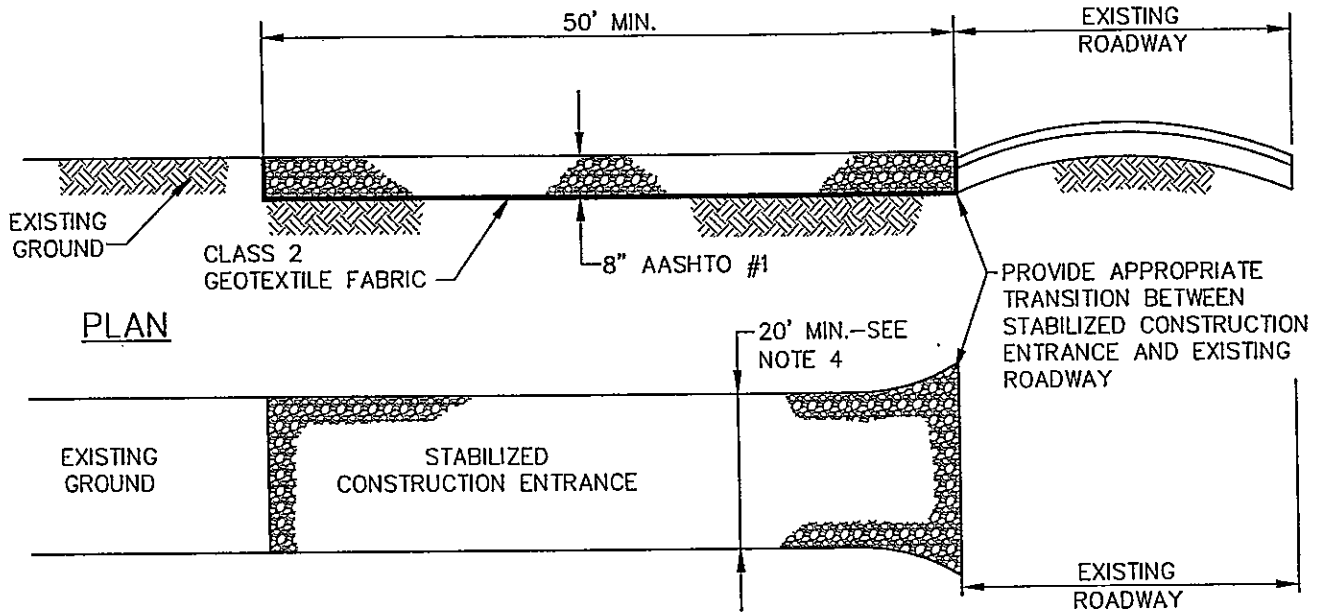
**STRAW BALE BARRIER  
DETAIL**

DATE:	12/27/2006
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SECTION



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - AASHTO #1.
2. LENGTH - AS REQUIRED TO BE EFFECTIVE, BUT NOT LESS THAN 50'.
3. THICKNESS - NOT LESS THAN 8".
4. WIDTH - FULL WIDTH OF ALL POINTS OF INGRESS OR EGRESS, BUT NOT LESS THAN 20'.
5. WASHING - WHEELS SHALL BE CLEAN PRIOR TO ENTRANCE ONTO EXISTING ROADWAY. WHEN WASHING IS REQUIRED IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH, OR WATERCOURSE THROUGH USE OF SAND BAGS, GRAVEL, BOARDS, OR OTHER APPROVED METHODS.
6. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO EXISTING ROADWAY, THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO EXISTING ROADWAYS MUST BE REMOVED IMMEDIATELY.

NOTE: NOT TO SCALE

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



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**STABILIZED  
CONSTRUCTION  
ENTRANCE DETAIL**

DATE:	12/27/2006
DRAWN BY:	JLD
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SECTION 02444

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 DESCRIPTION

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

Chain-Link Fencing

Zinc-coated (Galvanized) steel fabric

Top rail, bottom tension wire

Gates: (Size and swing as required by the Municipal Engineer)

Barbed Wire

Three strands of barded wire, where directed by the Municipal Engineer.

Accessories

1.02 QUALITY ASSURANCE

- A. Referenced Standards:

American Society for Testing and Materials (ASTM):

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

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

A392 Zinc-Coated Steel Chain-Link Fence Fabric

1.03 SUBMITTALS

- A. Manufacturer's Product Data:

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

- B. Compliance Statement:

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

- C. Shop Drawings:

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

## 1.04 JOB CONDITIONS

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

## PART 2 PRODUCTS

### 2.01 CHAIN-LINK FABRIC

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

### 2.02 FRAMEWORK

- A. Galvanized Steel Pipe; ASTM A120, Schedule 40. Hot-dip galvanized inside and outside. Provide post caps.
- B. Fence Posts:
  - 1. Corner, Terminal and Pull Posts: 4.000" O.D.
  - 2. Line Posts: 2.375" O.D.
  - 3. Top Rail, Brace Rails: 1.660" O.D.
  - 4. Truss Rods: 0.313" Rod, w/Turnbuckles

#### C. Gate Posts:

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

### 2.03 GATES

- A. Framework: 1.660" O.D. galvanized steel pipe joined at the corners by arc welding, with diagonal truss rods. Provide horizontal center rail on gates over 6' high; vertical center upright on gate leaves over 8' wide.
- B. Fabric shall be fastened in the frame on all four sides by means of adjustable hood bolts and tension rods.
- C. All gates shall be equipped with latches, stops for both open and closed positions, and all other necessary accessories of an approved type.



## 2.04 GATE HINGES

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

## 2.05 GATE LATCHES

- A. Swimming pool enclosures with gates shall be equipped with a self-closing, self-latching device.
- B. Latch – Forked type capable of retaining gate in closed position and have provision to attach a padlock. Latch shall permit operation from either side of gate.

## 2.06 FITTINGS

- A. Rail ends, rail sleeves, tension bars, brace ends, post tops and caps, latch forks, lock keepers, and other appurtenances, including gate hinges.

- 1. Malleable, pressed or cast steel. Hot-dip galvanized after fabrication, ASTM A123.

## 2.07 TENSION WIRE

- A. #6 gage Galvanized Coil Spring Tension Wire; #9 gage Hog Rings and Tie Wire, attached at intervals of approximately 2'-0".

## 2.08 BARBED WIRE

- A. #9 gage Galvanized, 4 point thick set barbs spaced 4" apart.
- B. One piece press steel arm, galvanized after fabrication, clamped to the top of each line post at an upward 45° angle. Arms shall be formed with tongue for permanently attaching barbed wire topping.

# PART 3 EXECUTION

## 3.01 INSPECTION

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

## 3.02 PREPARATION

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

### 3.03 POST INSTALLATION

- A. Encase posts in concrete to minimum 3' depth. Extend concrete at least 6" below bottom of posts.

10" diameter encasement for line posts.

12" diameter encasement for end, corner, pull and gate posts.

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

- B. Provide corner, end, and pull posts with a horizontal brace and tie rod on each side of the posts, extending and connecting to adjacent line posts.

- C. Provide fences higher than 8' with center rail.

- 1. Fences are regulated by the Manchester Township Zoning Ordinance, which states that the maximum height permitted in rear yards is six (6) feet. Fences of greater height require Special Exception approval.

- D. On fences under 6' high, attach post caps with setscrews.

- E. At all changes in relative grade greater than 15 percent, pull posts and diagonal braces shall be provided.

### 3.04 FABRIC INSTALLATION

- A. Remove slack from fabric by means of mechanical fence stretchers before making attachment to posts.

- B. Cut fabric to form one continuous piece between terminal posts.

- C. Hold bottom of fabric 1" to 2" above finished grade.

- D. Attach fabric to terminal posts with vertical tension bands.

- E. Fasten fabric to line posts with #9 galvanized gage ties, or by integral fabric lock loops as applicable, at maximum 12" intervals.

- F. Fasten fabric to top rail and intermediate rail with #9 galvanized gage double-wrap ties at maximum 18" intervals.

- G. Fasten fabric to tension wire with hog rings and ties at maximum 18" intervals.

### 3.05 GATES

- A. Install gates of the size and swing as required and as approved by the Municipal Engineer.

- B. Fill gate frame with same fabric fence.

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

### 3.06 FIELD QUALITY CONTROL

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

END OF SECTION



SECTION 02485

FINISH GRADING, SEEDING, AND SODDING

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Placing topsoil
2. Soil conditioning
3. Finish grading
4. Seeding
5. Sodding
6. Mulching
7. Maintenance

B. Related work specified elsewhere:

1. Clearing and grubbing: Section 02100
2. Trenching, backfilling & compacting: Section 02221

C. Definitions: NONE

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation Publication 408, Specifications.
2. Pennsylvania Seed Act of 1965, Act 187, as amended.
3. Agricultural Liming Materials Act of 1978, P.L.15, No. 9 (3P.S.132-1), as amended.
4. Pennsylvania Soil Conditioner and Plant Growth Substance Law, Act of December 1, 1977, P.L. 258, No. 86 (3P.S.68.2), as amended.
5. Rules for Testing Seeds of the Association of Official Seed Analysts.
6. American Association of State Highway and Transportation Official (AASHTO):  
T194 Determination of Organic Matter in Soils by Wet Combustion.

B. Sod Producer - Company specializing in sod production and harvesting.

C. Sod Installer - Company specializing in performing this work with a minimum five (5) years experience.

### 1.03 SUBMITTALS

#### A. Samples:

1. Unless otherwise directed, furnish three strips of sod, 4-1/2' long by 12" wide, laid on 3 inches of topsoil and tamped in place. The samples shall be representative of the sod and workmanship to be provided. Include sod source location.

#### B. Certificates:

1. Unless directed otherwise, prior to use or placement of material, submit certifications of material composition of the following for approval:
  - a. Topsoil analysis
  - b. Fertilizer
  - c. Lime
  - d. Seed mixtures
  - e. Inoculant
  - f. Sod

### 1.04 JOB CONDITIONS – SECTION NOT UTILIZED

## PART 2 PRODUCTS

### 2.01 TOPSOIL

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

### 2.02 FERTILIZER

#### A. Basic Dry Formulation Fertilizer:

1. Analysis 10-20-20 and as defined by the Pennsylvania Soil Conditioner and Plant Growth Substance Law.

#### B. Starter Fertilizer:

1. Analysis 38-0-0 or 31-0-0 and as defined by the Pennsylvania Soil Conditioner and Plant Growth Substance Law.

2.03 LIME

- A. Raw ground limestone conforming to Publication 408, Section 804.2(a).

2.04 SEED

- A. Fresh, clean, dated material from the last available crop and within the date period specified, with a date of test not more than 9 months prior to the date of sowing. Percentage of pure seed present shall represent freedom from inert matter and from other seeds distinguishable by their appearance. All seeds will be subject to analysis and testing.
- B. Deliver seed fully tagged and in separate packages according to species or seed mix. Seed which has become wet, moldy, or otherwise damaged in transit or storage will not be accepted.

TABLE 1 - GRASS AND AGRICULTURAL SEEDS			
Species	Minimum Guaranteed Purity (Percent)	Maximum Weed Seed (Percent)	Minimum Guaranteed Germination
Kentucky Bluegrass ( <i>Poa pratensis</i> ) Domestic origin; min. twenty-one pounds per bushel	98	0.20	80
Perennial Ryegrass ( <i>Lolium perenne</i> , var. Pennfine)	95	0.15	90
Kentucky 31 Fescue ( <i>Festuca elatior arundinacea</i> )	98	0.15	85
Crownvetch ( <i>Coronilla varia</i> , var. Penngift)	99	0.10	65
Pennlawn Red Fescue ( <i>Festuca rubra</i> , var. Pennlawn)	98	0.15	85
Annual Rye Grass ( <i>Lolium multiflorum</i> )	95	0.15	90
Timothy ( <i>Phleum pratense</i> )	98	0.25	85

2.05 SEED MIXTURES

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

2.06 INOCULANT

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

D. Reinoculate seed not sown within 24 hours following initial inoculation.

## 2.07 MULCHING MATERIALS

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

1. Straw:

- a. Cured to less than 20% moisture content by weight.
- b. Contain no stems of tobacco, soybeans, or other coarse or woody material.
- c. Wheat or oat straw.

2. Wood Cellulose:

- a. No growth or germination inhibiting substances.
- b. Green, air dried. Packages not exceeding 100 pounds.
- c. Requirements:

Moisture content: 12%±3%

Organic Matter: 98.6%±0.2% on the oven dried basis.

Ash Content: 1.4%±0.2%

Minimum Water-Holding Capacity: 1,000%

3. Mushroom Manure:

- a. Organic origin, free of foreign material larger than 2" and substances toxic to plant growth.
- b. Organic Matter: 20% minimum
- c. Water-Holding Capacity: 120% minimum
- d. pH: 6.0

B. Sewage sludge compost is not allowed.

## 2.08 SOD

- A. Well-rooted Kentucky Bluegrass (*Poa pratensis*) sod containing a growth of not more than 10% of other grasses and clovers.
- B. Free from noxious weeds such as bermuda grass, wild mustard, crab grass, and kindred grasses.
- C. Mow sod in the field to a height of not more than 2-1/2" within 5 days prior to lifting.
- D. Cut sod to a depth equal to the growth of the fibrous roots, but in no case less than 1-1/2", exclusive of grass and thatch. Do not cut sod when the ground temperature is below 32°F.
- E. Deliver sod to the project site within 24 hours after being cut and place sod within 36 hours after being cut. Do not deliver small, irregular, or broken pieces of sod.



- F. During wet weather, allow sod to dry sufficiently to prevent tearing during handling and placing. During dry weather, moisten sod to ensure its vitality and to prevent dropping of the soil during handling. Sod which dries out will be rejected.

## 2.09 SLOPE

- A. Erosion control mat (ECM) with appropriate seed mix.
- B. Erosion control and vegetation mat (ECRM) with appropriate seed mix.
- C. For all slopes 25% or steeper, use appropriate matting and seed mix.

## PART 3 EXECUTION

### 3.01 TIME OF OPERATIONS

#### A. Spring Seeding:

- 1. Preliminary operations for seed bed preparation may commence as soon after February 15 as ground conditions permit.

#### B. Fall Seeding:

- 1. Preliminary operations for seed bed preparation may commence after July 15.

### 3.02 FINISH GRADING

#### A. Preparation of Subgrade:

##### 1. "Hard pan" or heavy shale:

- a. Plow to a minimum depth of 6".
- b. Loosen and grade by harrowing, discing, or dragging.
- c. Hand rake subgrade. Remove rocks over 2" in diameter and other debris.

##### 2. Loose loam, sandy loam, or light clay:

- a. Loosen and grade by harrowing, discing, or dragging.
- b. Hand rake subgrade. Remove rocks over 2" in diameter and other debris.

#### B. Placing Topsoil:

- 1. Place topsoil and spread over the prepared subgrade to obtain the required depth and grade elevation. Compact with a roller having not more than 65 pounds per roller foot width to a final compacted thickness of not less than 4".
- 2. Handrake topsoil and remove all materials unsuitable or harmful to plant growth.
- 3. Do not place topsoil when the subgrade is frozen, excessively wet, or extremely dry.

4. Do not handle topsoil when frozen or muddy.

C. Tillage:

1. After seed bed areas have been brought to proper compacted elevation, thoroughly loosen to a minimum depth of 4" by discing, harrowing, or other approved methods. Do not work topsoiled areas when frozen or excessively wet.

2. Liming:

- a. Distribute lime uniformly at the specified rates.
- b. Thoroughly incorporate into the topsoil to a depth of 4".
- c. Incorporate as a part of the tillage operation.

3. Basic Fertilizer:

- a. Distribute basic fertilizer uniformly at the specified rate.
- b. Thoroughly incorporate into the topsoil to a depth of 4".
- c. Incorporate as a part of tillage operation.

D. Finish Grading:

1. Remove unsuitable material larger than ½" in any dimension.
2. Uniformly grade surface to the required contours without the formation of water pockets.
3. Rework areas which puddle by the addition of topsoil and fertilizer and rerake.

3.03 SEEDING

- A. Distribute starter fertilizer at the specified rates.

- B. Incorporate starter fertilizer into the upper 1" of soil.

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

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

- E. Mulch immediately after seeding, using one of the following methods:

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

- a. Anchor straw mulch by use of twine, stakes, wire staples, paper, or plastic nets.

- b. Emulsified asphalt may be used for anchorage provided it is applied uniformly at a rate not less than 31 gallons per 1,000 square yards.

- c. Chemical mulch binders may be used for anchorage if they are applied uniformly at the manufacturer's recommended rate.
  - d. Chemical mulch binders or a light covering of topsoil may be used for anchorage when the size of the area precludes the use of mechanical equipment.
2. Apply wood cellulose fiber hydraulically at a rate of 320 pounds per 1,000 square yards. Incorporate as an integral part of the slurry after seed and soil supplements have been thoroughly mixed.
  3. Spread mushroom manure uniformly to a minimum depth of ½" or to the depth indicated on the drawings.
- F. When mulch is applied to grass areas by blowing equipment, the use of cutters in the equipment will be permitted to the extent that a minimum of 95% the mulch is 6" or more in length. For cut mulches applied by the blowing method, achieve a loose depth in place of not less than 2".
  - G. When mulching by the asphalt mix method, apply the mulch by blowing. Spray the asphalt binder material into the mulch as it leaves the blower. Apply the binder to the mulch in the proportion of 1.5 to 2.0 gallons per 45 pounds of mulch.
    1. Protect structures, pavements, curbs, and walls to prevent asphalt staining.
    2. Erect warning signs and barricades at intervals of 50 feet or less along the perimeter of the mulched area.
    3. Do not spray asphalt and chemical mulch binders onto any area within 100 feet of a stream or other body of water.
  - H. When seed and mulch are applied hydraulically as part of a slurry, the specifications as defined in Section 805 of the PennDOT Publication 408, shall be followed.

### 3.04 SODDING

- A. Prior to sod placement, complete finish grading.
- B. Do not place sod when the temperature is lower than 32°F.
- C. Place sod by hand with tight joints and no overlap. Transverse joints shall be broken or staggered.
- D. Place sod so that the top of the sod is flush with the surrounding grade.
- E. Use of tools which damage the sod or dumping of sod from vehicles will not be permitted.
- F. Water sod to the saturation point immediately after placement.
- G. After watering, tamp with an approved tamper to close all joints and insure close contact between sod and sod bed. After tamping, the sod shall present a smooth, even surface free from bumps and depressions. If so directed, use a light roller, weighing not more than 65 pounds per foot of roller width to complete firming and smoothing the sod.

- H. When placing sod in ditches, place the strip with the long dimension at right angles to the flow of water. At any point where water will start flowing over a sodded area, the upper edge of the sod strips shall be turned into the soil below the adjacent area and a layer of compacted earth placed over this juncture to conduct the water over the edge of the sod.
- I. In ditches and on slope areas, stake each strip of sod securely with at least 1 wood stake for each 2 square feet of sod. Stakes shall be ½" by 1" with a length of 8" to 12". Drive stakes flush with the top of the sod, with the long face parallel to the slope contour.

### 3.05 STEEP SLOPES

- A. Prepare final graded surface, topsoil and designated seed mix and mulch.
- B. Install matting with appropriate anchoring devices. Follow manufacturer's installation instructions.

### 3.06 MAINTENANCE

- A. Maintenance includes watering, weeding, cleanup, edging and repair of depressions, washouts or gullies.
- C. Those areas which do not show a prompt catch of grass within 14 days of seeding or sodding shall be reseeded or resodded until complete grass catch occurs.
- C. Maintain sodded areas for 3 months from date of substantial completion, mow to maintain maximum height of 2-1/2" or as specified on drawings:

END OF SECTION

SECTION 02500

BITUMINOUS PAVING AND SURFACING

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Surface preparation
2. Bituminous concrete base course construction.
3. Placement and compaction of bituminous binder and wearing surface.
4. Placement of bituminous seal coat and surface treatment.
5. Placement of street signs and pavement markings.

B. Related work specified elsewhere:

- |                                                    |               |
|----------------------------------------------------|---------------|
| 1. Clearing and grubbing:                          | Section 02100 |
| 2. Site excavation and placement of fill material: | Section 02210 |
| 3. Roadway excavation, fill, and compaction:       | Section 02230 |
| 4. Trench paving and restoration:                  | Section 02575 |

C. Definitions: NONE

D. Applicable Standard Details:

- MT2500-1 Residential Street Cross Section (Standard)
- MT2500-2 Residential Street "B" Cross Section (Alternate)
- MT2500-3 Residential Street "C" Cross Section (Alternate)
- MT2500-4 Industrial Street Cross Section (Standard)
- MT2500-5 Industrial Street "B" Cross Section (Alternate)
- MT2500-6 Industrial Street "C" Cross Section (Alternate)
- MT2500-7 Temporary Cul-de-sac Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

Publication 408, Specifications  
Regulations Governing Occupation of Highways by Utilities (67 PA Code, Chapter 459)  
Publication 213, Work Zone Traffic Control Guidelines  
Publication 27, Specification for Bituminous Mixtures (Bulletin 27)  
Publication 37, Specification for Bituminous Materials (Bulletin 25)

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

D2950 Density of Bituminous Concrete in Place by Nuclear Method.

B. Inspections:

1. Inspection by the Municipality will, at a minimum, be made of the materials upon delivery to the job site; of the subgrade prior to placement of the base course; of the completed base course prior to placement of the binder surface; of the complete binder course prior to placement of the wearing course; and of the completed wearing course.

C. Qualifications:

1. Pavement marking contractor shall be a PennDOT pre-qualified Contractor.

1.03 SUBMITTALS

A. Certification:

1. Submit certification from bituminous and aggregate suppliers attesting that materials conform to PennDOT Publication 408, Specifications.
2. Job Mix Formula -- Submit job mix formula to the owners Engineer five (5) days prior to start of work.
3. Provide PennDOT Certification of Compliance (CS-4171) with the first load delivered to the job site each day. Certification must be signed by the plant technician and cross referenced with the job mix formula number which must appear on the delivery ticket.
4. Delivery Tickets/Weight Slips -- Must be provided with each load delivered to the job site. Weight slips must include, at a minimum, the following:
  - a. Job Mix Formula Number
  - b. Date and Time
  - c. Material Type
  - d. Design ESALS
  - e. For Wearing Course -- Provide SRL Designation
5. Provide compaction testing results, if determined by the Municipal Engineer that the quality of material placement is questionable.

1.04 JOB CONDITIONS

A. Control of Traffic:

1. Take measures to control traffic during paving operations. Do not allow traffic on newly paved areas until adequate stability and adhesion have been attained and the material has cooled to 140°F or less.
2. Employ traffic control measures only after requesting traffic alterations, in writing to the Municipality, and receiving approval at a regularly scheduled Board of Supervisor's meeting.
3. The Contractor shall employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.

4. Notify York County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to existing traffic patterns.

B. Protection of Adjacent Areas:

1. Restore existing surface outside the limits of the work that has been damaged by the Contractor's operations, to its original condition.

C. Weather Limitations:

1. Do not place bituminous paving mixtures when surface is wet, or when the temperature of either the air or the surface on which the mixture is to be placed is less than 45°; in addition, the air temperature shall be forecast to remain at or above 45° for the 24 hours immediately following placement.

D. Coordinate With Utilities

1. The Contractor shall insure all work complies with the requirements of the Pennsylvania Underground Utility Protection Law.

PART 2 PRODUCTS

2.01 BITUMINOUS MATERIALS AND AGGREGATES

A. All bituminous materials and aggregates used in base course construction, paving, and resurfacing are designated in these specifications by, and shall conform to, the applicable portions of the PennDOT Publication 408 Specifications. The coarse aggregate used in bituminous wearing surfaces shall have the following aggregate Skid Resistance Level (SRL) letter designation based on the current Average Daily Traffic (ADT) for resurfacing or anticipated initial daily traffic on new facilities:

<u>ADT</u>	<u>SRL</u>	<u>ALTERNATIVES</u>
20,000 and Above	E	None
5,000 to 20,000	H	E, H, Blend of E and M, Blend of E and G
3,000 to 5,000	G	E, H, G, Blend of H and M, Blend of E and L
1,000 to 3,000	M	E, H, G, M, Blend of H and L, Blend of G and L, Blend of E and L
1,000 and Below	L	Any

Note: All blends are 50% by mass and shall be accomplished by an approved method.

- B. All Superpave (HMA) mixtures shall conform to applicable portions of Publication 408 Specifications. Aggregate shall be provided by approved sources and have the SRL designation as specified above. All mixtures will be petroleum grade PG 64-22 and ESALS detailed on Drawings MT2500-1 to MT2500-6 unless specified otherwise by the Municipality. Submit mixture design for base, binder, and wearing to Municipality for approval prior to placement.

## 2.02 SEALANTS

- A. PG 64-22 or rubberized joint sealing material (ASTM D3405 or modified AASHTO M173) for all transverse, longitudinal or other joints at utilities and curbs.

## 2.03 STREET SIGNS, POSTS, AND BRACKETS

### A. Street Identification Signs

1. Extruded aluminum, 0.80" thick, 9" high, minimum 24" long, high density, blue for unadopted streets.
  - a. High intensity 6" high white letters.
2. Municipality provides street signs, posts, and brackets for adopted streets.

### B. Posts:

1. Breakaway steel, in compliance with PennDOT Publication 408 Specifications, Section 931.
2. Ten feet long, extending seven (7) feet above the surface grade.

### C. Brackets

1. Aluminum alloy, in compliance with Publication 408 Specifications.

## 2.04 PAVEMENT MARKINGS

- A. Waterborne traffic paints shall conform to Publication 408, Section 962.
- B. Thermoplastic material shall conform to Publication 408, Section 960 and Section 965.

## PART 3 EXECUTION

### 3.01 BASE COURSES

- A. Superpave Base Course - Where indicated on the drawings, construct HMA base course to compacted depth in accordance with Publication 408, Section 309.
- B. Proof roll base course to satisfaction of the Municipality. Municipality shall approve crushed aggregate base course prior to placement of Superpave base course.



### 3.02 PREPARATION OF EXISTING PAVEMENT SURFACE

- A. Clean street surface of all dust, debris, loose stone, earth, or other deleterious material by means of hand brooms or approved power brooms.
- B. Scarify areas shown on the drawings. Where the existing base is judged inadequate by the Municipality, construct new base of the required type shown on Standard Details.
- C. Patch holes and depressions greater than one inch and less than four inches with binder material, compacted in layers not exceeding two inches after compaction.
- D. Holes greater than four inches in depth shall be sawed back to sound pavement, and patched with a minimum of six inches of crushed aggregate base course and two inches of binder material.
- E. Apply tack coat prior to overlaying existing pavement in accordance with Publication 408 Specifications, Section 460.
- F. Milling of existing bituminous pavement shall be performed in accordance with Publication 408, Section 491 to the depth and limits specified in the drawings.
  - 1. Saw cut all edges at intersections with streets and driveways and at the limits of work.
  - 2. All milled surfaces shall be swept completely. Millings must be disposed of properly.

### 3.03 SURFACE COURSES

#### A. Superpave Asphalt

- 1. HMA Binder Course - Construct HMA binder course to the compacted depth shown on the drawings and PennDOT Publication 408 Specifications, Section 409.
- 2. HMA Wearing Course - Construct HMA wearing course to the compacted depth shown on the drawings and PennDOT Publication 408 Specifications, Section 409. Tack coat shall be applied and conform to PennDOT Publication 408 Specifications, Section 460, to ensure bonding between the two courses.

#### B. Compaction

- 1. Compact by rolling with steel-wheel, vibration or pneumatic tire rollers (minimum GVW = 5 tons) or a combination of these to obtain specified layer thickness and until non-movement of material under compaction equipment is achieved, unless other density requirements required by the Municipality.
- 2. The roller pattern and speed shall be monitored by the Municipality to avoid roller marks, pattern segregation and displacement of hot mixtures.
- 3. Do not allow vehicular traffic on newly compacted bituminous material until the temperature cools below 140° F.

4. Compaction testing shall be in accordance with PennDOT Publication 408 Specifications, Section 409.3. Alternatively, pavement cores in accordance with PennDOT Publication 408 Specifications, Section 409.4 may be substituted.

C. Bituminous Seal Coat (single application)

1. Construct bituminous seal coat in accordance with PennDOT Publication 408 Specifications, Section 470.

D. Bituminous Surface Treatment (double application)

1. Construct bituminous surface treatment in accordance with PennDOT Publication 408 Specifications, Section 480.

### 3.04 JOINTS

A. Notch

The edge of an overlay shall be saw cut to a depth of 1-1/2" for the entire length of the joint and the detached material removed to a minimum notch width of 12". Notch shall be skewed a minimum 6:1 unless otherwise noted. A cold planer may be used. The vertical face must be painted with E-6, E-8, AET, PG64-22 or the same asphalt material used in mix design (PennDOT Publication 408 Specifications, Section 409).

B. Sealing

All joints shall be sealed. When wearing course is placed adjacent to curb to form bituminous gutter, seal with hot bituminous material of the class and type designated for wearing course and extend to 6 inches from the curb, applied evenly.

### 3.05 FIELD QUALITY CONTROL

- A. At the time of material delivery to the site, the Contractor shall furnish the delivery ticket indicating vehicle, material source, date, time, project identification, material quantity and material specifications, which should identify the Petroleum Grade, Equivalent Single Axle Loads (ESALs), aggregate size, and SRL designation (only for wearing course).

B. Surface Tolerance of Base Course.

1. After the base course has been completed as specified, the surface smoothness shall be checked with approved templates, string lines, or straightedges.
  - a. Templates. The Contractor shall furnish and use approved templates of required length and cut to the required crown of the finished surface of the base course, for checking the crown and contour thereof. The templates shall be equipped with metal or other approved vertical extensions attached to each end, so that the bottom of the template will be at the elevation of the top of the aggregate. At least 3 such templates shall be furnished, and used at intervals of not more than 25 feet.

b. String Lines. String lines, for controlling the finished elevation of the base course, shall be furnished with ample supports and offset along each side of the base course, and shall be maintained until all irregularities have been satisfactorily corrected.

c. Straightedges. Approved straightedges 10 feet in length shall also be furnished and used for testing longitudinal irregularities in the surface of the base course.

2. Any surface irregularities that exceed 1 inch shall be remedied by removing or adding bituminous material as required, after which the entire area, including the surrounding surface, shall be rolled until satisfactorily compacted.

C. Tests for Depth of Finished Base Course.

1. During the progress of the work, the depth of the base course will be measured by the Municipality and unsatisfactory work shall be repaired, corrected, or replaced.

a. The depth will be determined by cutting or coring holes to the full depth of the completed base course. One depth measurement may be required for each 1500 square yards, or less, of completed base course. Any section in which the depth is ½ inch or more deficient in specified depth, shall be satisfactorily corrected at no expense to the Municipality.

b. All test holes shall be backfilled with similar material and satisfactorily compacted by and at the expense of the Contractor. This operation shall be performed under the observation of the Municipality who will check the depth for record purposes.

D. Surface Tolerance of Wearing Course.

1. After the wearing course has been completed as specified, the surface smoothness shall be checked with straightedges.

a. Straightedges. Approved straightedges 10 feet in length shall be furnished and used for testing longitudinal irregularities in the surface of the wearing course.

2. Any surface irregularities that exceed 3/16 inch shall be remedied by removing or adding wearing material as required, after which the entire area, including the surrounding surface, shall be rolled until satisfactorily compacted.

E. Tests for Depth of Finished Wearing Course.

1. During the progress of the work, the depth of the wearing course may be measured by the Municipality and unsatisfactory work shall be repaired, corrected, or replaced. The Municipality will not be liable for payment for any excess depth of wearing course.

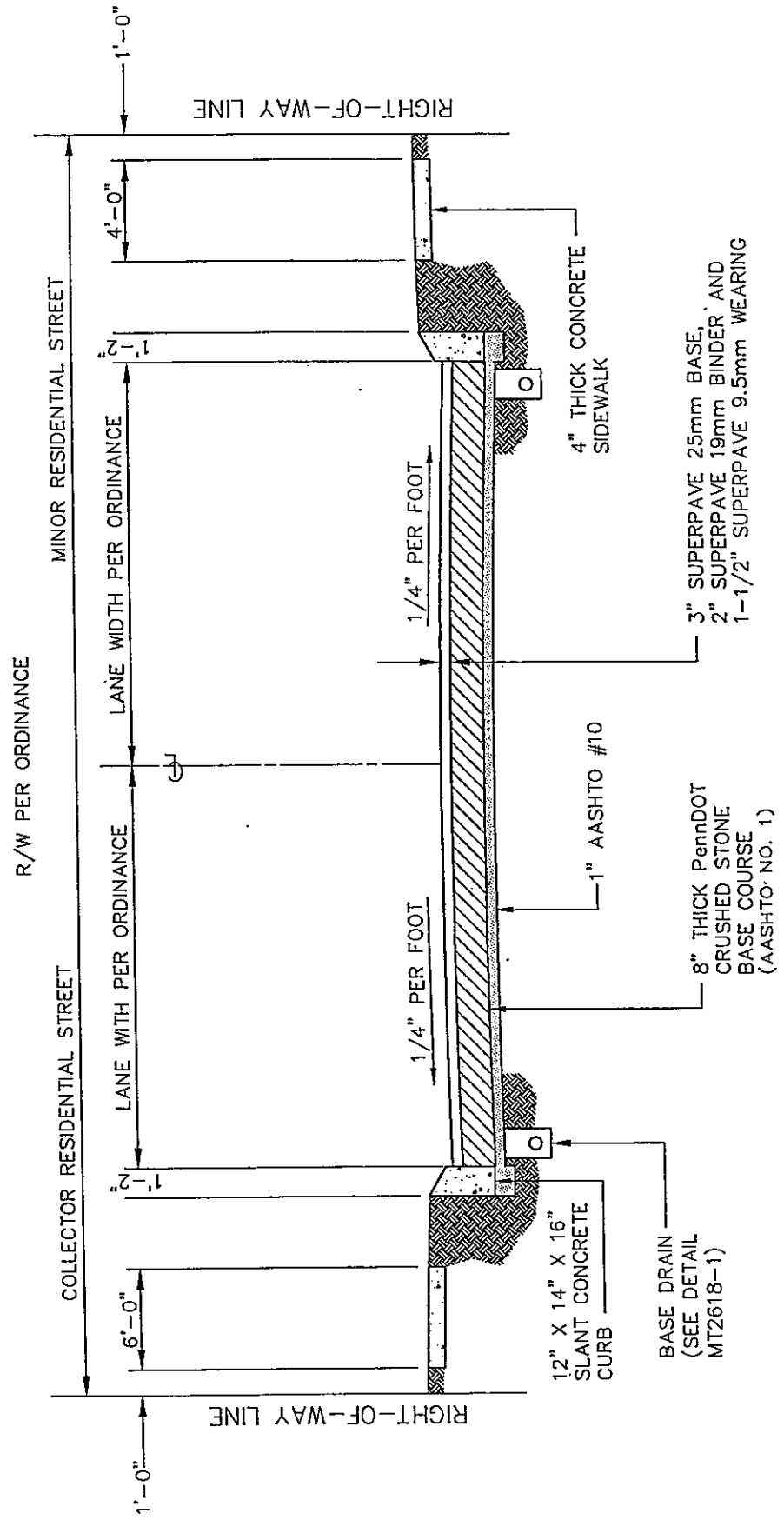
a. The depth will be determined by cutting or coring holes to the full depth of the completed wearing course. Test holes to be excavated by the Contractor at no expense to the Municipality. One depth measurement may be required for each 1500 square yards of completed wearing course. Any section in which the depth is 1/4 inch or more deficient in specified depth, shall be satisfactorily corrected at no expense to the Municipality.

- b. All test holes shall be backfilled with similar material and satisfactorily compacted by and at the expense of the Contractor. This operation shall be performed under the observation of the Municipality who will check the depth for record purposes.

3.06 PAVEMENT MARKINGS

- A. Apply waterborne traffic paints in accordance with Publication 408, Section 962.
- B. Apply thermoplastic markings in accordance with Publication 408, Section 965.

END OF SECTION



**NOTES:**

1. MINIMUM ESAL = 0.3 TO 3.0 MILLION
2. MINIMUM SRL = L (MINOR), M (COLLECTOR)
3. MINIMUM CBR = 6.0
4. ALL PETROLEUM GRADE TO BE 64-22
5. PROVIDE BASE DRAIN ON EACH SIDE OF VERTICAL SAG CURVES.
6. STRAIGHT CURB MAY BE SUBSTITUTED FOR SLANT CURB, WHEN APPROVED BY THE TOWNSHIP

REVISED: 12/27/2006  
NOTE: NOT TO SCALE

DATE:	4/7/2000
DRAWN BY:	JLD
CHK. BY:	
NO.	MT2500-1

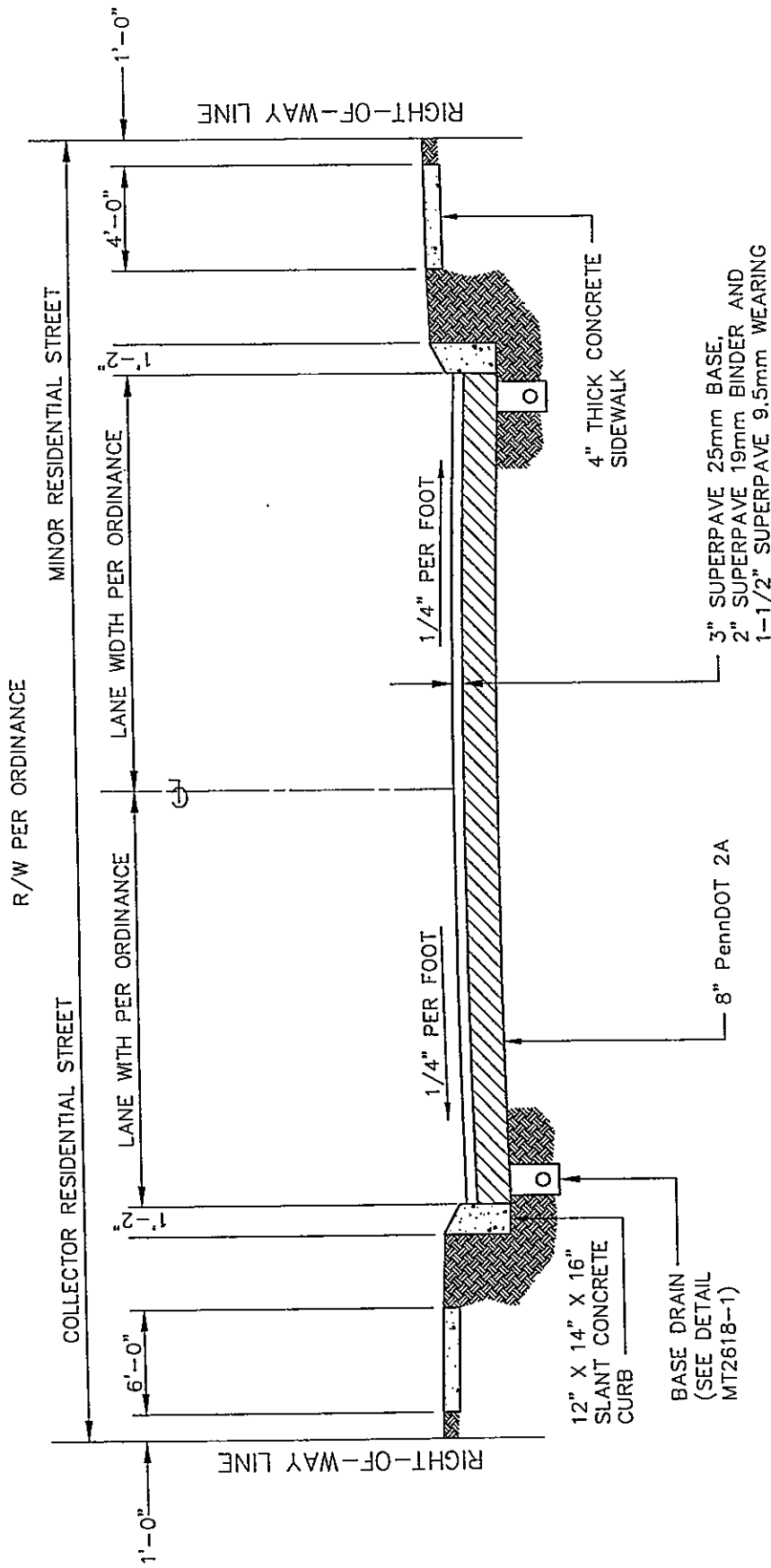
**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**

**RESIDENTIAL STREET  
CROSS SECTION (STANDARD)**



38 NORTH DINE STREET, YORK, PA • PHONE (717) 846-8805 • FAX (717) 846-3811  
50 WEST MADOLE STREET, GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782  
315 W. JAMES STREET, LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690





REVISED: 12/27/2006  
NOTE: NOT TO SCALE

DATE: 4/7/2000  
DRAWN BY: JLD  
CHK. BY:  
NO. MT2500-2

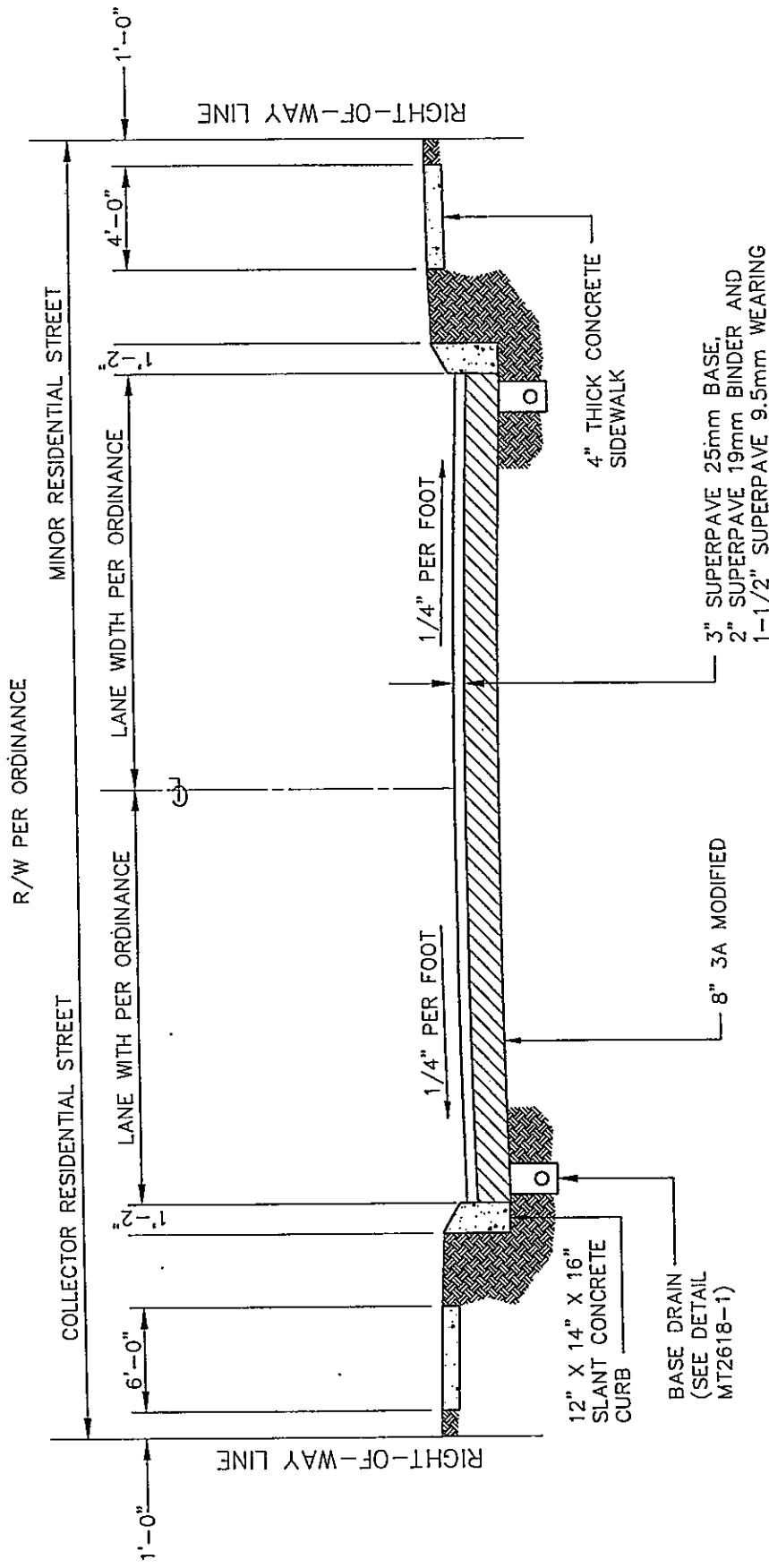
- NOTES:
1. MINIMUM ESAL = 0.3 TO 3.0 MILLION
  2. MINIMUM SRL = L (MINOR), M (COLLECTOR)
  3. MINIMUM CBR = 6.0
  4. ALL PETROLEUM GRADE TO BE 64-22
  5. PROVIDE BASE DRAIN ON EACH SIDE OF VERTICAL SAG CURVES.
  6. STRAIGHT CURB MAY BE SUBSTITUTED FOR SLANT CURB, WHEN APPROVED BY THE TOWNSHIP

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS  
RESIDENTIAL STREET "B"  
CROSS SECTION (ALTERNATE)

C.S. Davidson, Inc.  
38 NORTH DUKE STREET, YORK, PA • PHONE (717) 846-8805 • FAX (717) 846-5811  
50 WEST HIDDLE STREET, GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782  
315 W. JAMES STREET, LANCASTER, PA • PHONE (717) 861-2581 • FAX (717) 481-8890







**NOTES:**

1. MINIMUM ESAL = 0.3 TO 3.0 MILLION
2. MINIMUM SRL = L (MINOR), M (COLLECTOR)
3. MINIMUM CBR = 6.0
4. ALL PETROLEUM GRADE TO BE 64-22
5. PROVIDE BASE DRAIN ON EACH SIDE OF VERTICAL SAG CURVES.
6. STRAIGHT CURB MAY BE SUBSTITUTED FOR SLANT CURB, WHEN APPROVED BY THE TOWNSHIP

REVISED: 12/27/2006  
NOTE: NOT TO SCALE

DATE:	4/7/2000
DRAWN BY:	JLD
CHK. BY:	
NO.	MT2500-3

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**

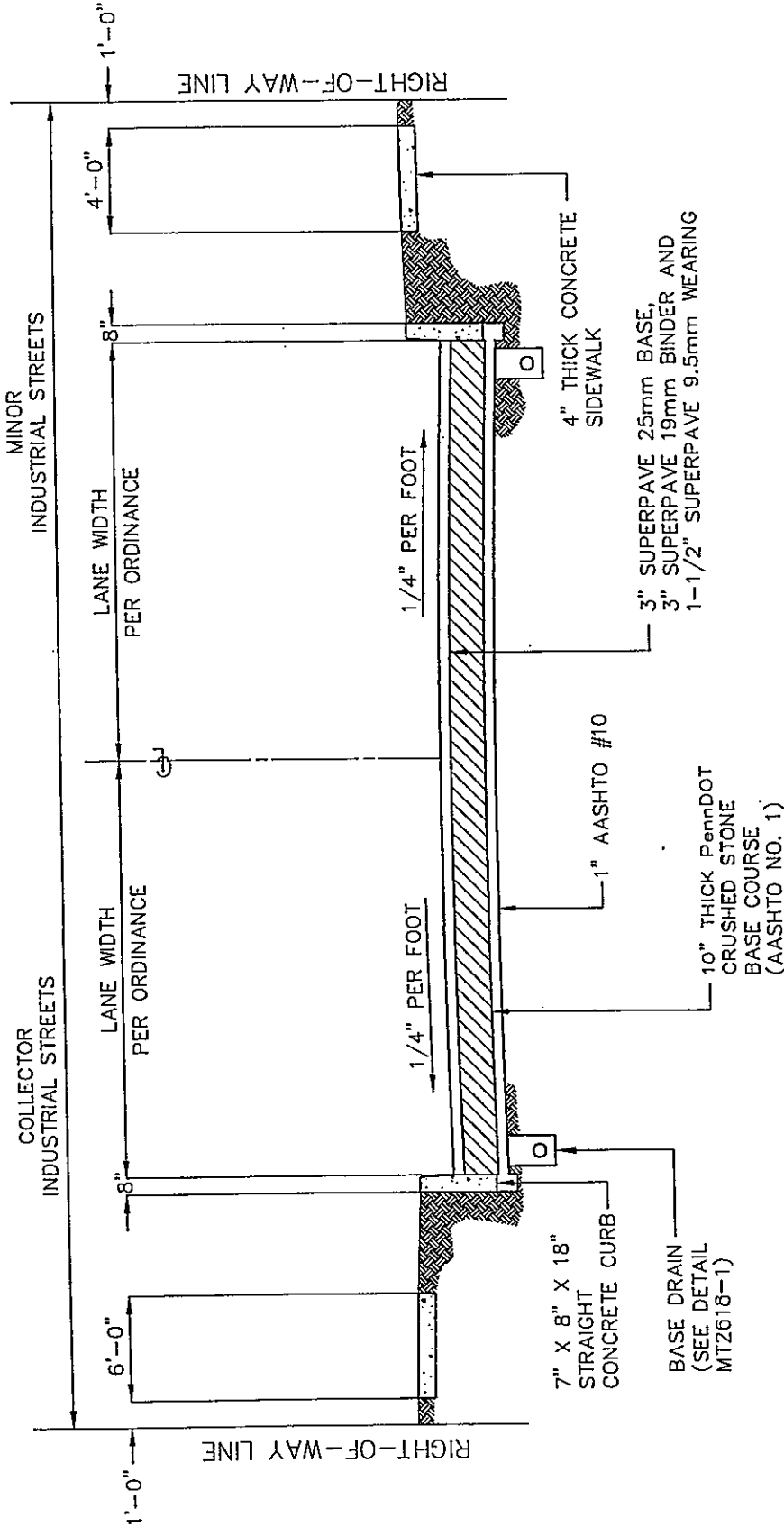
**RESIDENTIAL STREET "C"  
CROSS SECTION (ALTERNATE)**



38 NORTH DUKE STREET, YORK, PA • PHONE (717) 846-1805 • FAX (717) 846-5911  
50 WEST MIDDLE STREET, GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0092  
315 W. JAMES STREET, LANCASTER, PA • PHONE (717) 461-2981 • FAX (717) 461-6680



R/W WIDTH PER ORDINANCE



**NOTES:**

1. MINIMUM ESAL = 0.3 TO 3.0 MILLION
2. MINIMUM SRL = L (MINOR), M (COLLECTOR)
3. MINIMUM CBR = 6.0
4. ALL PETROLEUM GRADE TO BE 64-22
5. PROVIDE BASE DRAIN ON EACH SIDE OF VERTICAL SAG CURVES.
6. SLANT CURB MAY BE SUBSTITUTED FOR STRAIGHT CURB, WITH TOWNSHIP APPROVAL

REVISED: 12/27/2006  
NOTE: NOT TO SCALE

DATE:	4/7/2000
DRAWN BY:	JLD
CHK. BY:	
NO.	MT2500-4

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**

**INDUSTRIAL STREET  
CROSS SECTION (STANDARD)**



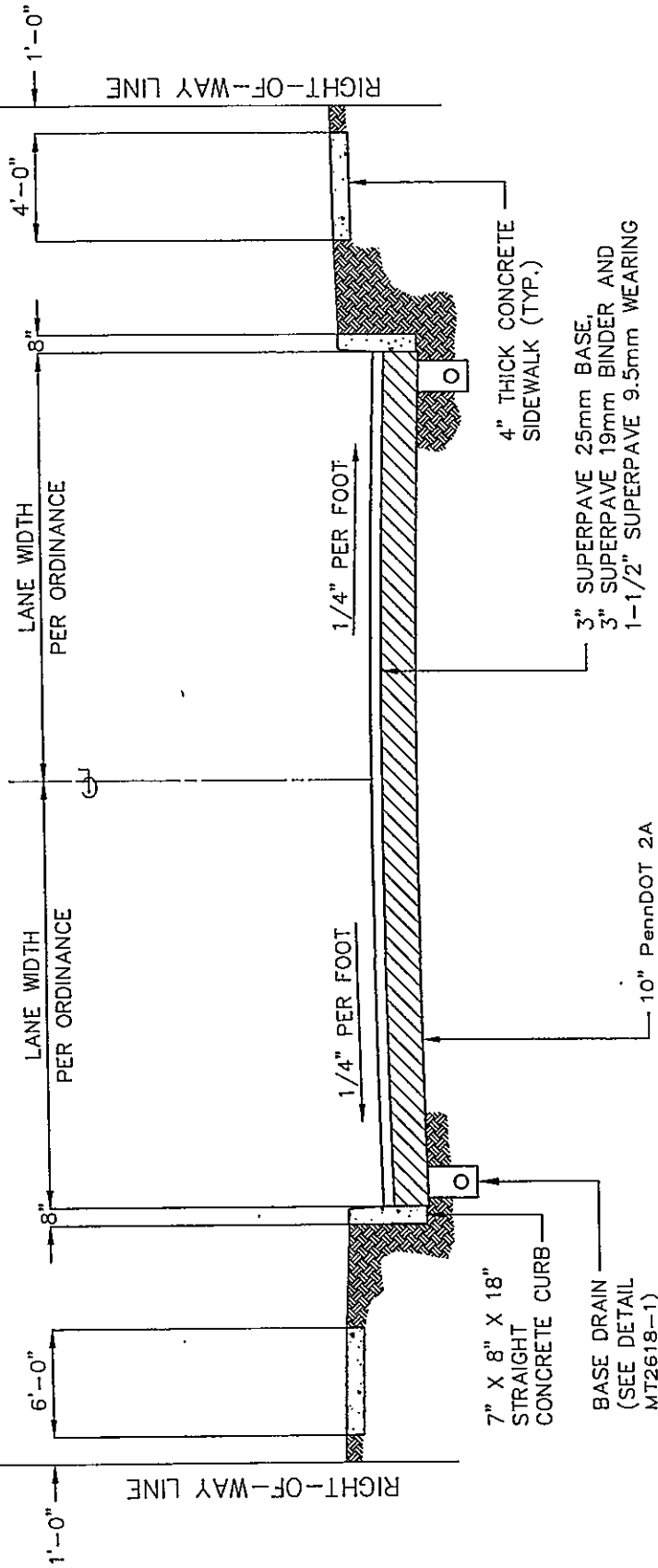
38 NORTH DUKE STREET, YORK, PA • PHONE (717) 846-6905 • FAX (717) 846-5811  
50 WEST MOBLE STREET, GETTYSBURG, PA • PHONE (717) 337-3071 • FAX (717) 337-0782  
318 W. JAMES STREET, LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8890

02500-12



R/W WIDTH PER ORDINANCE

COLLECTOR INDUSTRIAL STREETS  
MINOR INDUSTRIAL STREETS



NOTES:

1. MINIMUM ESAL = 0.3 TO 3.0 MILLION
2. MINIMUM SRL = L (MINOR) M (COLLECTOR)
3. MINIMUM CBR = 6.0
4. ALL PETROLEUM GRADE TO BE 64-22
5. PROVIDE BASE DRAIN ON EACH SIDE OF VERTICAL SAG CURVES.
6. SLANT CURB MAY BE SUBSTITUTED FOR STRAIGHT CURB, WITH TOWNSHIP APPROVAL

REVISED: 12/27/2006  
NOTE: NOT TO SCALE

DATE: 4/7/2000  
 DRAWN BY: JLD  
 CHK. BY:  
 NO. MT2500-5

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS  
 INDUSTRIAL STREET "B"  
 CROSS SECTION (ALTERNATE)

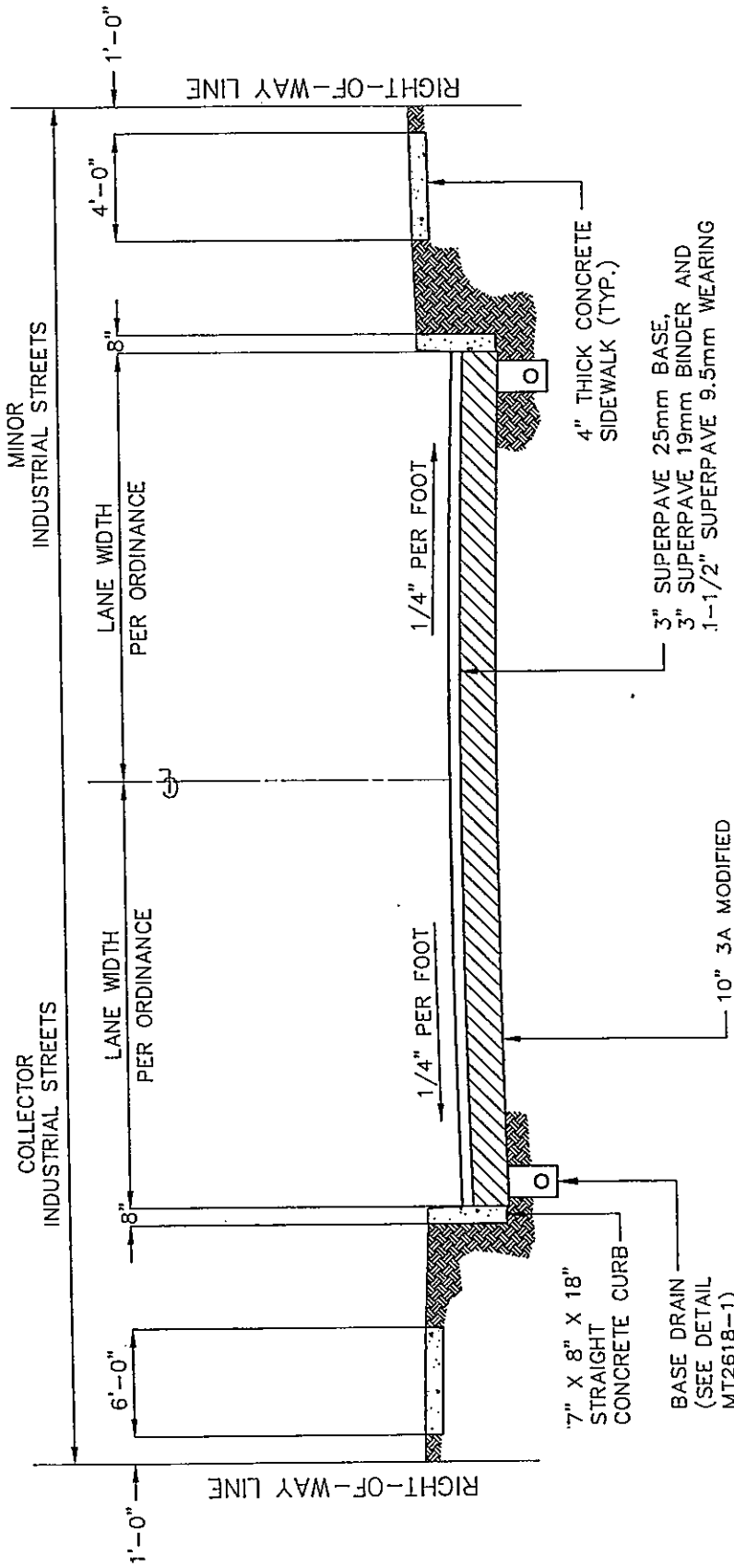


38 NORTH DUKE STREET, YORK, PA • PHONE (717) 846-6895 • FAX (717) 846-5811  
 50 WEST MIDDLE STREET, GETTYSBURG, PA • PHONE (717) 337-3001 • FAX (717) 337-0782  
 315 N. JAMES STREET, LANCASTER, PA • PHONE (717) 481-2981 • FAX (717) 481-8650



R/W WIDTH PER ORDINANCE

COLLECTOR INDUSTRIAL STREETS  
MINOR INDUSTRIAL STREETS



NOTES:

1. MINIMUM ESAL = 0.3 TO 3.0 MILLION
2. MINIMUM SRL = L (MINOR) M (COLLECTOR)
3. MINIMUM CBR = 6.0
4. ALL PETROLEUM GRADE TO BE 64-22
5. PROVIDE BASE DRAIN ON EACH SIDE OF VERTICAL SAG CURVES.
6. SLANT CURB MAY BE SUBSTITUTED FOR STRAIGHT CURB, WITH TOWNSHIP APPROVAL

REVISED: 12/27/2006  
NOTE: NOT TO SCALE

DATE: 4/7/2000  
DRAWN BY: JLD

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NO. MT2500-6

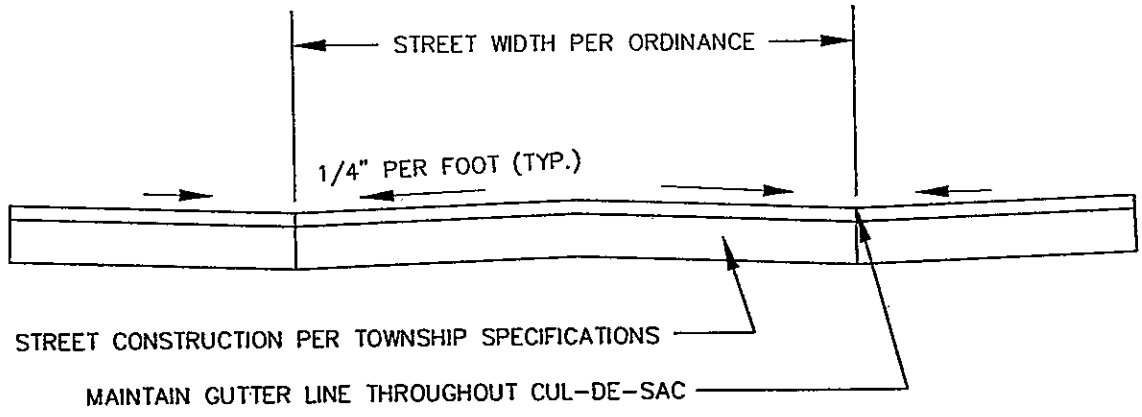
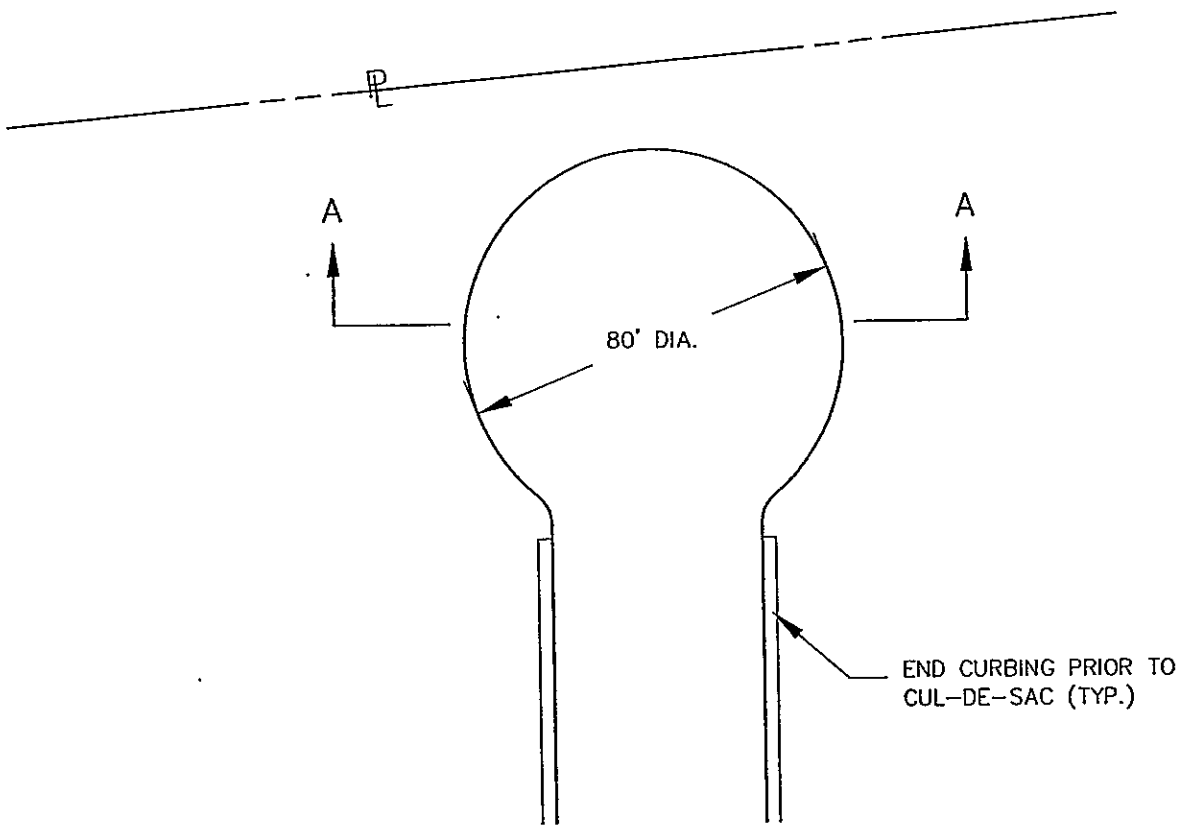
MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS  
INDUSTRIAL STREET "C"  
CROSS SECTION (ALTERNATE)



38 NORTH DUKE STREET, YORK, PA • PHONE (717) 846-6805 • FAX (717) 846-5811  
56 WEST STREET, GETTYSBURG, PA • PHONE (717) 337-3031 • FAX (717) 337-0782  
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SECTION A-A

NOTE: NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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TEMPORARY  
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DATE:	12/21/2006
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CHK. BY:	
NO.	MT2500-7

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SECTION 02525

CEMENT CONCRETE CURB & SIDEWALK

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Subgrade preparation
2. Construction of cement concrete curb and sidewalk
3. Construction of handicap ramps

B. Related work specified elsewhere:

- |                                           |               |
|-------------------------------------------|---------------|
| 1. Trenching, backfilling and compaction: | Section 02221 |
| 2. Finish grading, seeding and sodding:   | Section 02485 |
| 3. Bituminous paving and surfacing:       | Section 02500 |
| 4. Trench paving and restoration:         | Section 02575 |
| 5. Plain and reinforced cement concrete:  | Section 03000 |

C. Definitions: NONE

D. Applicable Standard Details:

- MT2525-1 Vertical Concrete Curb Details
- MT2525-2 Slant Concrete Curb Details
- MT2525-3 Concrete Sidewalk with Grass Strip Details
- MT2525-4 Concrete Sidewalk Adjacent to Curb Details (Alt.)
- MT2525-5 Handicap Ramp Details (With Grass Strip)
- MT2525-6 Handicap Ramp Detail (No Grass Strip)

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation:

- Publication 408, Specifications
- Publication 213, Work Zone Traffic Control Guidelines

2. American Society for Testing and Materials (ASTM)

- A185 Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement
- A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- C94 Specification for Ready-Mixed Concrete
- C143 Test Method for Slump of Hydraulic Cement Concrete
- C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

- C309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- D994 Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
- E329 Specification for Agencies Engaged in the Testing and/or Inspection of Materials used in Construction

B. Inspections:

1. When required by the Municipality, inspection by the Municipality will be made of the subgrade, formwork, and any steel prior to placement of the concrete.
2. Municipality will observe all on-site testing of concrete, unless noted otherwise.

C. Testing:

1. As specified in Section 03000. On-site testing and laboratory testing will be performed by the same independent testing agency.

1.03 SUBMITTALS

- A. Submit concrete mix designs, including strength test records, for review and approval.
- B. Submit certified results of compressive strength cylinder tests (from laboratory/testing agency).
- C. Submit copies of concrete batch slips.

1.04 JOB CONDITIONS

A. Control of traffic:

1. Take measures to control traffic during concreting operations. Do not allow traffic on newly placed concrete until adequate strength has been attained.
2. Employ traffic control measures only after requesting traffic alterations, in writing to the Municipality, and receiving approval at a regularly scheduled Board of Supervisor's meeting.
3. The Contractor will employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.
4. Notify York County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to existing traffic patterns.

B. Protection of adjacent areas:

1. Restore existing surfaces outside the limits of the work that have been damaged by the Contractor's operations to their original condition.

C. Coordination with utilities:

1. Coordinate all necessary adjustments of existing utilities to accommodate this work.

2. Provide access to the site for utility work.
3. The Contractor shall insure all work complies with the requirements of the Pennsylvania Underground Utility Protection Law.

## PART 2 PRODUCTS

### 2.01 CONCRETE

A. As specified in Section 03000, Articles 2.01 and 3.01, except as follows:

1. Minimum 28 day compressive strength shall be 3,300 psi unless specified higher by Municipality.

B. Cement concrete criteria for curbs and sidewalks:

Slump:	1" minimum, 4" maximum
Air Content:	4.5% minimum, 7.5% maximum
Temperature:	60° F minimum, 90° maximum
Water/cement ratio:	0.51 minimum

C. For slip formed curb, same as above except with a minimum slump of 1-1/2".

D. For replacement of curb and sidewalk at existing driveways, use air-entrained, PennDOT Class HES (High Early Strength).

### 2.02 FORMS

A. General requirements:

1. Forms shall be coated with a form release agent just prior to placement of concrete.

B. Straight curbing (or radius greater than 40 feet):

1. Approved metal forms.
2. Wood forms, not less than 2 inch nominal thickness, planed on finish side.

C. Radius curbing:

1. Approved metal forms.
2. Fabricated plywood or hardboard forms.

D. Machine-placed curbing:

1. Straight or radius curbing may be placed with a self-propelled machine approved by the Municipality.

## 2.03 REINFORCEMENT

- A. As specified in Section 03000, Article 2.02.

## 2.04 JOINT MATERIAL

- A. Joint Filler - Premolded expansion joint material shall be fiber joint filler conforming to ASTM D994.

## 2.05 FORM COATING MATERIALS

- A. As specified in Section 03000, Article 2.04.

## 2.06 CONCRETE CURING COMPOUNDS

- A. As specified in Section 03000, Article 2.05.

# PART 3 EXECUTION

## 3.01 CURB CONSTRUCTION

- A. Excavate to required depth, remove and dispose of material, and compact the subgrade material to a firm, even surface.
- B. Saw cut existing pavement a minimum of 12 inches from face of new curb. Exposed edges of existing work shall be smooth and square.
- C. Forms shall be placed as appropriate to the type of curbing on 2 sides (front and back).
- D. Forms shall be securely braced to limit deflection during placement of concrete.
- E. Provide openings through curb for drainage pipes, if required. Install one, 2'-0" long, #4 reinforcing bar in the middle of curb centered above the pipe.
- F. Concrete shall be placed in accordance with Section 03000.
- G. Variation of more than 1/8" from the established line and grade shall be cause for rejection of that portion of the work.
- H. Form or saw contraction joints 3/16" wide and 2" deep at 10-foot maximum intervals on 2 sides (front and top). Saw as soon as possible after the concrete has set sufficiently to preclude raveling during the sawing and before any shrinkage cracking occurs in the concrete, but in no case later than 24 hours following completion of the curb placement.
- I. Provide 1/2" expansion joints at 60-foot intervals, at the end of each pour, and at the beginning and end of all radii. 1/2" expansion joint material shall also separate curb from adjacent sidewalks, poles, hydrants, walls and other permanent structures, except that 3/4" thick expansion joint material shall be provided at storm inlets.

- J. Place two (2) #4 dowels, 24 inches long at each expansion joint, as shown on Standard Detail. Do not dowel into inlet tops.
- K. Unless otherwise indicated on the drawings, the last three feet of curb shall be tapered to a 2" reveal with expansion joint at the beginning of taper.
- L. Finish top surface with wood floats. Provide depressions for drainage, driveways, and ramps for the handicapped per the approved drawings.
- M. Tool all exposed edges to the specified radius.
- N. Do not remove forms until concrete has set.
- O. Begin proper curing in accordance with Section 03000, immediately after placement.
- P. Correct minor irregularities with a carborundum stone or mortar comprised of two parts fine aggregate to one part cement.
- Q. For slip formed curb, uniformly feed the concrete to the machine so the concrete maintains the shape of the section, without slumping after extrusion. Voids or honeycomb on the surface of the finished curb will not be allowed. Immediately after extrusion, perform any additional surface finishing required.

### 3.02 SIDEWALK CONSTRUCTION

- A. Excavate to required depth, remove and dispose of material, and compact the subgrade material to a firm, even surface.
- B. Exposed edges of existing work shall be smooth and square.
- C. Construct ramps for the handicapped, as required by ADA Regulations, where directed by the Municipality. Ramps shall be 6" thick concrete with WWF 6 x 6 - W2.9 x W2.9 (6 ga.) wire mesh, placed 2" from top surface, See Section 03000.
- D. Sidewalks at driveway entrances shall be 6" thick with WWF 6 x 6 - W2.9 x W2.9 (6 ga.) wire mesh placed 2" from top of surface, See Section 03000.
- E. Sidewalks across sanitary sewer or storm sewer easements shall be 6" thick.
- F. Spread aggregate and compact to the thickness shown on the Standard Details.
- G. Concrete shall be placed in accordance with Section 03000.
- H. Score contraction joints at 5-foot intervals to sufficient depth to insure cracking at the joint. Do not saw cut the contraction joints without prior approval from the Municipality. Also score sidewalks over each drainage pipe placed underneath.
- I. Provide 1/4" expansion joint at 30-foot intervals and at the end of each pour. 1/2" expansion joint material shall also separate adjacent curb, poles, hydrants, walls, and other permanent structures.

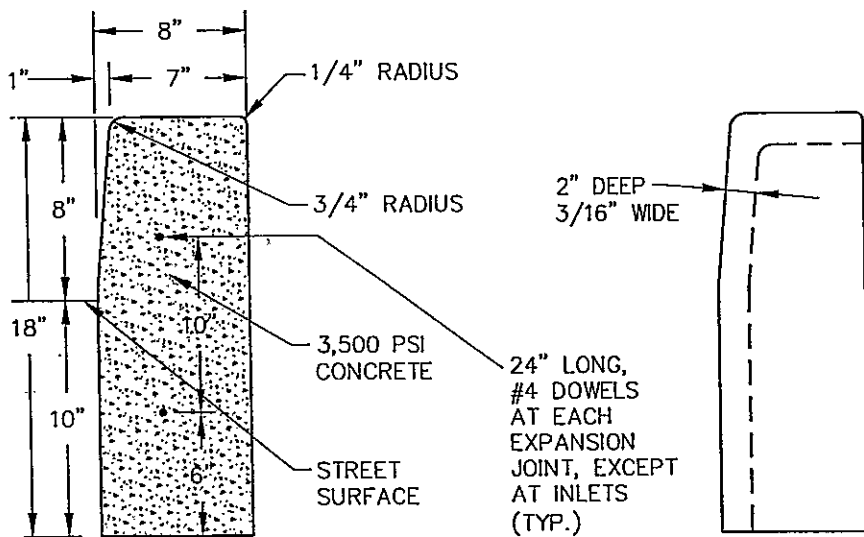
- J. Apply light broom finish as specified in Section 03000, immediately after that finish.
- K. Provide depressions for driveways, downspouts, and drainage as directed by the Municipality or shown on the drawings. Wherever possible, roof leaders shall be placed under the sidewalks in lieu of depressions.
- L. Begin proper curing in accordance with Section 03000, immediately following form removal.

### 3.03 BACKFILLING AND RESTORATION

- A. Temporary backfill at curbs shall consist of select granular material per Section 02221, front and back, to within 8" of top of curb.
- B. Restore adjacent areas as indicated in Section 02575.

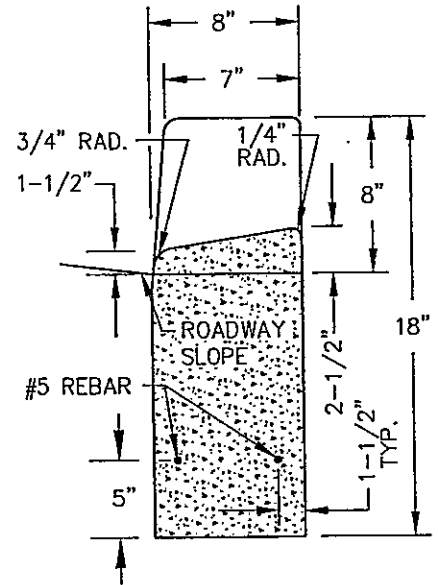
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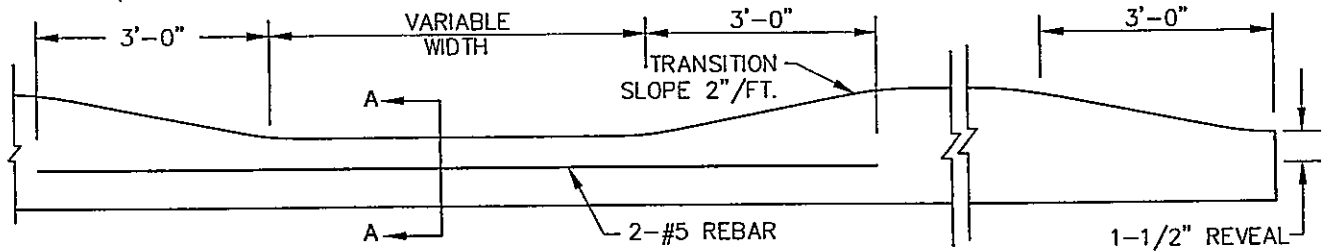


TYPICAL CROSS SECTION

CONTRACTION JOINT



SECTION A-A



DEPRESSED CURBS FOR DRIVES

TERMINAL SECTION

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REVISED 12/27/2006

NOTE: NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



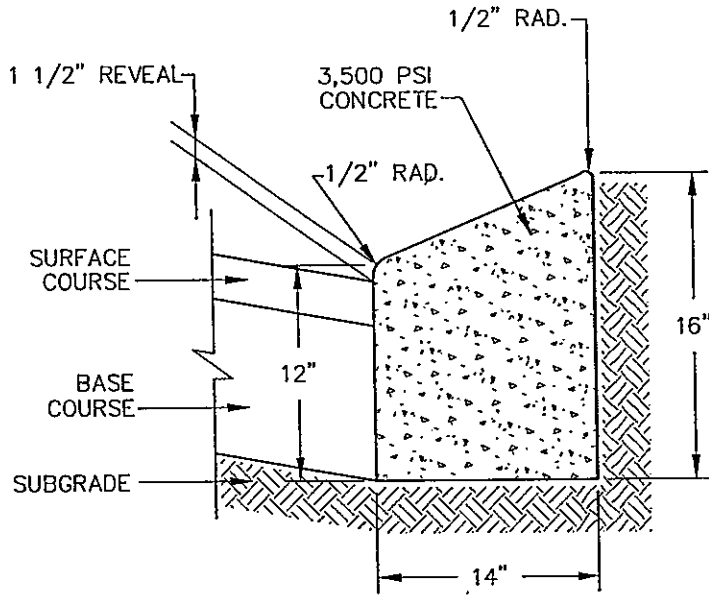
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VERTICAL CONCRETE CURB DETAILS

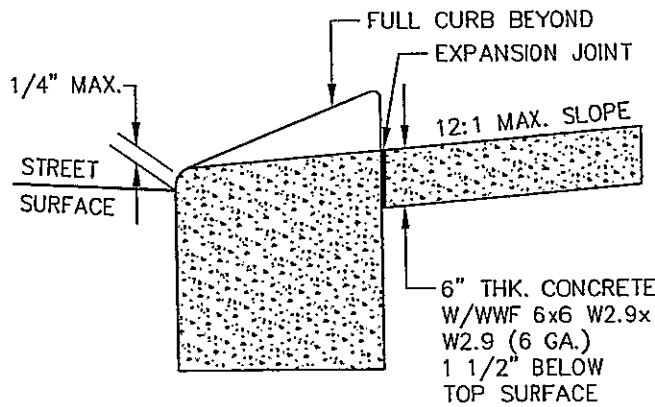
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CHK. BY:	
NO.	MT2525-1





TYPICAL CROSS SECTION

NOTE: SLANT CURB MAY BE CONSTRUCTED ONLY WITH PRIOR WRITTEN APPROVAL FROM THE MUNICIPALITY.



CROSS SECTION AT HANDICAP RAMPS

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**SLANT CONCRETE  
CURB DETAILS**

DATE: 12/14/2005

DRAWN BY: BAM/JLD

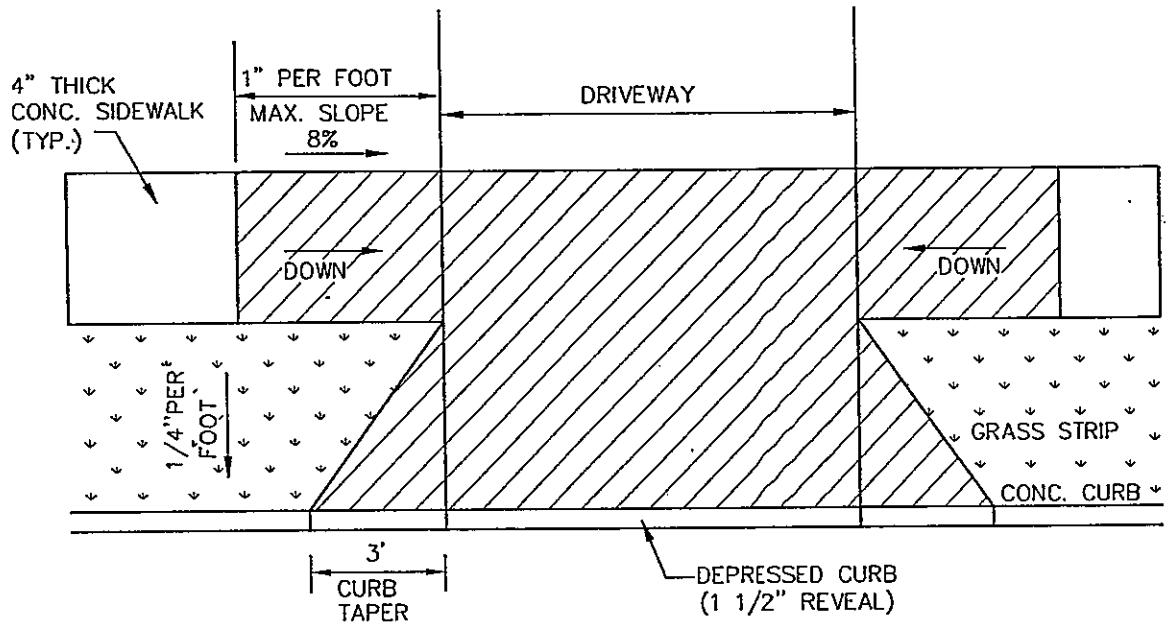
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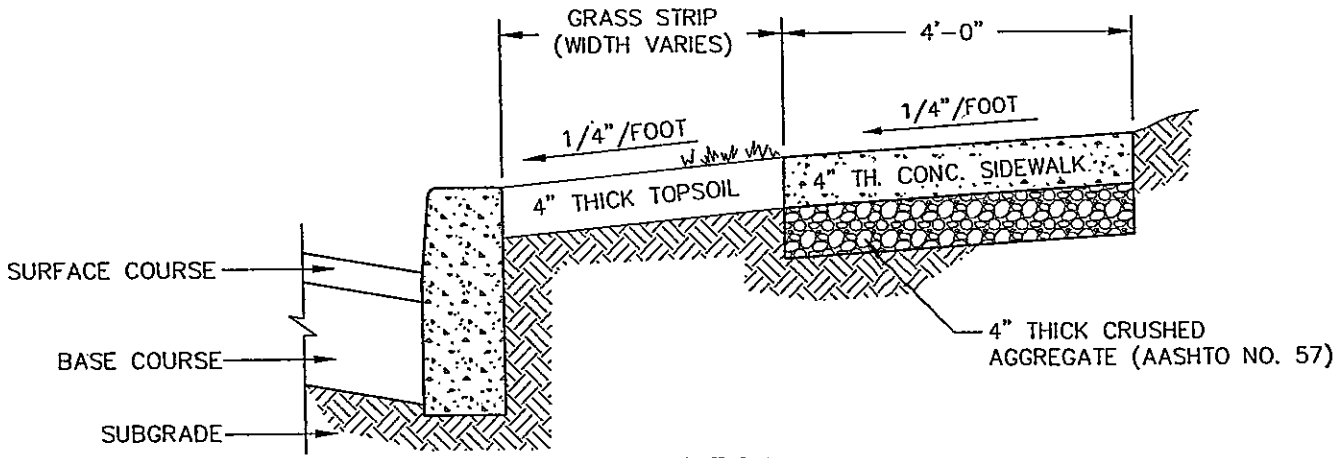
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 6" THICK, REINF. CONCRETE SIDEWALK



PLAN



SECTION

SEE DETAIL 02525-4 FOR DETAILS AT DRIVEWAY AND DEPRESSED CURB.

NOTE: NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



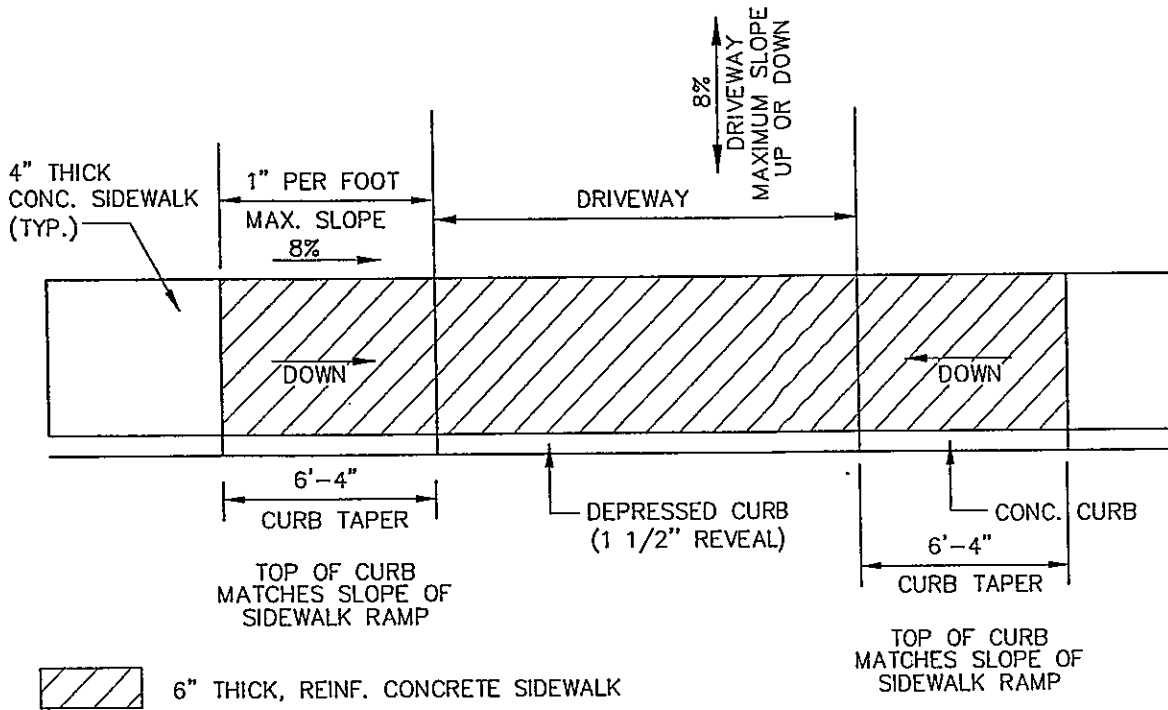
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CONCRETE SIDEWALK WITH GRASS STRIP DETAILS

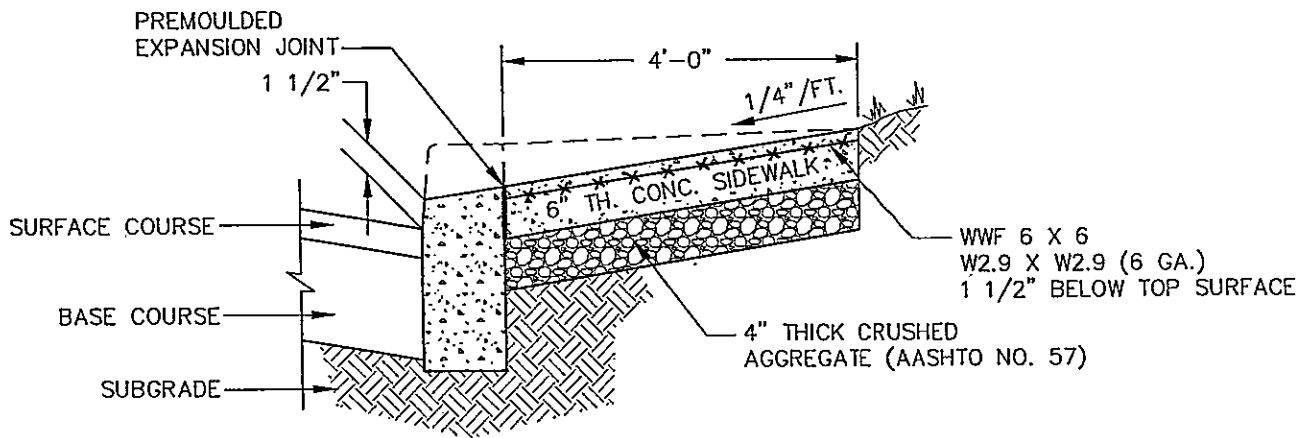
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PLAN OF 4' SIDEWALK ADJACENT TO CURB



TYPICAL SECTION THROUGH CONCRETE CURB & SIDEWALK AT DRIVEWAY DEPRESSION

NOTE: NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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 315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690  
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CONCRETE SIDEWALK  
 ADJACENT TO CURB  
 DETAILS (ALT.)

DATE: 12/27/2006

DRAWN BY: JLD

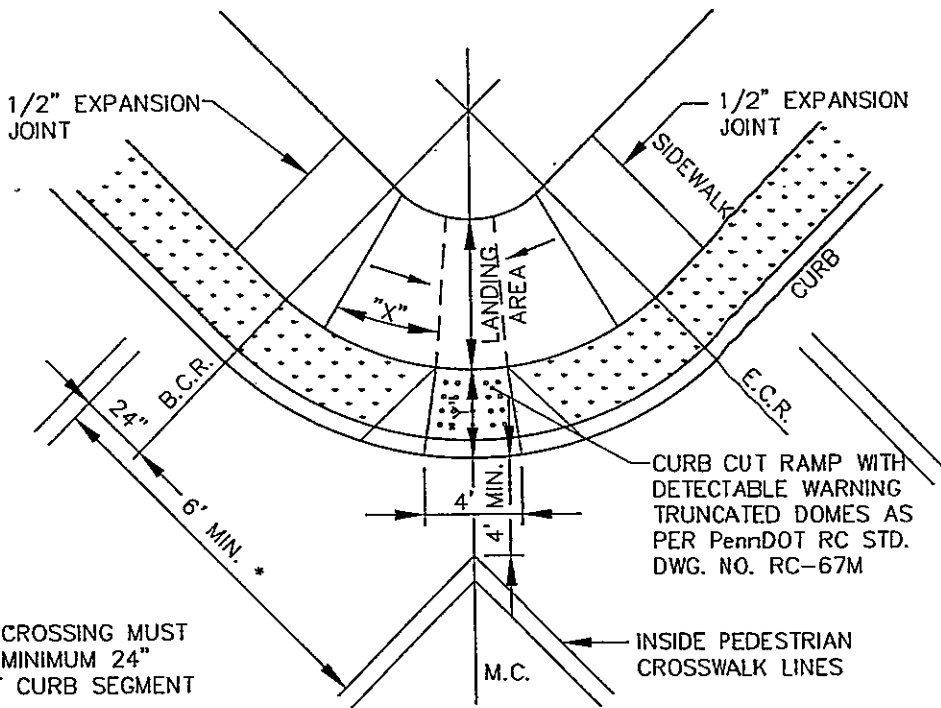
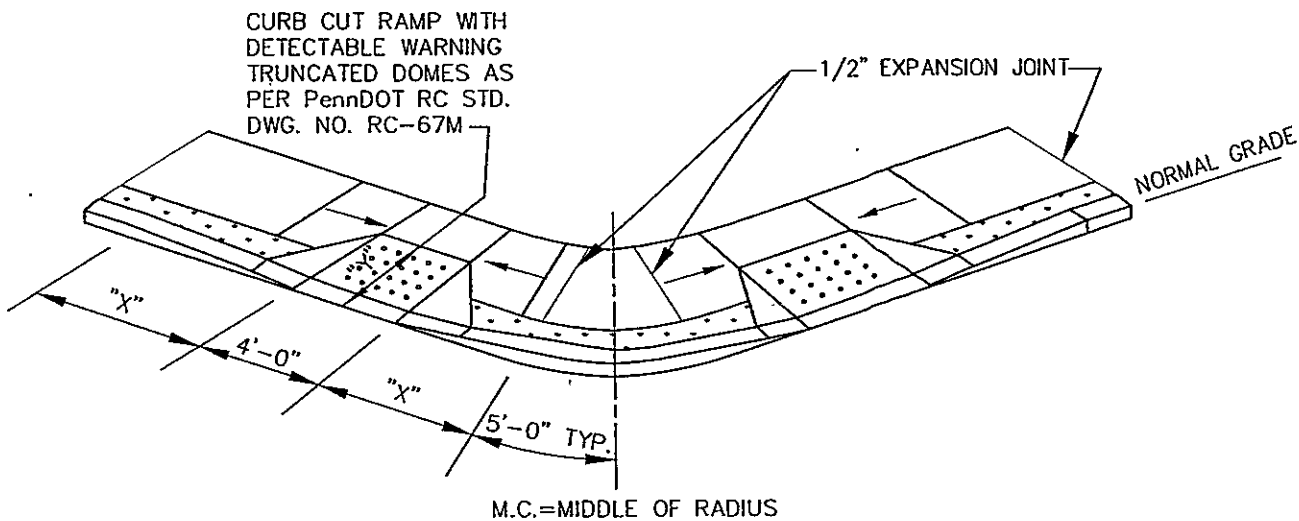
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\* MARKED CROSSING MUST INCLUDE MINIMUM 24" STRAIGHT CURB SEGMENT

"X" - LENGTH NEEDED TO MAINTAIN A MAXIMUM 12:1 SLOPE ALONG THE FACE OF THE CURB.

"Y" - LENGTH NEEDED TO MAINTAIN A MAXIMUM 12:1 SLOPE FROM THE CURB LINE TO THE TOP OF THE RAMP.

NOTE: NOT TO SCALE

## MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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 315 W. JAMES ST. SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690  
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HANDICAP RAMP  
 DETAILS  
 (WITH GRASS STRIP)

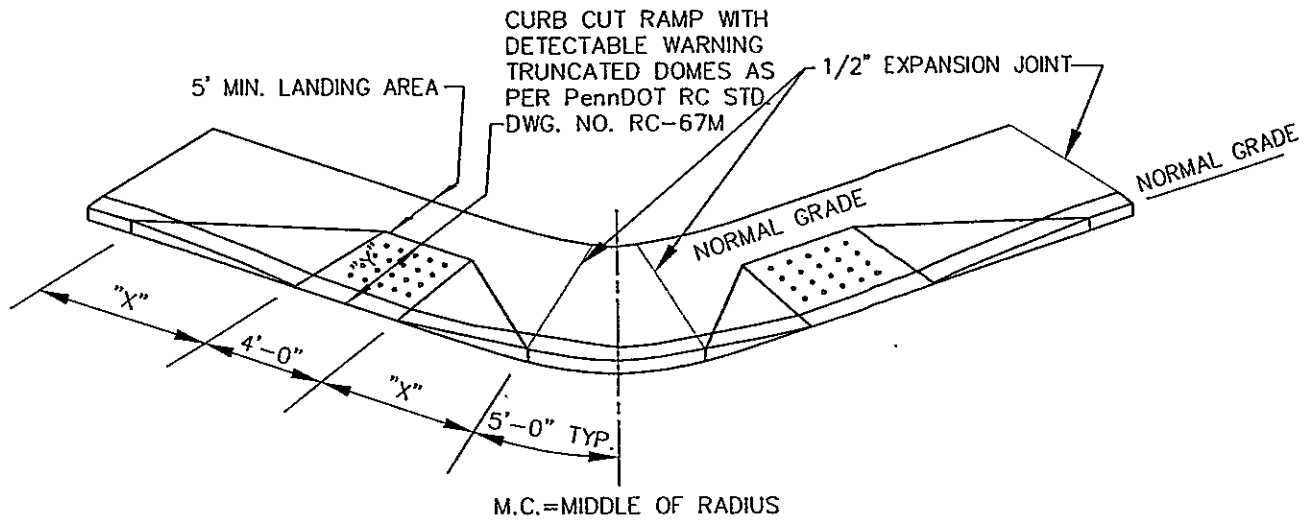
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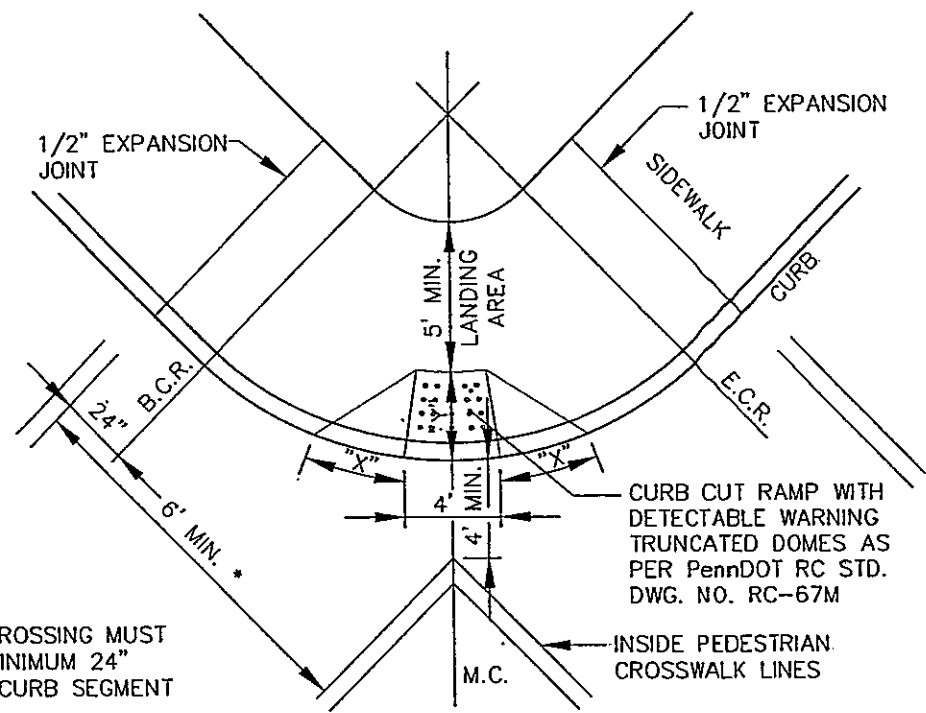
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M.C.=MIDDLE OF RADIUS



\* MARKED CROSSING MUST INCLUDE MINIMUM 24\"/>

"X" - LENGTH NEEDED TO MAINTAIN A MAXIMUM 12:1 SLOPE ALONG THE FACE OF THE CURB.  
 "Y" - LENGTH NEEDED TO MAINTAIN A MAXIMUM 12:1 SLOPE FROM THE CURB LINE TO THE TOP OF THE RAMP.

NOTE: NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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 315 W. JAMES ST. SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690  
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HANDICAP RAMP  
 DETAILS  
 (NO GRASS STRIP)

DATE:	12/27/2006
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SECTION 02534

WET WELL MOUNTED PUMP STATION

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Site preparation and restoration.
2. Design parameters
3. Preferred products and materials

B. Related Work Specified Elsewhere:

- |                                                    |               |
|----------------------------------------------------|---------------|
| 1. Clearing and grubbing:                          | Section 02100 |
| 2. Site excavation and placement of fill material: | Section 02210 |
| 3. Trenching, backfilling and compaction:          | Section 02221 |
| 4. Soil erosion and sediment pollution control:    | Section 02270 |
| 5. Chain link fences and gates:                    | Section 02444 |
| 6. Finish grading, seeding, and sodding:           | Section 02485 |
| 7. Bituminous paving and surfacing:                | Section 02500 |
| 8. Sanitary sewer pipe:                            | Section 02610 |
| 9. Inlets, manholes and endwalls:                  | Section 02630 |
| 10. Sanitary sewer testing:                        | Section 02651 |
| 11. Low-pressure sewer system:                     | Section 02722 |
| 12. Plain and reinforced cement concrete:          | Section 03000 |

C. Applicable Standard Details:

- MT02534-1 Typical Sanitary Sewer Pump Station Site Plan
- MT02534-2 Typical Generator Enclosure

1.02 QUALITY ASSURANCE

A. Qualifications

1. The installer shall have a minimum of ten (10) years of documented experience in performing similar work.
2. Design shall conform to the requirements of all governing regulatory agencies, as well as meet the approval of the Municipality's Engineer.
3. Diesel Generator Set – Firms regularly engaged in manufacture of diesel engine-driven generator units and ancillary equipment, of types, ratings and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Reference Standards

1. Pennsylvania Department of Environmental Protection (PA DEP) - Domestic Wastewater Facilities Manual, Latest Revision.

2. CSA C22.2, No. 14 – M92 Industrial Control Equipment.
  3. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
  4. N55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
  5. IEC8528 part 4. Control Systems for Generator Sets
  6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
  7. Mil Std 461D –1993. Military Standard, Electromagnetic Interference Characteristics.
  8. Mil Std 462D - 1993. Military Standard, Measurement of Electromagnetic Interference Characteristics.
  9. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
  10. NFPA99 – Essential Electrical Systems for Health Care Facilities.
  11. NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.
  12. UL2200. The genset shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed
- C. NEMA Compliance: Comply with applicable requirements of NEMA's Stds Pub No. 250, "Enclosures for Electrical Equipment (1000-Volts Maximum)."
- D. IEEE Compliance: Comply with applicable portions of IEEE Std 446, "IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications."
- E. Inspections and Testing
1. Inspections of the wet well shall be conducted by the Municipality as specified for manholes in Section 02630.
  2. Inspections and testing of concrete slabs and the various concrete items shall be conducted by the Municipality as specified in Section.03000.
  3. Inspections of pipe laying procedures shall be conducted by the Municipality as specified for low pressure sewers in Section 02722 and as specified for sanitary sewer pipe (gravity) in Section 02610.
  4. Testing of gravity sanitary sewer pipe and low pressure sewer pipe shall be in accordance with Section 02651.
  5. Inspections of bituminous paving shall be conducted by the Municipality as specified in Section 02500.
  6. Inspections of the chain link fence components and placement procedures shall be conducted by the Municipality as specified in Section 02444.

### 1.03 SUBMITTALS

- A. PA DEP approval must be acquired prior to the beginning of the construction of the pumping station.
- B. Engineering Design Calculations, Reports and Plans must meet the approval of the Municipal Engineer prior to construction of the pump station. This includes, but is not limited to:
  - 1. Pump manufacturer's descriptive literature.
  - 2. Manufacturer's data on diesel engine-driven generator sets and components.
  - 3. Site plan showing subject pumping station relative to area under development and the existing sewer system.
  - 4. Layout drawings of diesel engine-driven generator unit and accessories including instrumentation.
  - 5. Wiring diagrams for diesel engine-driven generator units and controls to include start-stop control systems, monitoring, indicating and alarm systems.
  - 6. Reports generated for PA DEP approval.
  - 7. All calculations and assumptions for the system head curve, total dynamic head, flow quantification, wet well volume, pump duty cycle at average and peak daily flow, force main line velocity, pump curves as well as any other design calculations.
- C. Operation and maintenance manuals shall be furnished for all mechanical and electrical equipment.
- D. Certified Performance Test - Pumps and controls shall be tested as a unit at the pump manufacturer's facility for capacity, power requirement, and efficiency at specified minimum operating head, rated head, shut-off head, and at as many other points as necessary to provide certified pump performance curves. The Municipality's Engineer shall be provided with a copy of the certified test data. Suction lift pumps must include certified reprime performance tests.
- E. Certifications: Provide diesel engine-drive generator sets certified test record of the following final production testing:
  - 1. Single-step load pickup in accordance with NFPA 110.
  - 2. Transient and steady-state governing.
  - 3. Safety shutdown device testing.
  - 4. Voltage regulation.
  - 5. Rated power.
  - 6. Maximum power.
  - 7. Motor starting capability.
  - 8. Fuel consumption
  - 9. Engine/alternator cooling air flow.
  - 10. Alternator temperature rise in accordance with NEMA MG1-22.40.
  - 11. Three phase short circuit test for mechanical and electrical strength.

- F. Provide certified test record prior to engine-driven generator set being shipped from factory.

#### 1.04 OPERATING CONDITIONS

- A. All openings and passages shall be large enough to permit the passage of a sphere 3" in diameter. The pump motors shall not be overloaded beyond their nameplate rating, at the design conditions, nor at any head in the operating range.
- B. Pumps shall be capable of handling the maximum peak hourly flow with one unit out of service.
- C. Pumping station shall have a minimum capacity of 80 gallons per minute (gpm).

#### 1.05 WARRANTY

- A. Generator unit with a set exerciser whether in the automatic transfer switch or on engine generator unit and a running time meter engine/generator. Manufacturer shall provide an extended warranty on the complete unit for a period of five years or 1500 hours, whichever ever occurs first. Start date shall be initial start up of unit. Coverage shall include parts, all labor and travel expenses. No deductibles shall apply to this warranty.

### PART 2 MATERIALS

#### 2.01 PUMPING STATION

- A. Each station shall be one complete factory-built assembly as manufactured by Smith & Loveless, Inc., Lenexa, Kansas, or approved equal
- B. Stations shall be complete with all needed equipment, factory installed on a welded steel base with fiberglass cover.
- C. The Municipality intends to standardize the equipment in order to optimize their operation, maintenance, and safety programs, provide for interchangeability of costly equipment items, reduce stocking levels required for necessary spare parts and provide increased flexibility in the utilization of their pumping stations.

#### 2.02 MAIN PUMPS

- A. The pumps shall be 4" vertical, non-clog type of heavy cast iron construction, especially designed for the use of mechanical seals and vacuum priming.
- B. The pump shall have an adapter providing a large water reservoir above the impeller to provide for positive exclusive of air from the impeller. The seal shall be inside this area to assure lubrication. Pumps which do not use hollow priming adapters for positive lubrication of the seal will not be acceptable.
- C. The pump shall be constructed so as to permit priming from the low pressure area behind the impeller. Priming from high pressure connections tending to cause solids to enter and clog the priming system, will not be acceptable. The priming bowl shall be transparent to enable the operator to monitor the priming level.



- D. The pump shall be arranged so that the rotating element can easily be removed from the volute without disconnecting the electrical wiring or disassembling the motor, impeller, backhead or seal, so that any foreign object may be removed from the pump or suction line.
- E. The pump shaft shall be sealed against leakage by a single mechanical seal constructed so as to be automatically drained and primed each time the pump is drained and primed. Water which lubricates the mechanical seal shall be automatically drained from around the seal if the pump loses prime, in order to allow both the pump and the seal to be drained, thereby preventing freezing and breakage of the seal during power outages in sub-freezing temperatures.
- F. The seal shall be of carbon and ceramic materials with the mating surfaces lapped to a flatness tolerance of one light band. The rotating ceramic shall be held in mating position with the stationary carbon by a stainless steel spring.
- G. The pump volute shall be furnished with mounting lugs and be bolted to the station floor plate, forming a gas-tight seal.
- H. In order to minimize seal wear caused by linear movement of the shaft, the shaft bearing nearest the pump impeller shall be locked in place so that end play is limited to the clearance within the bearing. To minimize seal wear resulting from shaft deflection caused by the radial thrust of the pump, the shaft from the top of the impeller to the lower bearing supporting the impeller shall have a minimum diameter of 1 7/8" for motor frame sizes 213 through 286; 2 1/8" for motor frame sizes 324 and 326; and 3" for frame 364 and larger. The dimension from the lowest bearing to the top of the impeller shall not exceed 6".
- I. The bearing nearest the impeller shall be designed for the combined thrust and radial load. The upper bearing shall be free to move linearly with the thermal expansion of the shaft and shall carry only radial loads.
- J. The shaft shall be solid stainless steel through the mechanical seal to eliminate corrosion and abrasive rust particles. Removable shaft sleeves will not be acceptable if the shaft under the sleeve does not meet the specified minimum diameter.
- K. The pump impeller shall be of the enclosed type made of close-grained cast iron and shall be balanced. The impeller shall be keyed with a stainless steel key and secured to the motor shaft by a stainless steel cap screw equipped with a Nylock or other suitable self-locking device. The impeller shall not be screwed or pinned to the motor pump shaft and shall be readily removable without the use of special tools. To prevent the buildup of stringy materials, grit and other foreign particles around the pump shaft, all impellers less than full diameter shall be trimmed inside the impeller shroud. The shroud shall remain full diameter so that close minimum clearance from shroud to volute is maintained. Both the end of the shaft and the bore of the impeller shall be tapered to permit easy removal of the impeller from the shaft.
- L. Gauge Kit – Each pump shall be equipped with a glycerin-filled compound gauge to monitor suction pressures, and a glycerin-filled pressure gauge to monitor discharge pressures. Gauges shall be a minimum of 4 inches in diameter, and shall be graduated in feet water column. Rated accuracy shall be one percent of full scale reading. Suction gauges shall be graduated -30 feet to +30 feet water column minimum. Gauges shall be mounted on a resilient panel and frame assembly which shall be firmly secured to pumps or piping. Gauge installations shall be complete with all hoses and fittings, and shall include a shutoff valve installed in each gauge inlet at the point of connection to suction and discharge pipes.

## 2.03 MOTORS

- A. The pump motors shall be vertical, solid shaft, NEMA P-base, explosion proof, squirrel-cage induction type, suitable for 3 phase, 60 cycle, 460 volt electric current (preferred). 208 volt electric current may be acceptable upon approval of the Municipal Engineer. They shall have Class F insulation. Insulation temperature, however, shall be limited to Class B.
- B. The motors shall have normal starting torque and low-starting current, as specified by NEMA Design B characteristics. They shall be open drip-proof design with forced air circulation by integral fan. Openings for ventilation shall be uniformly spaced around the motor frame. Leads shall be terminated in a cast connection box and shall be clearly identified.
- C. The motor shall have 1.15 service factor. The motors shall not be overloaded beyond their nameplate rating, at the design conditions, nor at any head in the operating range as specified under Operating Conditions.
- D. The motor pump shaft shall be centered, in relation to the motor base, within .005". The shaft runout shall not exceed .003".
- E. The motor shaft shall equal or exceed the diameter specified under "main pump", at all points from immediately below the top bearing to the top of the impeller hub.
- F. A bearing cap shall be provided to hold the bottom motor bearing in a fixed position. Bearing housings shall be provided with fittings for lubrication as well as purging old lubricant. The motor shall be fitted with heavy lifting eyes or lugs, each capable of supporting the entire weight of the pump and motor.

## 2.04 CONTROLS

- A. The control equipment shall be mounted in a NEMA Type 1 steel enclosure with a removable access cover. The circuit breakers, starter reset buttons, and control switches shall be operable without removing the access cover, for deadfront operations.
- B. The pump control panel shall be manufactured by a UL panel builder and the assembly shall bear a serialized UL label for "Enclosed Industrial Control Panels". All wiring workmanship, and schematic wiring diagrams shall be in compliance with the National Electrical Code (NEC).
- C. A grounding type convenience outlet shall be provided on the side of the cabinet for operation of 115 volt AC devices.
- D. Thermal magnetic air circuit breakers shall be provided for branch disconnect service and short circuit protection of all motor control and auxiliary circuits.
- E. NEMA style magnetic across-the-line starters with under-voltage release and overload coils for each phase shall be provided for each pump motor to give positive protection. Each single phase auxiliary motor shall be equipped with an over-current protection device in addition to the branch circuit breaker, or shall be impedance protected.
- F. All switches shall be labeled and a coded wiring diagram shall be provided.

- G. Phase converter pilot relays - terminals and/or pilot relays shall be provided in the lift station control panel to facilitate connection to an external phase converter unit.
- H. Intrinsically safe relays - relays shall be provided for all field (wet well) interfaced equipment.
- I. Three phase power failure - a relay with double pole double throw contacts to monitor and protect against phase loss (single phasing), under voltage (brown outs) and phase reversal (improper sequence). Automatically resets when three-phase service returns to normal.
- J. Generator interlock H. L. (high level) pump - provisions shall be made in the control circuit of the lift station to facilitate locking out the standby pump/ compressor when the emergency generator set is powering the station. An interlock consisting of a normally closed auxiliary contact shall be supplied with the emergency generator controls by the generator manufacturer. This normally closed contact shall be wired to the terminal blocks provided in the lift station control panel by the lift station manufacturer. The interconnecting wiring shall be supplied and connected by the installing CONTRACTOR.

## 2.05 FLOAT SWITCH CONTROL AND ALARM

- A. To control the operation of the pumps with variations of liquid level in the wet well, a minimum of three (3) mercury displacement switches shall be provided a 30' cord shall be provided with each switch. The cord shall have a corrosion resistant vinyl jacket and be multi-stranded in order to prevent fatigue.
  - 1. High wet well level - an adjustable mercury displacement switch shall be provided to sense a high water level condition. The switch shall hang into the wet well and shall activate a contact to indicate the high water condition.
  - 2. Low wet well level - an adjustable mercury displacement switch shall be provided to sense a low water level condition. The switch shall hang into the wet well and shall activate a contact to indicate the low water condition.
- B. An automatic alternator with manual switch shall be provided to change the sequence of operation of the pumps every eight hours. Alternating the pumps at less than 8-hour intervals will not be acceptable.
- C. Provisions shall also be made for the pumps to operate in parallel should the level in the wet well continue to rise above the starting level of the low level pump.
- D. A limit switch shall be provided on the external arm of the discharge check valve for Pump No. 1 & 2 to detect failure of the pump to deliver normal operating pressure. An auxiliary time delay relay shall be provided to prevent an alarm signal during pump start-up period.
- E. Alarm light 120 VAC - a vapor-proof light fixture with 50 watt lamp for outdoor pole mounting with red globe and guard.

## 2.06 TELEPHONE SERVICE

- A. Telephone service shall be brought to the facility.

- B. An autodialer shall be connected to the telephone service to contact specified personnel in the event of a failure at the facility. The autodialer shall be programmable with multiple numbers and messages, shall have multiple inputs for alarm conditions and have a battery backup to maintain operation during a power outage. Surge protection shall be provided on the telephone line to protect the autodialer from electronic damage.
- C. The following minimum alarm conditions shall be connected to the autodialer, high water alarm, high pump temperature, pump overload failure, power failure, engine overcrank, battery failure, and high engine temperature.
- D. A separate float switch shall be wired directly to the autodialer to serve as an independent high water alarm.
- E. Design shall include all arrangement with utility company to provide telephone service to facility. Design shall be in accordance with all utility company requirements.

## 2.07 RUNNING TIME METER

- A. Provide an electronic solid state motor monitor powered by 120 VAC, that will accept a 0-5 amp. input signal, condition the signal to perform on/off or open/close discrete dry type setpoint contact conditions based on the input signal value. Provide an LCD readout meter providing field adjustable scales of 0-25.0, 0-50.0, 0-100.0, 0-250, 0-500 and 0-1000 to accurately indicate the motor full load current using the 0-5 amp CT input signal.
- B. The monitor shall be capable of displaying motor total running time up to 99,999.99 hours and be provided with reset capability from the rear of the unit.
- C. The running time meter shall be provided with a battery backup system capable of maintaining the reading for at least 5 years.
- D. Provide two (2) separate field-adjustable setpoints, each with discrete, isolated sealed SPDT relay output contacts. Each setpoint shall be adjustable throughout the complete signal input range from the front of the monitor and shall be displayed on the LCD display at any time. Each setpoint shall be provided with field adjustable on and off delay times adjustable from 0 to 15 seconds. LED indicators shall be provided for each setpoint which operates in the following manner: (1) Setpoint #1 - when the setpoint is timing, the indicator shall be amber. After the timing period is over and the current is above the setpoint, the indicator shall be green. (2) Setpoint #2 - when the setpoint is timing, the indicator shall be amber.
- E. After the timing period is over and the current is above the setpoint, the indicator shall be red. Unit shall be a motor monitor Model MM01A, or approved equal.

## 2.08 MAIN PIPING AND VALVES

- A. The pump suction shall be drilled and tapped for a 125 pound American Standard flange for ready connection of the suction riser. The discharge line from each pump shall be fitted with a clapper-type check valve and eccentric plug valve.

- B. Size, location, and quantity of check valves and plug valves shall be as shown on the Construction Drawings. The check valve shall be of the spring-loaded type with external lever arm and an easily replaced resilient seat for added assurance against vacuum leaks. Check valves shall have stainless steel shaft with replaceable bronze shaft bushings and shall be sealed with an adjustable Teflon seal. An operating wrench shall be provided for the plug valves.
- C. Penetrations through the floor plate shall be gas-tight where necessary to effect sealing between the equipment chamber and the wet well. Bolted and sealed joints shall be provided at the volutes or suction pipes in order to prevent corrosive, noxious fumes from entering the station. The pump station manufacturer shall extend the suction and discharge connections below the floor plate at the factory, so that field connections can be made without disturbing the gas-tight seals.
- D. The manufacturer of the pump station shall provide a compression-type sleeve coupling for installation in the common discharge pipe.

#### 2.09 VACUUM PRIMING SYSTEM

- A. A vacuum priming system shall be furnished to prime the main pumps. The system shall include two vacuum pumps, providing 100 percent standby. Vacuum pumps shall have corrosion-resistant internal components.
- B. The vacuum priming system shall be complete with vacuum control solenoid valves, prime level sensing probes, float-operated check valves to protect the vacuum pumps, and all necessary shut-off valves. The float-operated check valves shall have a transparent body for visual inspection.
- C. The priming system shall automatically provide positive lubrication of the mechanical seal each time a main pump is primed. To prevent excessive stoppage due to grease accumulation, no passageway in the priming system through which the pumped liquid must pass shall be smaller than the equivalent of a 2-1/2" opening.
- D. Suction head calculations shall be provided with shop drawing submittal.

#### 2.10 VENTILATING BLOWER

- A. A ventilating blower capable of delivering 250 CFM at 0.1" static water pressure shall be provided in order to remove the heat generated by continuous motor operation. The ventilating blower shall be turned on and off automatically by a present thermostat. A louvered opening shall cover the discharge.
- B. A 1300 to 1500 watt, dual range, electric heater with automatic circulating fan, thermostat control and an on-off switch is to be provided. The heater is to be operated by connection to the convenience receptacle located on the control panel with the heater mounted on a wall mounted shelf.

#### 2.11 STEEL MEMBERS

- A. All structural steel surfaces shall be factory blasted with steel grit to remove rust, mill scale, weld slag, etc. All weld spatter and surface roughness shall be removed by grinding. Surface preparation shall comply with SSPC-SP6 specifications. Immediately following cleaning, a single 6-mil dry film thickness of Versapox epoxy resin, or equal, shall be factory applied.

- B. Stainless steel, aluminum and other corrosion resistant surfaces shall not be coated. Carbon steel surfaces not otherwise protected shall be coated with a suitable non-hardening rust preventative compound. Auxiliary components, such as the electrical enclosure, ventilating blower and vacuum pumps, shall be furnished with the original manufacturer's coating.
- C. Finish coating shall be accomplished prior to shipment of the station from the factory and shall comply fully with the intent of these specifications. A touch-up kit shall be provided by the pump station manufacturer for repair of any marks or scratches occurring during shipping and installation. This kit shall contain detailed instructions for use and shall be the same material as the original coating.
- D. All structural steel members shall be joined by electric arc welding with welds of adequate section for joint involved.
- E. Fabricated Steel Base – Common fabricated steel base shall be provided for pump and motor assemblies. Bases shall be comprised of a base plate, perimeter flange, and reinforcements. Base plate shall be fabricated of steel not less than ¼" thick, and shall incorporate openings for access to all internal cavities to permit complete grouting of unit base after installation. Perimeter flange and reinforcements shall be designed to prevent flexing or warping under operating conditions. Base plate and/or flange shall be drilled for hardware used to secure unit base to concrete pad as shown on the construction drawings. Unit base shall contain provisions for lifting the complete pump unit during shipping and installation. A layer of neoprene rubber shall be installed between the steel base and the concrete on which the base is mounted.

## 2.12 ENCLOSURE

- A. The wet well mounted pump station shall be enclosed by a hinged, insulated, fiberglass cover, complete with drip lip, cutouts for ventilation system and hasp to allow the pump station to be locked with a padlock. The insulation shall be minimum 1" urethane.
- B. The cover shall have a latch mechanism to keep the cover open under load. Adjustable ventilating louvers shall be provided on each end of the fiberglass cover which are capable of being closed during cold weather operation.
- C. A diamond pattern aluminum manway cover, located exterior to the fiberglass pump changer, shall be provided, complete with padlocking provisions. The manway shall be an integral part of the station floor plate and provide access to the wet well. Floor plate shall be minimum 3/8" thick steel plate, reinforced as needed to prevent deflection.
- D. Enclosures utilized to house the valve train and/or controls which are defined under OSHA Article 29CFR, parts 1910 as a confined space shall not be acceptable.
- E. A stanchion with lifting arm shall be provided to lift each pump. The lifting arm shall have a hook over the center of the motor to support a hoist for removal of the motors, impellers and pumps from the station.
- F. The pump casings and discharge piping shall be mounted in relation to the floor plate as detailed in the construction drawings.

## 2.13 WET WELL

- A. Wet well shall be similar to concrete manholes, in accordance with all requirements of Section 02630. Diameter and depth shall be indicated on the Construction Drawings.
- B. Diamond pattern aluminum manway cover shall have a minimum 36" x 36" clear opening. The door shall have a 300 lbs./sq. ft. load rating and shall be a minimum of 1/4" thick. Hatches shall be as described below:
  1. Single leaf construction, watertight gasketed hatch.
  2. Hatch shall be furnished with flush stainless steel hinges, angle stiffeners and slam hatches.
  3. Hatches shall be provided with an auto-lock, hold open device and torsion spring assembly.
  4. All hardware shall be stainless steel or bronze.
  5. A one (1) inch minimum drain coupling shall be provided in hatch frame. Drain line shall be routed outside to a drywell two (2) feet in diameter carried to frost depth.
  6. Hatches shall be lockable with two sets of keys.
  7. Aluminum hatch shall be as manufactured by Halliday Products, Bilco, or approved equal.
- C. Bottom of wet well shall be sloped 1:1 toward a drain placed in the center of the wet well. Floor slope shall begin below pumps off elevation.
- D. A minimum four (4) inch ductile iron pipe shall extend to the bottom of the wet well. The end of this pipe at the bottom of the wet well shall have a 90° elbow and a flare fitting on the end. The 90° elbow shall be encased in the concrete sloping towards the center of the wet well. The other end of the pipe shall have a quick disconnect fitting mounted above grade. This pipe shall serve a dual purpose as a bypass suction pipe and for clearing of the wet well.
- E. A four (4) inch ductile iron pipe shall extend from the force main and shall have a valve placed at the tee of the force main. The other end of the pipe shall have a quick disconnect fitting mounted above grade. This pipe can serve a dual purpose as a bypass suction pipe and for cleaning of the wet well.
- F. The wet well shall have a ductile iron four (4) inch vent pipe with a 180° turn-down above grade. The vent shall be cast into the wet well top slab and be made of PVC.
- G. A ladder or manhole rungs of corrosion resistant materials shall be provided to provide access to the bottom of the wet well. Grating shall be installed ten (10) feet below the hatch. The grating shall be removable, around the ladder, to allow access to the bottom of the wet well.
- H. For three (3) inch pumps passing 2.5 inch solids, a strainer basket to remove rags shall be required. The strainer basket bars shall be 2" on center and the basket mounted on guide tracks and removable without entering the wet well. The basket and guide tracks shall be constructed of welded aluminum and anchored with stainless steel nuts and-bolt. An aluminum winch stand shall be provided for removal of basket.

- I. The wet well volume shall be of sufficient capacity to ensure that, at design flow, the time between pump run cycles is within the requirements of the electric motor manufacturer. For duplex pumping stations with alternating pumps, the wet well cycle time between pump on and pump off levels, at design flow, shall be a minimum of 10 minutes for motor sizes less than 15 HP or 15 minutes for motor sizes greater than 15 HP when the inflow to the wet well is  $\frac{1}{2}$  of the pump rated capacity.
- J. Adequate distance between the pump off level and the pump suction intake pipe shall be provided to prevent vortexing.

#### 2.14 SPARE PARTS

- A. The following spare parts will be included with the pump, prior to the adoption of the pump station:
  - 1. Complete replacement shaft seal assembly, for each pump
  - 2. Spare casing gasket
  - 3. Seal gasket

#### 2.15 PUMP SERVICEABILITY

- A. The pump manufacturer shall demonstrate to the Municipality's satisfaction that due consideration has been given to reducing maintenance costs by incorporating the following features:
  - 1. Special Tools: No special tools shall be required for replacement of any components within the pump.
  - 2. Removable Cover Plate: The pump shall be equipped with a removable cover plate, allowing access for service and repairs without removing suction or discharge piping. The cover plate shall be large enough to allow clearance of stoppages and to permit removal and replacement of impeller or seal plate assembly through the cover plate opening.
  - 3. Replaceable Wear Plate: The pump shall be fitted with a replaceable wear plate. Replacement of the wear plate, impeller, seal, and suction check valve shall be accomplished through the removable cover plate.
  - 4. Rotating Assembly: The entire rotating assembly, which includes bearings, shaft, seal, and impeller, shall be removable as a unit without removing the pump volute or piping. The rotating assembly shall be easily detached from the pump by removal of four (4) bolts.
  - 5. External Clearance Adjustment: Means shall be provided for external adjustment of the clearance between the impeller and wear plate. The entire rotating assembly shall move as one unit to enable the clearances to be adjusted. Clearance adjustment by means of moving the shaft, thereby reducing pressure on the seal, shall not be acceptable.
  - 6. Pump Drain Kit – The pump drain kit shall consist of a 10' length of plastic hose with a quick connect female kamlock fitting on one end of hose and two (2) sets of fittings for pump drains. Each set of fittings for pump drain includes a pipe nipple, bushing, bronze gate valve and quick connect male kamlock fitting.



## 2.16 DIESEL GENERATOR SETS

A. Manufacturers: As approved by the Municipal Engineer.

B. Vibration isolators shall be provided between the engine-generator and heavy-duty steel base.

### C. Engine

1. The engine shall be equipped with the following:

- a. An electronic isochronous governor capable of +0.25% steady-state frequency regulation.
- b. 24 Volt positive engagement solenoid shift-starting motor.
- c. 55-Ampere minimum automatic battery charging alternator with solid-state voltage regulation.
- d. Positive displacement, full pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain.
- e. Dry-type replaceable air cleaner elements for normal applications.
- f. Engine-driven or electric fuel transfer pump capable of lifting fuel 3 feet, fuel filters, and electric solenoid fuel shut-off valve.

2. The turbocharged and aftercooled engine shall be fueled with No. 2 diesel

3. The engine shall have a minimum of 6 cylinders, and be liquid-cooled by a unit-mounted radiator, blower fan, water pump, and thermostats. This system shall properly cool the engine with up to 0.5 inches H<sub>2</sub>O static pressure on the fan in an ambient temperature up to 122F/50C.

### D. Generator

1. The alternator shall be salient-pole, brushless, 12-lead reconnectable, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed stator for smooth voltage waveform. The insulation shall meet the NEMA standard (MG1-22.40 and 16.40) for Class H and be insulated with epoxy varnish to be fungus resistant per MIL 1-24092. Temperature rise of the rotor and stator shall be limited to 150°C. The excitation system shall be of brushless construction controlled by a solid-state voltage regulator capable of maintaining voltage within +/- 2% at any constant load from 0% to 100% of rating. The regulator must be isolated to prevent tracking when connected to SCR loads, and provide individual adjustments for voltage range, stability and volts-per-hertz operations; and be protected from the environment by conformal coating.

2. The generator set shall meet the transient performance requirements of ISO 8528-5, level G-2.

3. The alternator excitation shall be of a permanent magnet exciter design.

4. The generator shall be inherently capable of sustaining at least 250% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current support devices.

5. The generator, having a single maintenance-free bearing, shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

#### E. Controller

1. Set-mounted controller capable of facing right, left, or rear, shall be vibration isolated on the generator enclosure. The controller shall be capable of being remote-mounted. The microprocessor control board shall be moisture proof and capable of operation from -40°C to 85°C. Relays will only be acceptable in high-current circuits.
2. Circuitry shall be of plug-in design for quick replacement. Controller shall be equipped to accept a plug-in device capable of allowing maintenance personnel to test controller performance without operating the engine. The controller shall include the following features:
  - a. Fused DC circuit.
  - b. Complete 2-wire start/stop control, which shall operate on closure of a remote contact.
  - c. Speed sensing and a second independent starter motor disengagement systems shall protect against starter engagement with a moving flywheel. Battery charging alternator voltage will not be acceptable for this purpose.
  - d. The starting system shall be designed for restarting in the event of a false engine start, by permitting the engine to completely stop and then re-engage the starter.
  - e. Cranking cyclers with 15-second ON and OFF cranking periods.
  - f. Overcrank protection designed to open the cranking circuit after 75 seconds if the engine fails to start.
  - g. Circuitry to shut down the engine when signal for high coolant temperature, low oil pressure, or overspeed are received.
  - h. Engine cooldown timer factory set at 5 minutes to permit unloaded running of the standby set after transfer of the load to normal.
  - i. 3-position (Automatic-OFF-TEST) selector switch. In the TEST position, the engine shall start and run regardless of the position of the remote starting contacts. In the Automatic position, the engine shall start when contacts in the remote control circuit close and stop 5 minutes after those contacts open. In the OFF position, the engine shall not start even though the remote start contacts close. This position shall also provide for immediate shutdown in case of an emergency. Reset of any fault shall also be accomplished by putting the switch to the OFF position.
  - j. Alarm horn with silencer switch per NFPA 110.
3. Standard indicating lights to signal the following shall be included:
  - a. Not-in-Auto (flashing red)
  - b. Overcrank (red)
  - c. Emergency Stop (red)
  - d. High Engine Temperature (red)
  - e. Overspeed (red)
  - f. Low Oil Pressure (red)
  - g. Battery Charger Malfunction (red)
  - h. Low Battery Voltage (red)
  - i. Low Fuel (red)
  - j. Auxiliary Prealarm (yellow)
  - k. Auxiliary Fault (red)
  - l. System Ready (green)

4. Test button for indicating lights.
5. Terminals shall be provided for each indicating light above, plus additional terminals for common fault and common prealarm.

F. Instrument Panel

1. The instrument panel shall include the following:
  - a. Dual range voltmeter 3 1/2-inch, +/- 2% accuracy
  - b. Dual range ammeter 3 1/2-inch, +/- 2% accuracy.
  - c. Voltmeter-ammeter phase selector switch.
  - d. Lights to indicate high or low meter scale.
  - e. Direct reading pointer-type frequency meter 3 1/2-inch, 0.5% accuracy, 45 to 65 Hz scale.
  - f. Panel-illuminating lights.
  - g. Battery charging voltmeter.
  - h. Coolant temperature gauge.
  - i. Oil pressure gauge.
  - j. Running-time meter.
  - k. Voltage-adjust rheostat

G. Accessories

1. A 80% rated line circuit breaker of 250 amperes, 250 amps sensor, 600 volt rated, molded case type, generator mounted.
2. Engine block heater. Thermostatically controlled and sized to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA-99 and NFPA-110, Level 1.
3. Sound housings shall be as follows:
  - a. All enclosures are to be constructed from G60 galvanized high strength, low alloy steel
  - b. The enclosure shall be primed with BASF urethane and finish coated with BASF Superl System paint. Enclosures will be finished in the manufacturer's standard color.
  - c. The enclosures must allow the generator set to operate at full load in an ambient of 40°C with no additional derating of the electrical output.
  - d. The enclosures must meet all of the requirements of UL-2200.
  - e. Enclosures must be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker must meet the requirements of the National Electric Code.
  - f. Doors must be hinged with stainless steel hinges and hardware and be removable.
  - g. Doors must be equipped with lockable latches. Locks must be keyed alike.
  - h. Enclosures must be mounted to the generator set skid.
  - i. The enclosure roof must be pitched to prevent accumulation of water.
  - j. A duct between the radiator and air outlet must be provided to prevent re-circulation of hot air.

- k. The complete exhaust system shall be internal to the enclosure. Enclosures with roof mounted or externally exposed silencers are not acceptable.
  - l. The silencer shall be an insulated critical silencer with a tailpipe and rain cap.
  - m. All acoustical foam must be fixed to the mounting surface with pressure sensitive adhesive. In addition, all acoustical foam mounted a horizontal plane must be mechanically fastened. The acoustical foam must have a protective film facing to act as a barrier for liquids.
  - n. The enclosures must include an exhaust scoop to direct the cooling air in a vertical direction.
  - o. The maximum average sound level shall not exceed 75 dba at 7 meters (23 feet).
4. 12-volt lead-antimony battery(ies) capable of delivering the manufacturer's recommended minimum cold-cranking Amps required at 0°F, per SAE Standard J-537, shall be supplied.
  5. Remote annunciator panel enabling the generator status to be viewed remotely. This remote annunciator panel shall include a fourteen (14) relay dry contact box for connection to the controller terminal strip. The panel shall have the capability to be either flush mounted or surface mounted.
  6. Generator prealarm senders to provide signals for local and/or remote annunciation for engine conditions approaching critical/shutdown parameters.

#### H. Double Wall Secondary Containment Sub Base Fuel Tank

1. A subbase fuel tank used in conjunction with a diesel powered generator set shall contain an adequate volume of fuel to support the generator set for a period of 22 hours at 100% of rated load and 29 hours at 75% of rated load.
2. The sub base fuel system is listed under UL 142, sub section entitled Special Purpose Tanks EFVT category, and will bear their mark of UL Approval according to their particular classification.
3. The above ground steel secondary containment rectangular tank for use as a sub base for diesel generators is manufactured and intended to be installed in accordance with the Flammable and Combustible Liquids Code—NFPA 30, the Standard for Installation and Use of Stationary Combustible Engine and Gas Turbines—NFPA 37, and Emergency and Standby Power Systems—NFPA 110.
4. Construction:
  - a. Primary Tank
    - 1) It will be rectangular in shape and constructed in clam shell fashion to ensure maximum structural integrity and allow the use of a full throat fillet weld.
  - b. Steel Channel Support System
    - 1) Reinforced steel box channel for generator support, with a load rating of 5,000 lbs. per gen set mounting hole location. Full height gussets at either end of channel and at gen set mounting holes shall be utilized.

I. Exterior Finish

1. The exterior coating has been tested to withstand continuous salt spray testing at 100 percent exposure for 244 hours to a 5 percent salt solution at 92-97 F. The coating has been subjected to full exposure humidity testing to 100 percent humidity at 100° F for 24 hours. Tests are to be conducted in accordance with The American Standard Testing Methods Society.

J. Venting:

1. Normal venting shall be sized in accordance with the American Petroleum Institute Standard No 2000, Venting Atmospheric and Low Pressure Storage Tanks not less than 1-1/4" (3 cm.) nominal inside diameter. A 1 -1/4" atmospheric mushroom cap shall be furnished and piped above the highest fill point, as a minimum.

K. Emergency Venting

1. The emergency vent opening shall be sized to accommodate the total capacity of both normal and emergency venting and shall not be less than that derived from NFPA 30, table 2-8, and based on the wetted surface area of the tank. The wetted area of the tank shall be calculated on the basis of 100 percent of the primary tank. A zinc plated emergency pressure relief vent cap shall be furnished for the primary tank. The vent is spring-pressure operated: opening pressure is 0.5/psig and full opening pressure is 2.5 psig. Limits are stamp marked on top of each vent. The emergency relief vent is sized to accommodate the total venting capacity of both normal and emergency vents.

J. Fuel Fill:

1. There shall be a 2" NPT opening within the primary tank with an 8" raised fill pipe and lockable manual fill cap.

K. Fuel Level:

1. A direct reading, UL listed, magnetic fuel level gauge with a hermetically-sealed vacuum tested dial shall be provided to eliminate fogging.

L. Low Fuel Level Switch

1. Consists of a 50 watt float switch for remote or local annunciation of a (50% standard) low fuel level condition.

2.17 SITE REQUIREMENTS

- A. The pump station site shall be protected by a chain link fence 6' in height. One (1) 3' walk-through gate and one (1) 16' drive-through gate shall be provided. A "slide" style gate shall be installed, if the site dimensions allow for use.

1. Height – Fencing shall be of the chain link type six (6) feet high, (seven (7) feet high at the top of barbed wire), with bottom reinforcing wire. Except where specifically indicated otherwise, fencing shall include extension arms supporting three (3) strands of barbed wire. The entire fencing shall be the standard product of a manufacturer specializing in the manufacturer of chain link fencing.

2. Placement -- The fence shall be placed as indicated on Standard Detail MT02534-1. In the front, the fence will be placed on the building setback line. Provide and install a chain link fence including the necessary gates, terminal posts, and fittings, as indicated in Section 02444- Chain Link Fences and Gates.
  3. Sign -- A sign shall be placed on the gate identifying the pump stations number and phone numbers to call in the event of an emergency.
- B. Access to the station shall be via a dedicated asphalt or concrete paved road with a minimum width of 16 feet. In unusual cases, curbs may be required by the Municipal Engineer. In no case shall the profile grade exceed 12 percent.
  - C. All grounds shall be finish graded, seeded, and mulched in accordance with Section 02485. Slopes requiring mowing shall not exceed 25 percent.
  - D. The pump station shall be designed to remain fully operational and accessible during a one hundred (100) year flood event.
  - E. The pump station shall be located within a dedicated sanitary sewer easement.

### PART 3 EXECUTION

3.01 EROSION AND SEDIMENTATION POLLUTION CONTROL: Section 02270

3.02 BLASTING: Section 02210

3.03 EXCAVATION

- A. Perform trench excavation as specified in Section 02221 at location marked in the field.
- B. Excavate to the required depth and grade for the bottom of the wet well and vaults plus that excavation necessary for placement of base material. The wet well base material shall be AASHTO No. 57 stone a minimum of six (6) inches deep bearing on sound subgrade. The stone base shall extend a minimum of two (2) feet beyond the footprint of the wet well base.
- C. Excavate to the required depth and grade for placement of sanitary pipe as specified in Section 02610. Allow for a minimum of four (4) feet of cover above the top of pipe.

3.04 SUPPORT OF EXCAVATION: Section 02221

3.05 CONTROL OF EXCAVATED MATERIAL: Section 02221

3.06 DEWATERING: Section 02221

3.07 WET WELL

- A. Wet well shall be constructed in accordance with requirements for manholes in Section 02630.

3.08 BACKFILLING

- A. Backfill and compact pipeline trenches and underground structures only after examination by the Municipality and as specified in Section 02221.

3.09 PLAIN AND REINFORCED CEMENT CONCRETE: Section 03000

3.10 INSTALL PUMPS

- A. Install pump station in accordance with written instructions provided by the manufacturer.
- B. Operation and maintenance manuals shall be furnished and will include parts lists and complete service procedures and trouble shooting guide.

3.11 INSTALL GENERATOR

- A. Install generator enclosure pad in accordance with details provided on the construction drawings and as specified in Section 03000.
- B. Construct generator enclosure according to dimensions and configuration as shown on Standard Detail MT02534-2.

3.12 BITUMINOUS PAVING AND SURFACING: Section 02500

3.13 FINISH GRADING AND SEEDING: Section 02485

3.14 START UP

- A. Manufacturer shall provide a factory-trained representative for one-day to perform initial start-up of each pump station and instruct Municipality's operating personnel in proper start-up, testing, operation and maintenance of equipment.
- B. Diesel Generator Set Start-up Testing:
  - 1. Equipment manufacturer's representative shall perform start-up and load tests upon completion of installation, with the Engineer and/or Owner in attendance; provide certified test record. Tests are to include the following:
    - a. Check fuel, lubricating oil, and antifreeze in liquid cooled models for conformity to the manufacturer's recommendations under environmental conditions present.
    - b. Test prior to cranking engine for proper operation, accessories that normally function while the set is in a standby mode. Accessories include: engine heaters.
    - c. Check, during start-up test mode, for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and phase rotation.

- d. Test, by means of simulated power outage, automatic start-up by remote-automatic starting, transfer of load, and automatic shut-down. Prior to this test adjust, for proper system coordination, transfer switch timers. Monitor throughout the test, engine temperature, oil pressure, battery charge level, generator voltage, amperes, and frequency.
  - e. Complete field testing with the use of a load bank. Complete tests as required by NFPA 110 for a minimum of 2 hours.
2. Upon completion of installation demonstrate capability and compliance of system with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting. Initial testing and retesting to be at no cost to Owner.

### 3.15 FACTORY TESTS

- A. All components of the pump station shall be given an operational test at the pump station manufacturer's facility to check for excessive vibration, for leaks in the piping or seals and correct operation of the automatic control and vacuum priming systems and all auxiliary equipment. Installed pumps shall take suction from a deep wet well, simulating actual service conditions. The control panel shall undergo both a dry logic test and a full operational test with all systems operating.
- B. Factory test instrumentation must include flow measuring with indicator; compound suction gauge; bourdon tube type discharge pressure gauge; electrical meters to measure amperes, volts, kilowatts and power factor; speed indicator and a vibrometer capable of measuring both amplitude and frequency.

### 3.16 WARRANTY

- A. The manufacturer of the station shall warrant for one year from date of start-up, that the structure and all equipment he provides will be free from defects in material and workmanship. Warranties and guarantees of the suppliers of various components in lieu of a single source responsibility by the manufacturer will not be accepted. The manufacturer shall assume prime responsibility for the warranty of the station and all components.
- B. In the event a component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective part. He shall further provide, without cost, such labor as may be required to replace, repair or modify major components such as the steel structure, main pumps, main pump motors, main piping manifold and accessory items, such as the blower, priming pumps, alternator etc.
- C. The repair or replacement of those items normally consumed in service, such as seals, grease, light bulbs, etc., shall be considered as part of routine maintenance and upkeep after the one-year warranty period.

### 3.17 FUEL TANKS

- A. Fill fuel storage tank with appropriate fuel, for the generator.



B. Fuel tanks shall be above ground, meeting the all governing regulatory agencies requirements.

END OF SECTION



Property Line

NOTES:

1. PROVIDE LANDSCAPE BUFFER ON THREE SIDES.
2. SET ALL PROPERTY CORNERS.
3. ADDRESS STORMWATER RUNOFF.
4. 80 G.P.M. DUPLEX PUMPS (MIN.)

Building Setback Line  
(Varies With Zoning)

PAVING TO  
EXTEND 1'  
BEYOND  
FENCING

6' HIGH  
CHAIN LINK  
FENCE

GENERATOR  
PAD

6' I.D. WET WELL  
AND OPENING  
NO 90° FITTINGS  
PERMITTED

GATE VALVE

2-8' GATES

3' PEDESTRIAN  
GATE

D.I. MECHANICAL  
JOINT FITTINGS WITH  
THRUST BLOCKS

2' BEHIND  
CURB LINE

20' RADIUS  
(TYP.)

4"Ø P.V.C. FORCE MAIN

Varies  
Cartway

ELECTRIC  
METER BASE

35' (MIN.)

8"Ø D.I.P.

Varies  
Right of Way

X STREET

2-45° BENDS

REVISED: 4-17-07

NOTE: NOT TO SCALE

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SANITARY SEWER  
PUMP STATION  
SITE PLAN

DATE: 04/27/98

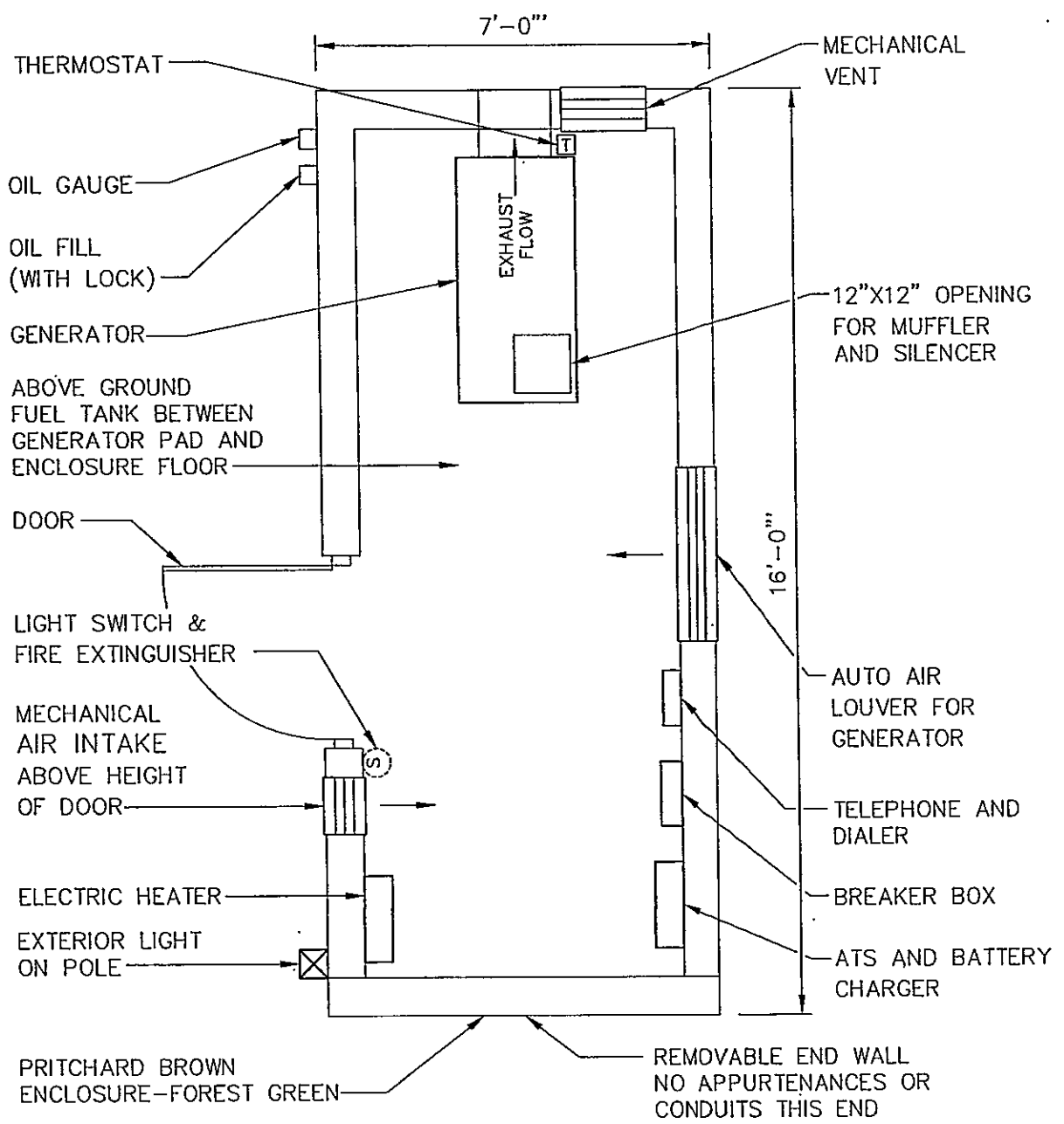
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NO. MT2534-1

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NOTE: NOT TO SCALE

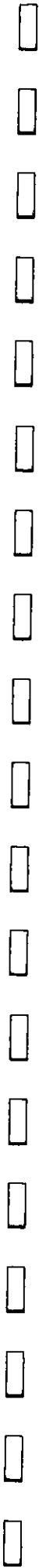
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**TYPICAL  
GENERATOR  
ENCLOSURE**

DATE:	04/27/98
DRAWN BY:	JLD
CHK. BY:	
NO.	MT2534-2



SECTION 02575

TRENCH PAVING AND RESTORATION

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Temporary trench paving
2. Permanent trench paving
3. Shoulder restoration
4. Driveway restoration

B. Related work specified elsewhere:

- |                                            |               |
|--------------------------------------------|---------------|
| 1. Trenching, backfilling, and compacting: | Section 02221 |
| 2. Bituminous paving and surfacing:        | Section 02500 |
| 3. Plain and reinforced cement concrete:   | Section 03000 |

C. Definitions: NONE

D. Applicable Standard Details:

- MT2575-1 Temporary Trench Paving
- MT2575-2 Permanent Trench Paving

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation:

- Publication 408, Specifications
- Regulations Governing Occupation of Highways by Utilities (67 PA Code, Chapter 459)
- Publication 213, Work Zone Traffic Control Guidelines
- Publication 27, Specification for Bituminous Mixtures (Bulletin 27)
- Publication 37, Specification for Bituminous Materials (Bulletin 25)

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

- D2950 Density of Bituminous Concrete in Place by Nuclear Method.

B. Inspections:

1. Inspection by the Municipality will, at a minimum, be made of the materials upon delivery to the job site; of the subgrade prior to placement of the base course; of the completed base course prior to placement of the binder surface; of the completed binder course prior to placement of the wearing course; and of the completed wearing course.

### 1.03 SUBMITTALS

#### A. Certificates:

1. Submit certification from bituminous and aggregate suppliers attesting that materials conform to Publication 408 Specifications. Submit bituminous concrete mix designs for approval. Provide PennDOT certifications with each load delivered to the Job Site.

#### B. Permits:

1. A street occupancy permit must be obtained from the Municipality prior to commencement of construction activities on Township adopted streets.
2. A Highway Occupancy Permit must be obtained from PennDOT prior to commencement of construction activities on State roads.

### 1.04 JOB CONDITIONS

#### A. Control of Traffic:

1. Take measures to control traffic during paving operations. Do not allow traffic on newly paved areas until adequate stability and adhesion have been attained and the material has cooled to 140° F or less.
2. Employ traffic control measures only after requesting traffic alterations, in writing to the Municipality, and receiving approval at a regularly scheduled Board of Supervisor's meeting.
3. The Contractor shall employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.
4. Notify York County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to existing traffic patterns.

#### B. Protection of Adjacent Areas:

1. Restore existing surface outside the limits of the work that has been damaged by the Contractor's operations, to its original condition.

#### C. Concrete Testing: Section 03000.

#### D. Coordination With Utilities

1. The Contractor shall insure all work complies with the requirements of the Pennsylvania Underground Utility Protection Law.



PART 2 PRODUCTS

2.01 CONCRETE

- A. As specified in Section 03000, Articles 2.01 and 3.01.
- B. For driveway restoration, use air-entrained, PennDOT Class HES (High Early Strength). (3-day compressive strength of 3,000 psi, 28-day compressive strength of 3,750 psi, as per Section 704 of PennDOT Publication 408 Specifications)

2.02 BITUMINOUS MATERIALS AND AGGREGATES

- A. All bituminous materials and aggregates used in base course construction, paving, and resurfacing are designated in these specifications by, and shall conform to, the applicable portions of the PennDOT Publication 408 Specifications. See descriptions in Sections 02230 and 02500.

PART 3 EXECUTION

3.01 TEMPORARY TRENCH PAVING

- A. Place temporary paving immediately upon completion of trench backfilling. Unpaved trenches shall not remain unpaved longer than five working days after backfilling, nor over weekends and holidays.
- B. Shape and compact subgrade material proof roll, then place and compact base course to the required thickness shown in Standard Detail MT2575-1.
- C. Place temporary paving material. Compact to required minimum thickness with trench roller having a minimum 300 pounds pressure per inch-width of compaction.
- D. Continuously maintain temporary paving.

3.02 PERMANENT TRENCH PAVING

- A. For all Bituminous Surface Course (trench), sawcut existing paving in accordance with 67 PA Code, Chapter 459. Remove temporary paving material.
- B. Construct permanent base and surface courses to the required compacted thicknesses shown in the Standard Detail MT2575-2. In State Highways, construct paving in accordance with PennDOT Highway Occupancy permit requirements.
- C. Maintain permanent paving throughout the contract maintenance period or for warranty period specified under Street Cut permit.

3.03 BITUMINOUS OVERLAY

- A. See Section 02500.

3.04 SHOULDER RESTORATION

- A. Restore shoulders as directed by the Municipality. In State Highways, restore in accordance with the Highway Occupancy Permit requirements.

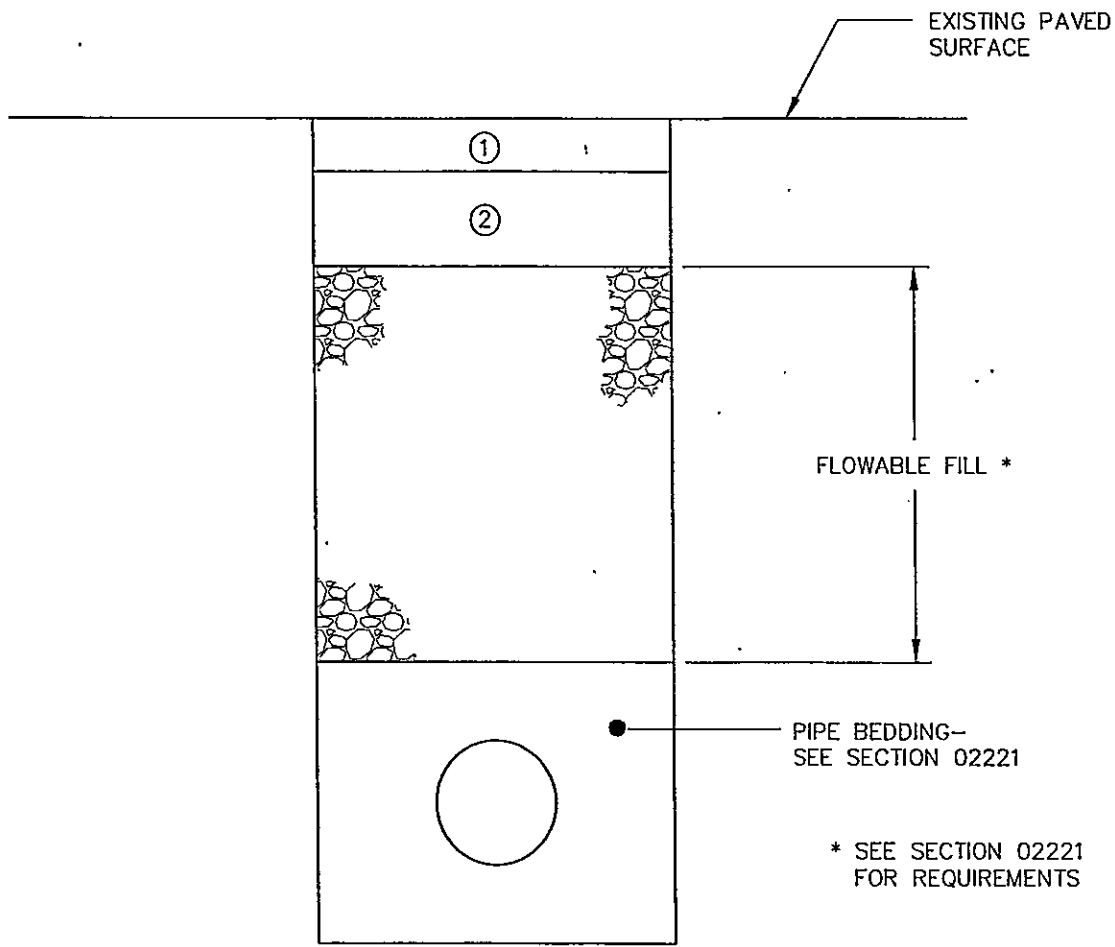
3.05 DRIVEWAYS

- A. Trim concrete and bituminous driveway surfaces to remove damaged areas. Saw or cut straight joint lines parallel to the centerline of the trench. Cut offsets at right angles to the trench centerline.

3.06 UNPAVED SURFACES

- A. Restore surfaces to a condition equal to that prior to construction.
- B. Restore non-paved areas in accordance with Section 02485.

END OF SECTION



\* SEE SECTION 02221 FOR REQUIREMENTS

STREET CLASSIFICATION	①	②
ARTERIAL	2" SUPERPAVE BINDER (19MM)	4" SUPERPAVE BASE COURSE (25MM)
COLLECTOR	2" SUPERPAVE BINDER (19MM)	4" SUPERPAVE BASE COURSE (25MM)
LOCAL AND CUL-DE-SAC	2" SUPERPAVE BINDER (19MM)	3" SUPERPAVE BASE COURSE (25MM)
STATE ROADS	SEE PERMIT	SEE PERMIT

MAINTAIN TEMPORARY PAVING UNTIL PERMANENT PAVING IS PLACED. (MIN. 60 DAYS)

NOTE: NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



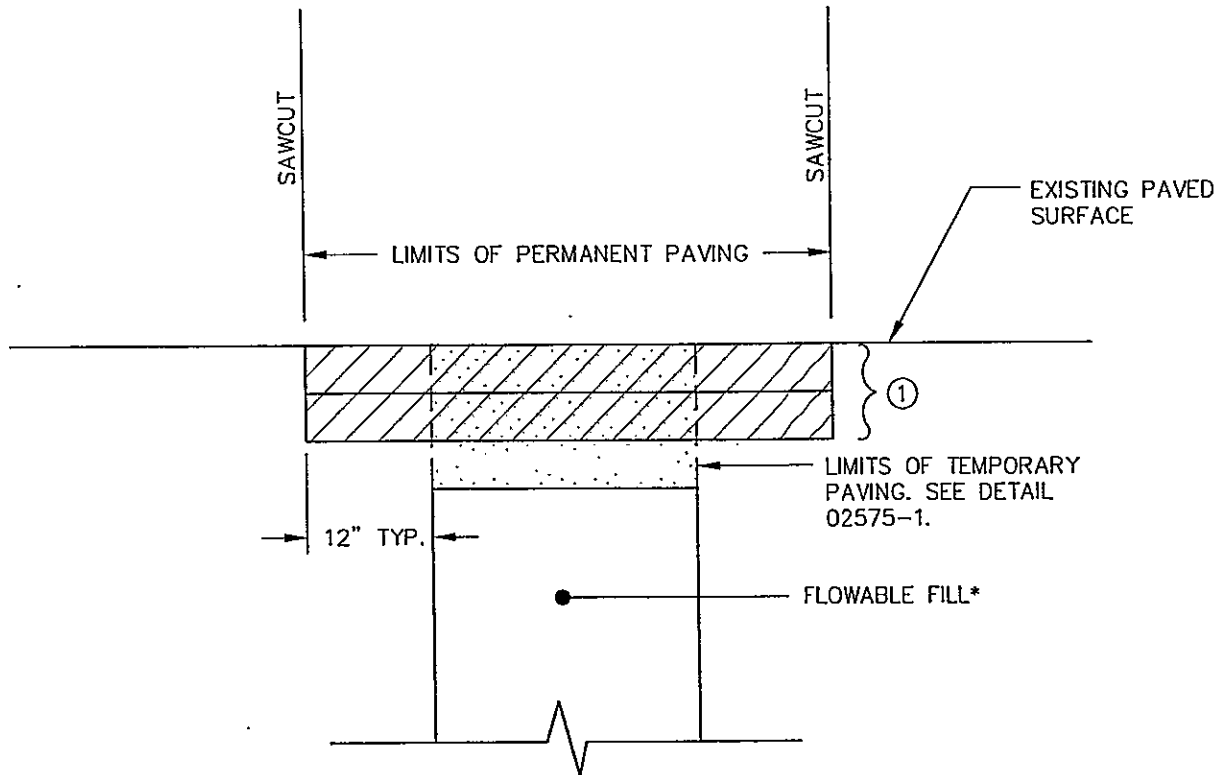
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TEMPORARY TRENCH PAVING

DATE:	12/27/2006
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NO.	MT2575-1

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\* SEE SECTION 02221 FOR REQUIREMENTS

BASE = SUPERPAVE BASE COURSE, 25MM

BINDER = SUPERPAVE BINDER COURSE, 19MM

WEARING = SUPERPAVE WEARING COURSE, 9.5MM

SEE DETAIL 02500-1 FOR SUPERPAVE BINDER AND WEARING MIX

STREET CLASSIFICATION	①
INDUSTRIAL	3" BASE, 3" BINDER, 1-1/2" WEARING
ARTERIAL/COLLECTOR	3" BASE, 2" BINDER, 1-1/2" WEARING
LOCAL AND CUL-DE-SAC	3" BASE, 2" BINDER, 1-1/2" WEARING
STATE ROADS	SEE PERMIT

NOTE: NOT TO SCALE

## MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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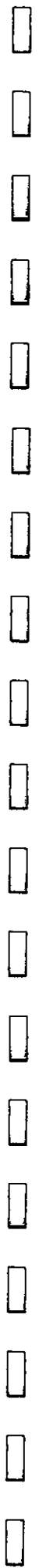
### PERMANENT TRENCH PAVING

DATE: 12/27/2006

DRAWN BY: JLD

CHK. BY:

NO. MT2575-2



SECTION 02581

UNDERGROUND UTILITIES

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Natural gas transmission and service
2. Underground electrical power transmission and service
3. Underground telephone and cable TV

1.02 QUALITY ASSURANCE

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

- D1785 Specifications for Poly (Vinyl Chloride)(PVC) Plastic Pipe, Schedule 40, 80, and 120
- D2241 Specifications for Poly (Vinyl Chloride)(PVC) Plastic Pipe (SDR-PR)
- D2321 Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe
- D2564 Specifications for Solvent Cements for Poly (Vinyl Chloride)(PVC) Plastic Pipe and Fittings
- D2855 Recommended Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride)(PVC) Plastic Pipe and Fittings
- D2729 Specifications for Poly (Vinyl Chloride)(PVC) Sewer Pipe and Fittings

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

C. Contractor installing the conduit shall be approved by the utility company and the Owner.

1.03 SUBMITTALS: SECTION NOT UTILIZED

1.04 JOB CONDITIONS

A. Coordination With Utilities

1. The Contractor shall insure all work complies with the requirements of the Pennsylvania Underground Utility Protection Law.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling:

1. During loading, transporting and unloading, exercise care to prevent damage to materials.
2. Do not drop pipe or fittings. Avoid shock or damage at all times.

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

B. Storage:

1. Do not stack pipe higher than recommended by the pipe manufacturer.
2. Store PVC pipe and fittings in a cool, dry location out of direct sunlight and not in contact with petroleum products.

## PART 2 PRODUCTS

### 2.01 POLY VINYL CHLORIDE (PVC) UTILITY CONDUIT

A. Natural Gas:

1. Main line conduits - three inch (3") diameter and larger shall meet the requirements of ASTM D2729. Joints shall be solvent cement.
2. Service line conduits - two and one-half inch (2½") diameter and smaller shall meet the requirements of ASTM D1785 (Schedule 40). Joints shall be solvent cement.
3. Materials approved specifically by the natural gas utility company shall be permitted.

B. Telephone, Electric and Cable TV:

1. Main line conduits - three inch (3") diameter and larger shall meet the requirements of ASTM D2729. Joints shall be solvent cement.
2. Junction boxes, accessories and other materials - As approved by the Utility company.

### 2.02 HIGH DENSITY POLYETHYLENE (HDPE) PIPE: SECTION NOT UTILIZED

### 2.03 WARNING TAPE

- A. Metallic warning tape, six inch (6") minimum width, printed with "CAUTION BURIED UTILITY LINE BELOW" or similar. Tape may be provided by utility company or furnished by the installing contractor and approved by utility. Materials shall meet requirements of U.S. DOT, office of Public Safety.

## PART 3 EXECUTION

### 3.01 EXCAVATION

A. Depth of Excavation

1. Natural Gas Line:



- a. Excavate main line trenches to a minimum depth of 36". Grade for the invert of the conduit plus that excavation necessary for placement of bedding material. During Street construction, prior to installation of the stone base course, conduits shall be installed at all proposed crossings. Conduits shall extend to the street right-of-way line.
  - b. Excavation for service lines shall be as nearly perpendicular to the street centerline as possible and shall be a minimum of twenty-four inches (24") deep plus that excavation necessary for placement of bedding material. A service line conduit shall be placed for each lot which will require a street crossing, prior to installation of the stone base course. Location of the service line conduits shall be coordinated with the local gas supplier. On larger lots, with authorization from the gas supplier, the number of conduits may be increased to two (2). In any event, no open cut trenching for installation of gas services will be allowed after installation of the stone base course.
2. Electric Conduits:
- a. Excavate main line trenches to a minimum depth of twenty-four inches (24") plus that excavation necessary for placement of bedding material. During street construction, prior to installation of the stone base course, conduits shall be installed at all proposed crossings. Conduits shall extend to the street right-of-way line.
3. Telephone and Cable TV:
- a. Excavate main line trenches to a minimum depth of twenty-four inches (24") plus that excavation necessary for placement of pipe bedding material. During street construction, prior to installation of the stone base course, conduits shall be installed at all proposed crossings. Conduit shall extend to the street right-of-way line.
- B. Where unsuitable bearing material is encountered in the trench bottom, continue excavation until the unsuitable material is removed, solid bearing is obtained or can be established, or concrete cradle can be placed. If no concrete cradle is to be installed, refill the trench bottom to required conduit grade, minus six inches (6") for bedding, with flowable backfill (under existing roadways) or Penn DOT 2RC aggregate (under proposed roadways).
- C. Width of Excavation:
1. Excavate main line and service trenches to a maximum width of twenty-four inches (24").
- D. Lay conduit to a true uniform line with a barrel of the conduit resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints. Do not subject the conduit to a blow or shock to achieve solid bearing or grade.
- E. Lay section of conduit in such a manner as to form a closed concentric joint with the adjoining section and to avoid offsets in the conduit.
- F. Clean and inspect each section of the conduit before joining. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. If unusual joining resistance is encountered or if the conduit 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 manufacturer. If no manufacturer's recommendations exist, then use the following:

1. Solvent cemented joints:

- a. Chamfer and deburr conduit. Clean socket and plain end. Measure and mark the socket depth on the outside of the conduit.
- b. Apply primer to inside socket surface using a scrubbing motion to ensure penetration. Repeated applications may be necessary. Soften surface of male end of conduit to depth of fitting socket by applying a liberal brush coat of primer. Do not pour primer on. Assure entire surface is well softened.
- c. Repeat application of primer to inside socket surface, then apply cement to conduit while surfaces are still wet with primer. Apply cement uniformly taking care to keep excess cement out of socket.
- d. Immediately after applying the last coat of cement to the conduit, and while both the inside socket surface and outside conduit surface are soft and wet, forcefully seat the conduit into the socket. Turn the conduit  $\frac{1}{4}$  turn during assembly to distribute the cement evenly. Assembly should be completed within twenty (20) seconds after the last application of cement. Insert conduit with a steady, even motion. Do not use hammer blows.
- e. Hold joint in place until cement has set. Wipe excess cement from the conduit.

2. Weld or fuse joints in accordance with utility company requirements, using approved welders or fusion machine.

H. Place sufficient compacted bedding and backfill on each section of conduit, as it is laid, to hold firmly in place.

I. Keep trenches and excavations free from water during construction.

J. When work is not in progress, at the end of each day, and at the end of each conduit run, securely plug open ends of conduit to prevent trench water, earth, and other substances from entering the conduit.

3.02 CONDUIT BEDDING

A. All conduits must be surrounded with a minimum of six inches (6") of stone dust (AASHTO #10) on top, bottom and each side.

3.03 DETECTABLE WARNING TAPE FOR ELECTRIC AND NATURAL GAS CONDUITS

A. The warning tape shall be installed twelve inches (12") below the finished ground or street surface. Materials shall meet the requirements of U. S. Department of Transportation, Office of Pipeline Safety, Code for pressure piping.

3.04 TESTING

- A. Test newly constructed gas main and service connections in accordance with utility company requirements.

END OF SECTION



SECTION 02610

SANITARY SEWER PIPE

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Sanitary sewer gravity pipelines
2. Sanitary sewer pressure pipelines
3. Laterals/service connections

B. Related work specified elsewhere:

- |                                                 |               |
|-------------------------------------------------|---------------|
| 1. Boring and jacking:                          | Section 02150 |
| 2. Trenching, backfilling and compaction:       | Section 02221 |
| 3. Soil erosion and sediment pollution control: | Section 02270 |
| 4. Finish grading, seeding and sodding:         | Section 02485 |
| 5. Trench paving and restoration:               | Section 02575 |
| 6. Manholes:                                    | Section 02601 |
| 7. Sewer pipeline testing:                      | Section 02651 |
| 8. Cement concrete for utility construction:    | Section 03050 |

C. Definitions: NONE

D. Applicable Standard Details:

- MT2610-1 Lateral Detail
- MT2610-2 Subbase Drain Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. American National Standards Institute (ANSI):

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

2. 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

A21.10 Gray-Iron and Ductile-Iron Fittings

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

A21.51 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids

- C564 Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
- D1785 Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
- D2241 Specification for Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)
- D2321 Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe
- D2564 Specifications for Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
- D2855 Recommended Practice for Making Solvent-Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
- D3033 Specification for Type PSP Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
- D3034 Specification for Type PMS Poly Vinyl 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 Poly Vinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

3. American Water Works Association (AWWA):

- C301 Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids
- C900 Poly Vinyl Chloride PVC Chloride (PVC) Pressure Pipe, 4" through 12" for Water

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

- Publication 408, Specifications
- Regulations Governing Occupation of Highways by Utilities (67 PA Code, Chapter 459)
- Publication 213, Work Zone Traffic Control Guidelines

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

1.03 SUBMITTALS

- A. All Public Sewer Systems shall be constructed in accordance with the standards published by PA DEP in the Domestic Wastewater Facilities Manual, latest revision.

B. Permits:

1. Submit a copy of the Bureau of Water Quality Management (BWQM) permit or planning module approval letter secured by PA DEP.
2. Submit a copy of any required PA DEP waterway encroachment or obstruction permits.
3. During construction, no changes affecting any engineering design parameter shall be made from the plans, designs, and other approved data unless the developer shall first receive written approval thereof from PA DEP. The sewerage facilities shall be constructed under the developer's expert engineering supervision and competent inspection.

4. For work within State highway rights-of-way, submit a copy of the PennDOT Highway Occupancy Permit.

C. Certificates:

1. Submit 2 copies of each manufacturer's certification attesting that the pipe, pipe fittings, joints, joint gaskets and lubricants and detectable warning tape meet or exceed these requirements.

D. Manufacturer's Literature:

1. Submit 2 copies of the manufacturer's recommendations on installation, handling and storage of materials.

E. Details of bypass pumping operation and pump curves.

F. Plans and Cut Sheets:

1. Submit three (3) copies of approved plans and cut sheets to the Municipal Engineer 72 hours in advance of proceeding with pipe installation. Any proposed changes in the approved design shall be indicated in red on the plans submitted.

G. One copy of the approved Soil Erosion & Sedimentation Pollution Control Plan, including approval letter.

1.04 JOB CONDITIONS

A. Control of Traffic:

1. Employ traffic control measures only after requesting traffic alterations, in writing to the Municipality, and receiving approval at a regularly scheduled Board of Supervisor's meeting.
2. The Contractor shall employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.
3. Notify York County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to existing traffic patterns.

B. All facilities to be constructed with State highway rights-of-way shall be constructed in accordance with standards developed by PennDOT.

C. The developer shall give the Municipal Engineer at least three (3) working days (72) hours notice prior to beginning work to assign an inspector to the project and review plans and grade. No work may begin until grade sheets have been reviewed by the Municipal Engineer.

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 materials.
  - a. Do not drop pipe or fittings. Avoid shock or damage at all times.
  - b. Take measures to prevent damage to the exterior surface or internal lining of the pipe.

B. Storage:

1. Do not stack pipe higher than recommended by the pipe manufacturer.
2. Store PVC pipe and 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 VITRIFIED CLAY GRAVITY SEWER PIPE - NOT PERMITTED

2.02 CEMENT CONCRETE SEWER PIPE - NOT PERMITTED

2.03 DUCTILE IRON PIPE

A. Pipe:

1. ANSI A21.51, Thickness Class as indicated on the Construction Drawings, minimum Class 50.
2. Standard cement-mortar lining, ANSI A21.4.
3. Standard bituminous coating, interior and exterior.

B. Fittings:

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

C. Joints:

1. Where not specifically shown on the Construction Drawings, pipe joints may be either mechanical joint or push-on joint.
2. Fitting joints shall be mechanical joint, unless specified otherwise.



D. Rubber gaskets, lubricants, gland, bolts and nuts: ANSI 21.11.

## 2.04 POLY VINYL CHLORIDE (PVC) SEWER PIPE

### A. Gravity Sewer Pipe and Fittings:

1. Pipe 15" diameter and smaller: ASTM D3034, minimum SDR-35.
2. Pipe 18" to 27" diameter: ASTM F679.
3. Flexible Elastomeric Seals: ASTM D3212  
Seal Material: ASTM F477

### B. Pressure Sewer Pipe and Fittings:

1. Pressure-Rated:
  - a. ASTM D2241, Pressure rating as indicated on the drawings, 125 psi minimum.
2. Schedule-Rated:
  - a. ASTM D1785, Schedule rating as indicated on the drawings, Schedule 40 minimum.
3. Dimension-Rated:
  - a. AWWA C900, SDR 18 minimum.
4. Flexible Elastomeric Seals:
  - a. ASTM D3139
5. Seal Material:
  - a. ASTM F477

## 2.05 CAST IRON SOIL PIPE (PLUMBING)

### A. Pipe and Fittings: ASTM A74, Service Class:

1. Hub and spigot or double hub.

### B. Joints:

1. Gaskets: Double-seal compression gaskets conforming to physical requirements of ASTM C564.

## 2.06 STEEL CASING PIPE: Section 02150.

## 2.07 FLEXIBLE COUPLINGS

### A. Gravity Pipe

1. Leakproof elastomeric plastic as manufactured by Fernco Joint Sealer Company of Davison, Michigan, 48423, or approved equal, and shall contain two #305 stainless steel clamps.
2. No other type of connectors or donut rings shall be permitted, except as specifically approved by the Municipality.

### B. Pressure Pipe - ductile iron fitting, as manufactured by Dresser.

## 2.08 SADDLES - NOT PERMITTED

## 2.09 DETECTABLE WARNING TAPE

- ### A. Provide utility marking tape as specified in Section 01010.

## 2.10 CLEANOUTS

- ### A. Cleanout riser pipe and fittings shall be PVC, SDR35.
- ### B. Cleanout caps shall be Brass, Style A, as manufactured by the General Engineering Company (Geneco), Frederick, MD, or approved equal.

## PART 3 EXECUTION

### 3.01 PREPARATION

- ### A. Perform trench excavation as specified in Section 02221.
- ### B. Unless otherwise required by the Municipality, provide for a minimum cover of 4 feet above the top of pipe laid in trenches in non-traffic areas, and 5 feet in traffic areas.
- ### C. Provide bedding as specified in Section 02221. Place and compact so that the pipe can be laid to the required tolerances in accordance with ASTM D2321.
- ### D. Use ASSHTO No. 57 crushed aggregate pipe bedding unless 2" diameter pipe and smaller pressure pipe, use AASHTO No. 10 crushed aggregate bedding.

### 3.02 LAYING PIPE IN TRENCHES

- ### A. Give ample notice to the Municipal Engineer in advance of pipe laying operations, minimum 72 hours.
- ### B. A minimum of six (6) feet horizontal separation shall be maintained between sanitary sewer and storm drainage pipes, inlets, curbs, and other utilities, except for potable water, where ten (10) feet shall be maintained.

- C. A minimum of twelve (12") inches vertical separation shall be maintained between the top of the sanitary sewer pie and all other pipes crossing above, except that eighteen (18") inches of vertical separation shall be maintained at potable water crossings, with sewer line under water main.
- D. Sanitary sewers constructed through fill shall be constructed of ductile iron pipe.
- E. All terminal manhole runs shall have a 1.00% minimum grade.
- F. Maintain no less than three batter boards or their equivalent between adjoining manholes during pipe laying operations, or use laser alignment instruments.
- G. 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 or fittings.
- H. Lay pipe proceeding up-grade with the bell or groove pointing upstream.
- I. 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.
- J. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.
- K. 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 and fitting manufacturer for making joints. If unusual joining resistance is encountered or if the pipe can not be fully inserted into the bell, disassemble joint, inspect for damage, reclean joint components, and reassemble joint.
- L. Assemble joints in accordance with recommendations of the manufacturer, or as follows:
  - 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.
  - 2. Mechanical joints:
    - a. Wash 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. Bring bolts to uniform tightness. Tighten bolts 180 degrees apart, alternately. Torque required:

Bolt Size, Inches	Torque, Ft., Pounds
5/8	45-60
3/4	75-90
1	100-120

- 3. Solvent cemented joints: NOT PERMITTED
- 4. Coupled joints:
  - a. Assemble in accordance with the manufacturer's recommendations.
- M. Disassemble and remake improperly assembled joints using a new gasket.
- N. 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 drawings, or deflection of pipe joints, will be cause for rejection.
- O. Place sufficient compacted backfill on each section of pipe, as it is laid, to hold firmly in place. When pipe is installed under existing public roadways, use flowable backfill as described in Section 02221.
- P. 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.
- Q. Keep trenches and excavations free of water during construction. If authorized by Municipal Engineer, construct subbase drain below pipe as shown in Standard Detail MT2610-2.
- R. When the work is not in progress, and at the end of each work day, securely plug open ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.
- S. Make connections in accordance with the drawings, and perform any adjustments and ensure a watertight installation. Connections to the existing sewers shall be made under the direct observation of the Municipality or his authorized representative. Do not permit any water, earth, debris or other materials to enter the existing sewer system.
- T. As soon as connections are completed, install an adequately sized plumber's stopper in the existing manhole and brace to prevent a "blowout". The stopper is to prevent flow from the new line from entering the existing system and it shall not be removed until written authorization to do so is given by the Municipality. Routinely remove any accumulated ground and surface water from the line upstream. Developer shall be totally responsible for any damages to existing facilities.
- U. If the project is constructed in phases or sections, each portion of the eight (8") inch diameter sanitary sewer shall terminate with a manhole and stub and stopper. Stubs may not extend more than seven feet (7') feet from the center of any manhole.

### 3.03 WYE BRANCHES

- A. Install wye branches at locations designated concurrent with pipe laying operations. Use standard fittings of the same material and joint type as the pipeline into which they are installed. Wyes shall be installed at 10 o'clock or 2 o'clock positions.
- B. For taps into an existing pipeline, install a wye with stainless steel clamps and watertight resilient boot.
- C. Where lateral is not to be installed, install an approved watertight plug, braced to withstand pipeline test pressure thrust.

### 3.04 LATERALS

- A. Construct laterals from the wye branch to a terminal point in accordance with Standard Detail MT2610-1. Lateral pipe shall be 6" diameter, unless otherwise approved.
- B. Install an approved watertight plug, braced to withstand pipeline test pressure thrust, at the termination of the lateral. Install a temporary marker stake (minimum 2" x 2") extending from the end of the lateral to 1 foot above finished grade.
- C. Lateral risers and lamp holes are not permitted.
- D. Minimum slope for laterals is 1/4"/ft, unless approved otherwise for larger diameter laterals.

### 3.05 CLEANOUTS

- A. Locate cleanout within 12 inches of street right-of-way and edge of sanitary sewer easement. Cleanout shall not be installed at the time of lateral construction. Cleanout is to be installed by the plumber at the time of building sewer construction. Cleanout shall be placed according to the Municipal Plumbing Code. Cleanouts shall not be placed within sidewalks.

### 3.06 CAST-IN-PLACE CONCRETE CONSTRUCTION

- A. Conform to the applicable requirements of Section 03050.

### 3.07 CRADLES AND ENCASEMENT

- A. Provide concrete cradles and encasement for pipeline where indicated on the drawings, or as directed by the Municipality, and in accordance with Standard Detail MT3050-1.

### 3.08 CARRIER PIPE IN CASINGS: Section 02150.

### 3.09 STREAM CROSSINGS

- A. The local waterways patrol officer of the Pennsylvania Fish Commission shall be notified when the construction of a stream crossing is started and completed. A permit must be secured from the Pennsylvania Fish Commission if the use of explosives is required. The developer shall notify the local waterways patrol officer by telephone when explosives are to be used.

- B. The developer shall secure all applicable PA DEP permits for stream crossings and encroachments.
- C. Construct sanitary sewer pipeline stream crossings in accordance with Standard Detail MT2221-2.
- D. Provide concrete encased ductile iron pipe backfilled with minimum 3" size stone to the level of the stream bed, between the limits of the stream crossing.

### 3.10 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of pipe by the Municipality.
- B. Backfill trenches as specified in Section 02221.
- C. Install the detectable warning tape along the entire length of PVC force main on top of the pipe bedding but no deeper than 48 inches below finished grade. The pipe bedding (12" cover) shall maintain sufficient separation between the tape and the line.

### 3.11 SURFACE RESTORATION

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

### 3.12 BYPASS PUMPING

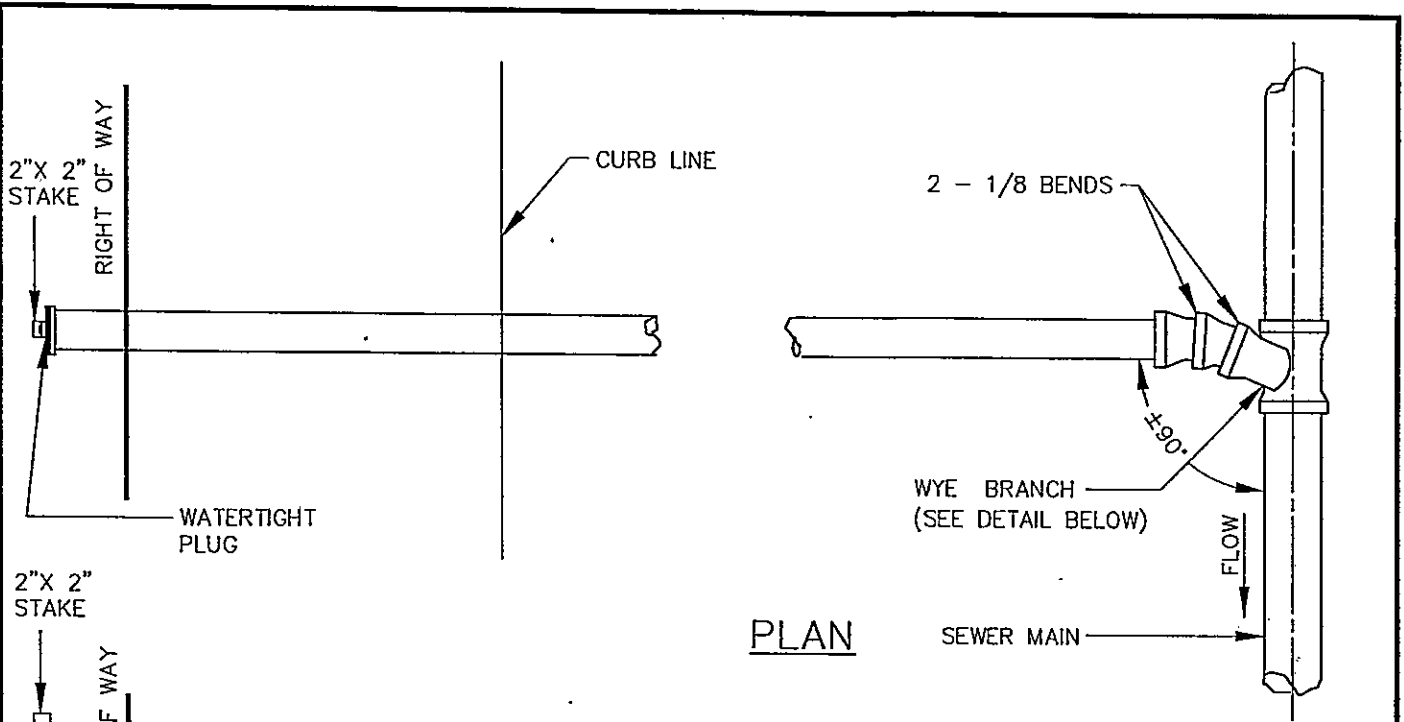
- A. Provide one reliable pump capable of handling the existing wastewater flows and daily fluctuations and enough discharge piping to bypass pump from upstream manhole to downstream manhole. Provide one backup pump on-site or provide evidence of ability to obtain backup pump within 30 minutes in case of pump failure. Bypass pumping system shall not allow backup in collection system beyond two (2) manholes. Bypass piping shall be watertight and not allow any discharge to the surface. Any leaks in the system will be just cause to disconnect bypass operation and pipe installation and tie piping back into gravity flow.
- B. At the end of each workday, the bypass pumping shall stop and the new PVC piping shall be connected to the existing piping with a watertight flexible coupling. All trenches in traffic areas shall be protected with jersey barriers and steel plating and all trenches shall be protected with construction fencing.

### 3.13 CLEANING & TESTING

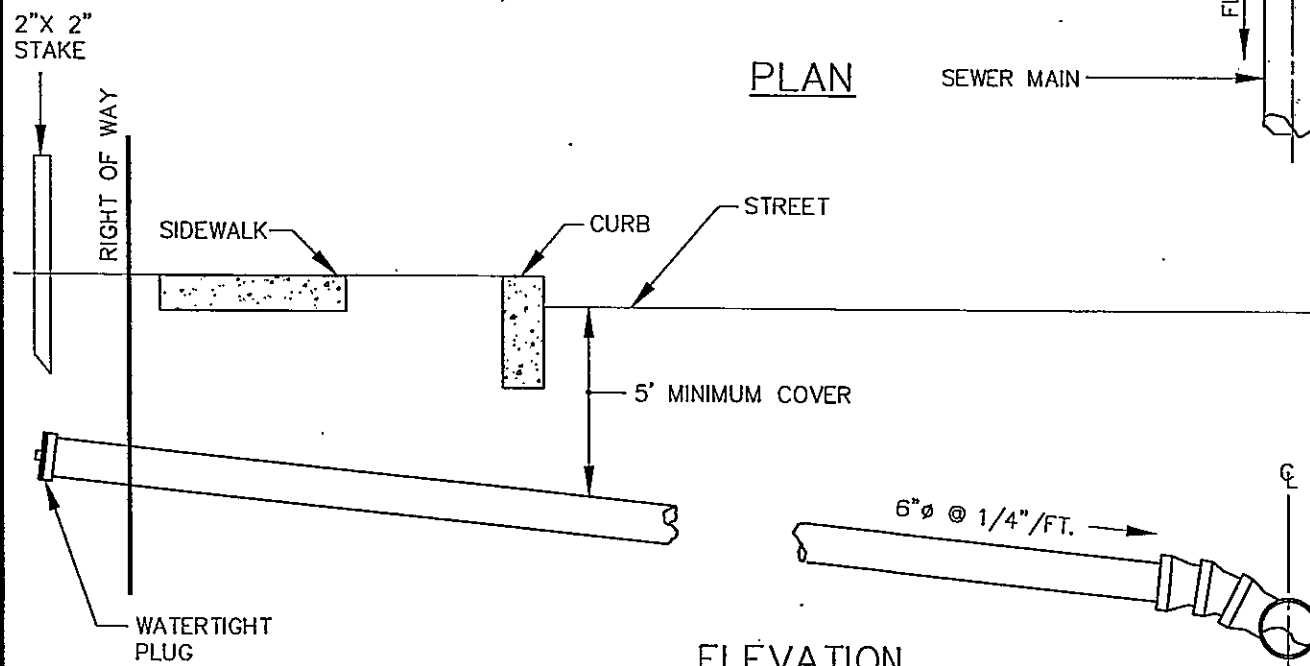
- A. Clean and test sewer pipe in accordance with Section 02651.

### 3.14 AS-BUILTS

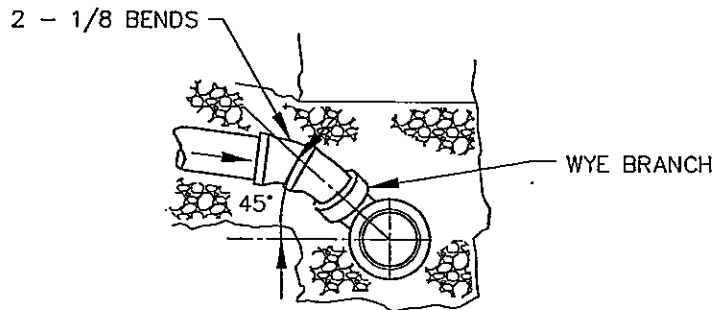
- A. "As-Built" sanitary sewer drawings shall be submitted to the Municipal Engineer for approval. Upon approval, the lines shall be televised by the Municipality and tested prior to performing and connections to the existing system. A thirty (30) day period prior to the desired occupancy date shall be allowed for the approval and testing.



PLAN



ELEVATION



DETAIL

REVISED 12/27/2006

NOTE: NOT TO SCALE

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



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 50 WEST MIDDLE ST. GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782  
 315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690  
 WWW.CSDAVIDSON.COM

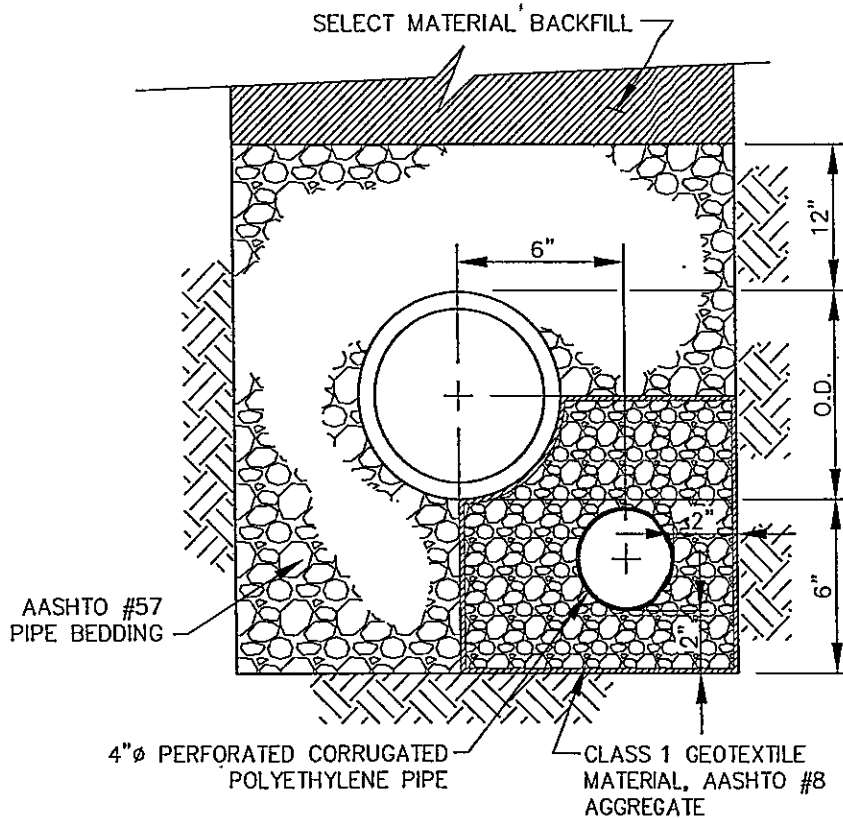
**LATERAL DETAIL  
WITH CLEANOUT**

DATE:	12/14/95
DRAWN BY:	BAM/JLD
CHK. BY:	
NO.	MT2610-1

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**NOTE:**

LOCATION OF SUBBASE DRAIN IN TRENCH TO BE MODIFIED TO SUIT FIELD CONDITIONS AND TIE INTO INLETS MANHOLES, OR OTHER EXISTING PIPING. POSITIVE FLOW MUST BE MAINTAINED.

NOTE: NOT TO SCALE

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



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 315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690  
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**SUBBASE DRAIN DETAIL**

DATE: 12/27/2006

DRAWN BY: JLD

CHK. BY:

NO. MT2610-2

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SECTION 02615

WATER MAINS

PART 1 GENERAL

1.01 DESCRIPTION

A. The work of this section includes the installing, testing and repairing of water mains.

B. Related Work Specified elsewhere:

- |                                           |               |
|-------------------------------------------|---------------|
| 1. Utility Conflict Statement:            | Section 00160 |
| 2. Trenching, backfilling and compacting: | Section 02221 |
| 3. Trench paving and restoration:         | Section 02575 |

1.02 OWNERSHIP

A. All public water mains in the Municipality are owned and maintained by The York Water Company.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials shall be in accordance with the requirements of The York Water Company.

PART 3 EXECUTION

3.01 CONSTRUCTION

A. All work shall be performed in accordance with the requirements of The York Water Company.

END OF SECTION



SECTION 02618

STORM DRAIN PIPE

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Storm sewer pipelines
2. Pavement base drains and subdrains

B. Related work specified elsewhere:

- |                                                 |               |
|-------------------------------------------------|---------------|
| 1. Boring and jacking                           | Section 02150 |
| 2. Trenching, backfilling and compaction:       | Section 02221 |
| 3. Soil erosion and sediment pollution control: | Section 02270 |
| 4. Finish grading, seeding and sodding:         | Section 02485 |
| 5. Trench paving and restoration:               | Section 02575 |
| 6. Inlets, manholes, and endwalls:              | Section 02630 |
| 7. Cement concrete for utility construction:    | Section 03050 |

C. Definitions: NONE

D. Applicable Standard Details:

MT2618-1 Base Drain Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation:

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

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

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

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

- M36 Metallic (zinc or aluminum) coated corrugated steel culverts and underdrains
- M246 Precoated galvanized steel sheet for culverts and underdrains
- M252 Corrugated Polyethylene Drainage Tubing
- M278 Class PS50 Polyvinyl Chloride (PVC) Pipe
- M294 Corrugated Polyethylene Pipe, 12" to 48" Diameter
- MP7 Corrugated Polyethylene Pipe, 54" to 60" Diameter

1.03 SUBMITTALS

A. Certificates:

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

B. Manufacturer's Literature:

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

C. One (1) copy of the approved Soil Erosion & Sedimentation Pollution Control Plan, including approval letter.

1.04 JOB CONDITIONS: SECTION NOT UTILIZED.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

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

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

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

PART 2 PRODUCTS

2.01 CORRUGATED POLYETHYLENE PIPE

A. Tubing and Fittings – 3" to 6"

1. AASHTO M252
2. ASTM F405

B. Pipe and Fittings – 12" to 48"

1. Integrally formed smooth interior – Type S-f
2. AASHTO M294 and MP7
3. ASTM F667

C. Minimum diameter: 12 inches, except in public rights-of-way the minimum shall be 18 inches

D. Pavement base drains (6" dia.) - AASHTO M304

## 2.02 REINFORCED CONCRETE PIPE

### A. Pipe and Fittings:

1. ASTM C76, Minimum Class II

### B. Joints:

1. Tongue and groove or bell and spigot.

a. Subject to specific written approval by Municipality.

D. Minimum diameter: 15 inches, except in public rights-of-way the minimum shall be 18 inches.

## 2.03 ELLIPTICAL REINFORCED CONCRETE PIPE

### A. Pipe:

1. ASTM C507, minimum class HE-A or VE-II

## 2.04 CORRUGATED GALVANIZED STEEL PIPE ARCH - NOT ALLOWED

## 2.05 POLY VINYL CHLORIDE PIPE - NOT ALLOWED

## 2.06 PIPE CULVERT END SECTIONS

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

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Perform trench excavation and associated work as specified in Section 02221.
- B. Provide pipe bedding as specified in Section 02221. Place aggregate and compact so that the pipe can be laid to the required tolerances.
- C. Work shall comply within the approved Soil Erosion & Sedimentation Pollution Control Plan.

### 3.02 LAYING PIPE IN TRENCHES

- A. Give ample notice to the Municipal Engineer in advance of pipe laying operations, minimum 72 hours.
- B. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to pipe. Do not drop pipe.

- C. Lay pipe proceeding upgrade with the bell or groove pointing upstream.
- D. Lay pipe to a true uniform 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 line.
- F. Clean and inspect each pipe and fitting before joining. Align pipe with previously laid sections. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. Assemble joints in accordance with the pipe manufacturer's instructions.
- G. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. A deviation from the designed line or grade as shown on the drawings will be cause for rejection.
- H. Place and compact sufficient backfill to hold each section of pipe firmly in place as the pipe is laid. For storm sewers laid at slopes of 15% or greater, construct concrete anchors as shown in Standard Detail MT3050-2.

### 3.03 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of pipe by the Municipality.
- B. Backfill and compact trenches as specified in Section 02221.
- C. Backfill and compact trenches in cartway of proposed Municipal roadway with PA No. 2RC from top of pipe to subgrade elevation. Use flowable backfill in cartway of existing Municipal roadway.

### 3.04 PAVEMENT BASE DRAINS AND PIPE UNDER DRAINS

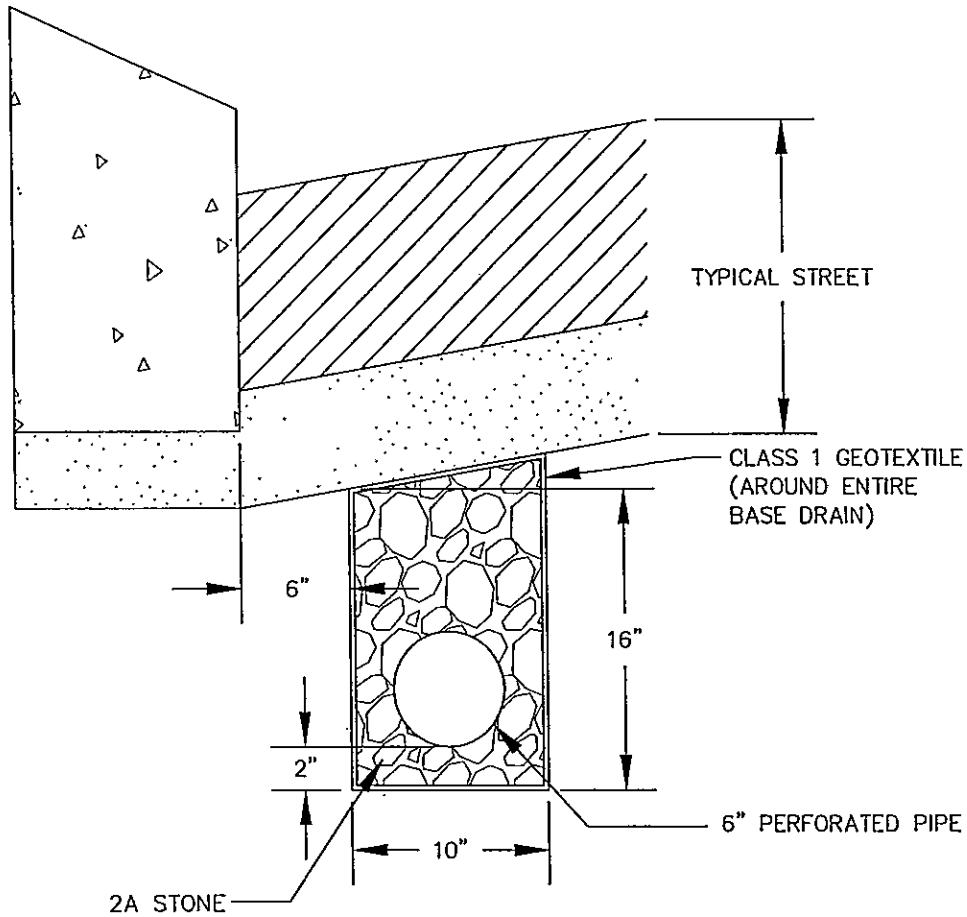
- A. Construct 6" diameter underdrains upon completion of stone base material placement. Provide at low points 50 feet each way, each side in accordance with the requirements set forth in Section 610, Publication 408 Specifications and as shown on Standard Detail MT2618-1.

### 3.05 SURFACE RESTORATION

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

END OF SECTION





**NOTE:**

PROVIDE BASE DRAIN 50 L.F. ON EITHER SIDE OF VERTICAL SAG CURVES, AND WHERE DESIGNATED BY THE TOWNSHIP ENGINEER.

.NOTE: NOT TO SCALE

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 WWW.CSDAVIDSON.COM

**BASE DRAIN DETAIL**

DATE: 12/27/06

DRAWN BY: JLD

CHK. BY:

NO. MT2618-1

K:\084110013\dwg\MT2618-1.dwg, 5/31/2007 9:19:29 AM



SECTION 02630

INLETS, MANHOLES, AND ENDWALLS

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Storm sewer inlets
2. Manholes - precast and cast-in-place - for sanitary and storm sewers
3. Manhole steps
4. Manhole covers and frames
5. Storm drainage pipe endwalls
6. Pipe culvert end sections

B. Related work specified elsewhere:

- |                                                 |               |
|-------------------------------------------------|---------------|
| 1. Trenching, backfilling and compacting:       | Section 02221 |
| 2. Finish grading, seeding and sodding:         | Section 02485 |
| 3. Soil erosion and sediment pollution control: | Section 02270 |
| 4. Bituminous paving and surfacing:             | Section 02500 |
| 5. Sanitary sewer pipe:                         | Section 02610 |
| 6. Storm drain pipe:                            | Section 02618 |
| 7. Plain and reinforced cement concrete:        | Section 03000 |
| 8. Cement concrete for utility construction:    | Section 03050 |

C. Definitions: NONE

D. Applicable Standard Details:

- |            |                                                    |
|------------|----------------------------------------------------|
| MT02630-1  | Inlet/Storm Pipe Installation Detail               |
| MT02630-2  | Galvanized Steel Pipe Guard                        |
| MT02630-3  | Cast-in-Place Manhole Details                      |
| MT02630-4  | Precast Manhole Base Details                       |
| MT02630-5  | Shallow Manhole Detail                             |
| MT02630-6  | Standard Deep Manhole Detail                       |
| MT02630-7  | Manhole Step Detail                                |
| MT02630-8  | Heavy Traffic Sanitary Sewer Manhole Frame & Cover |
| MT02630-9  | Bolted Waterproof Manhole Frame & Cover Type 1     |
| MT02630-10 | Manhole Cover Anchor Bolt                          |
| MT02630-11 | Cast-in-Place Concrete Manhole Adjustment          |
| MT02630-12 | Drop Connection Detail                             |
| MT02630-13 | D.I.P. Mechanical Joint Type A Drop Manhole Detail |
| MT02630-14 | D.I.P. Mechanical Joint Type B Drop Manhole Detail |

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

Publication 408, Specifications

Publication 72M, Standards for Roadway Construction

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

A36 Specification for Carbon Structural Steel

A47 Specification for Ferritic Malleable Iron Castings

A48 Specification for Gray Iron Castings

A185 Specification for Steel Welded Wire Fabric for Concrete Reinforcement

A536 Specification for Ductile Iron Castings

A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

C32 Specification for Sewer and Manhole Brick (made from clay or shale)

C270 Specification for Mortar for Unit Masonry

B221 Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes

C139 Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes

C443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets

C478 Specification for Precast Reinforced Concrete Manhole Sections

C923 Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals

3. Federal Specifications (FS):

SS-S-00210 Sealing compound, preformed plastic, for expansion joints and pipe joints.

4. American Association of State Highway & Transportation Officials (AASHTO)

B. Inspections:

1. Inspections of the manholes, inlets, and endwalls by the Municipality will, at a minimum, be made of materials upon delivery to the job site; of the subgrade, prior to structure base construction or placement; upon the completed installation, prior to backfill; upon completion of the base course; upon completion of the binder course; and upon completion of the wearing course.
2. Inspections of the structure tops, frames, and covers by the Municipality will be made upon delivery to the job site; and of the completed installation, prior to backfill.
3. A final inspection of the manhole channels, steps, frames and covers, and all joints will be performed upon completion of all testing, roadway restoration, and/or seeding.
4. Manholes, inlets, and endwalls shall be subject to rejection for failure to conform with these specifications or if any one of the following conditions is noted:
  - a. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.

- b. Defects that indicate incorrect proportioning, mixing, and molding.
  - c. Surface defects larger than ½" diameter indicating honey-combed or open texture.
  - d. Damaged or cracked ends, where such damage would prevent making a satisfactory joint.
  - e. Any continuous crack having a surface width of 0.01 inches or more and extending for a length of 6 inches or more, regardless of position in the section wall.
- 5. Lined manholes will be visually inspected and shall be tested with an approved electrical porosity detection.
  - 6. Inspections of inlets and manholes by the Municipality for accumulation of debris and silt will be performed upon completed installation.

C. Concrete Testing (For Cast-In-Place Work) - As specified in Section 03000.

### 1.03 SUBMITTALS

#### A. Certificates:

- 1. Submit two copies of certification from material suppliers attesting that materials meet or exceed specification requirements.
- 2. Submit certifications of welders for lining systems.

#### B. Shop Drawings:

- 1. Submit details for reinforcing steel.
- 2. Submit details of manhole sections, and precast bases if used.
- 3. Submit details of manhole frames and covers, including required lettering: "MAN TWP SANITARY SEWER" or "MAN TWP STORM SEWER", as applicable.
- 4. Submit details of adjusting rings.
- 5. Submit manufacturer's descriptive literature for the grouting of manhole steps.
- 6. Submit details of manhole steps.
- 7. Submit manufacturer's descriptive literature for joint sealant compounds.
- 8. Submit manufacturer's descriptive literature for the pipe to manhole flexible connections.
- 9. Submit manufacturer's details for interior protective lining systems.

C. One (1) copy of the approved Soil Erosion & Sedimentation Pollution Control Plan, including approval letter.

### 1.04 JOB CONDITIONS

A. As specified in Section 02221.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Precast Concrete Units:

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

B. Inspections

1. Inspection by the Municipality will, at a minimum, be made of materials upon delivery to the job site; of the subgrade, prior to construction or placement; and of the completed structure, prior to backfill.
2. Precast cement concrete products shall be subject to rejection for failure to conform with these specifications or if any one of the following conditions is noted:
  - a. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
  - b. Defects that indicate incorrect proportioning, mixing, and molding.
  - c. Surface defects larger than 1/2" diameter indicating honey-combed or open texture.
  - d. Damaged or cracked ends, where such damage would prevent making a satisfactory joint.
3. Concrete Testing (For Cast-In-Place Work): Section 03000.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed Stone Subbase:

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

B. Brick: ASTM C32 Grade SS, solid. (Not permitted for manholes)

C. Masonry Mortar: ASTM C270, Type S.

D. Malleable Iron Castings: ASTM A47, Grade 35018, Domestic.

E. Ductile Iron Castings: ASTM A536, Grade 60-40-18, Domestic.

F. Structural Grade Carbon Steel: ASTM A36.

G. Cast-in-Place Cement Concrete: Section 03050.

H. Cast Gray Iron Castings: ASTM A48.

I. Concrete Masonry Units: NOT PERMITTED

## 2.02 STORM SEWER INLETS

### A. Precast Cement Concrete Units

1. Comply with the requirements of Section 713.2 or Section 714, Publication 408 Specifications. Concrete shall be Class AA, unless otherwise specified.
2. All reinforcing shall comply with the requirements of Publication 72M.
3. 6' inlets shall be similar in all respects to standard inlets except that the longitudinal dimension shall be increased by 24".
4. Modified boxes (PennDOT Type 1, 2 or 3, Modified Type I or Modified Type II) shall have reinforced cover adjustment slabs in accordance with Details in Publication 72M.
5. Minimum reinforcing WWF 6 x 6 W2.9 (6 ga.) wire mesh, placed 1" from each surface.

### B. Inlet Grates

1. Comply with the requirements of Publication 72M, PennDOT approved vane, diagonal or bicycle safe grates.
2. Grates for 6' inlet shall be similar in all respects to standard inlet grates except that the longitudinal dimension shall be increased by 24".
3. Inlet grates in traffic areas shall be capable of handling HS-25 loading.
4. Welded structural steel grates and frames shall be coated with bituminous paint. All iron castings shall be furnished unpainted.
5. Inlets on roadways with longitudinal slopes equal to or greater than 4% shall have vane grates unless approved by Municipality.
6. Type 'S' inlet tops are not to be used without written approval from the Municipality.
7. Type 'C' inlet tops shall have an 8" reveal for use with slant curbing, use a 10" reveal at the low point in the street or with vertical curbing.

### C. Outlet Structures

1. Precast concrete or cast-in-place concrete in accordance with Article 2.02.A.
2. Construct outlet structures to dimensions shown on the drawings.
3. Pipe culvert end sections shall comply with the requirements of Standard Drawing RC-34, PennDOT Publication 72.

4. Headwalls or endwalls with 18" diameter pipe or larger shall be furnished with a guard, see Standard Detail MT2630-2.

#### 2.03 PRECAST CONCRETE MANHOLE BASES AND SECTIONS: ASTM C478

- A. 5.5%  $\pm$  1.5% air-entrained cement concrete.
- B. Eccentric cone or flat slab top sections; minimum 24" access opening.
- C. Precast riser sections of length to suit.
- D. Precast bases of a design similar to the precast riser sections.
- E. Precast drop connections and precast lampholes are not permitted.
- F. Manholes shall have a 4' inside diameter unless otherwise noted on the drawings.
- G. Precast manhole bases shall be manufactured in accordance with the elevations shown on the Municipality's grade sheets and shall accommodate lateral hookups as marked in the field.
- H. Precast manhole bases and precast concrete channels shall be constructed specifically for the work intended.
- I. Joint Sealant Compound: FS SS-S-00210, preformed, flexible, self-adhering, cold-applied. Joints between manhole base and riser, between risers, between riser and cone, between cone and adjusting rings and cast iron frame, shall be made of RUB'R-NEK, a flexible plastic gasket-type sealant manufactured by K. T. Snyder Company, Inc., of Houston, Texas, or approved equal.
- J. Rubber Gaskets: ASTM C443
- K. Non-shrink Grout: Fastsetting, cement-based mortar such as Waterplug, manufactured by Thoro Division of ChemRex, Shakopee, MN, or approved equal.
- L. Resilient pipe-to-manhole connection: ASTM C923, such as PSX gaskets manufactured by Press-Seal Gasket Corporation.

#### 2.04 MANHOLE STEPS

- A. Manhole steps shall be made of non-corrosive aluminum, or steel reinforced fiberglass or polypropylene materials. Steps in precast walls shall terminate 1" from outer surface and shall be cast in place wherever possible or grouted with an approved waterproof, non-shrink grout. Steps installed later shall be according to the manufacturer's specifications.
  1. Aluminum alloy steps (Alloy 6061-T6) shall be Model No. F-140, manufactured by Washington Aluminum Company, Inc., of Baltimore, MD, or approved equal and shall have a protective coating consisting of asphalt coating conforming to AASHTO —190 requirements applied to the portion to be embedded in the concrete.
  2. Steel reinforced fiberglass steps shall be Model No. 115 manufactured by R.J. Manufacturing, Inc. of San Antonio, Texas, or approved equal.



3. Steel reinforced copolymer polypropylene plastic steps shall be Model No. PS-2-B or PS-2-PFS, manufactured by M. A. Industries, Inc. of Peachtree City, Georgia, or approved equal.

B. Where possible, manhole steps shall be placed perpendicular to the manhole channel.

#### 2.05 MANHOLE FRAMES AND COVERS

A. Domestic soft, gray cast iron castings: ASTM A48, Class 35B or better; free of bubbles, sand and air holes, and other imperfections. Castings shall be furnished unpainted.

B. Frames and covers shall be capable of withstanding an AASHTO HS-25 loading and shall have a minimum 21" clear opening. Watertight frames and covers shall meet AASHTO HS-20 loading requirements.

C. Frame and cover shall have machined bearing surfaces and matched to insure against rocking and to prevent entrance of street wash or grit.

D. Cover shall be lettered or marked "MAN TWP SANITARY SEWER" or "MAN TWP STORM SEWER", as appropriate.

E. Standard heavy-duty frames and covers shall be similar to Model No. 1788-A manufactured by Neenah Foundry Company, Neenah, Wisconsin, or approved equal. The frame shall weigh a minimum of 210 pounds and the cover shall weigh a minimum of 180 pounds. Covers shall be self-sealing, have two (2) concealed watertight pick holes, and shall have two (2) one-piece lifting bars, and no openings to permit surface water entry.

F. Watertight frames and covers shall have suitable clamp, employing a rubber gasket seal, similar to Model No. 1755-E manufactured by the Neenah Foundry Company, Neenah, Wisconsin, or Model No. WT-26 manufactured by Washington Brass, Lebanon, Pennsylvania, or approved equal.

#### 2.06 REINFORCING STEEL: Section 03000

#### 2.07 ADJUSTING RINGS (MANHOLES AND INLETS)

A. Precast cement concrete grade adjustment rings shall be cast from 5000 psi concrete (28-day compressive strength), shall be a maximum of 2" thick per ring, with maximum of two (2) rings. Circumferential reinforcement shall be in conformance with ASTM C478. Split concrete rings are not permitted.

B. Plastic adjusting rings shall be molded high density polyethylene (HDPE) conforming to ASTM D1248, shall be a maximum of 2" thick per ring, with a maximum of two (2) rings. Plastic rings must be approved by the Municipality prior to use.

#### C. Cast-in-Place Concrete Adjustment of Manholes

1. A minimum of four (4) threaded rods, 1" diameter, stainless steel, may be used to adjust the frame. Maximum height adjustment of 6 inches. Two (2) leveling nuts must be used to level the frame on each threaded rod. Each threaded rod shall be embedded a minimum of 3" into the manhole, or per manhole manufacturer's specifications.

2. A cement concrete of 4,000 psi (28 day compressive strength) shall be placed around the frame and manhole. The concrete shall cover the frame flanges a minimum depth of 4", and shall extend a minimum of 6" horizontally from the frame flanges. Use a form inside manhole to prevent concrete from entering the manhole. See Standard Detail MT2630-11.

## 2.08 ENDWALLS

- A. Precast concrete: Publication 408, Section 714
- B. Cast-in-place concrete: PennDOT Class A (Pub. 408, Section 704)

## PART 3 EXECUTION

### 3.01 MAINTENANCE AND PROTECTION OF TRAFFIC: Section 02221

### 3.02 CUTTING PAVED SURFACE PRIOR TO EXCAVATION: Section 02221

### 3.03 BLASTING: As specified in Section 02210

### 3.04 EXCAVATION

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

### 3.05 INLET AND ENDWALL CONSTRUCTION

- A. Construct inlets and catch basins of either precast cement concrete sections or of cast-in-place cement concrete, and of the type indicated on the drawings.
  1. Place precast units on a minimum 12" compacted crushed stone base.
  2. Construct cast-in-place units on undisturbed earth.
  3. Shape bottom of inlet boxes to channel flow of water to the outlet pipe and to prevent water from standing in box.
  4. Unless units are cast-in-place, use precast cement concrete grade adjustment risers to adjust to grade. Mortar in place.
  5. Place appropriate grates in all paved (present or future) areas.
  6. Precast inlet tops shall be aligned with base.
  7. Provide  $\frac{3}{4}$ " expansion joints between curbing and inlets, as required in Section 02525.
- B. Construct endwalls to the dimensions and design indicated on Standard Drawing RC-31M, Publication 72M, and of the type shown on the drawings. Construct endwalls of monolithically cast reinforced concrete.

- C. Do not permit pipes to project more than 2" into inlets. Do not expose end of pipe through faces of endwalls. Do not insert bell end of pipe into inlet.
- D. Inlet grates in new streets shall be flush with binder course. Final grate elevation shall be 1½" to 2" below final street surface elevation, when vertical curbs are being used. Final grate elevation shall be 2" to 2-1/2" below final street surface elevation, when slant curbs are being used.
- E. Where indicated on the construction drawings, provide pipe culvert end sections of the design and dimensions of Standard Drawing RC-71M, PennDOT Publication 72M.
- F. Guards shall be provided on endwalls, headwalls, and discharge structures with an opening of 18" in diameter or larger. The guard bars shall be one-half inch (1/2") diameter galvanized bars on six inch (6") centers attached by a galvanized frame to the structure with three-eighths inch (3/8") diameter stainless steel anchors. See Standard Detail MT2630-2.

### 3.06 MANHOLE CONSTRUCTION

- A. Locate new manholes to be at the roadway centerline, center of a travel lane or behind the curb.
- B. Place a minimum of 4" thick compacted crushed stone base. Provide cast-in-place concrete or precast concrete bases.
  - 1. Construct cast-in-place bases as shown on Standard Detail MT2630-3.
    - a. Cast-in-place bases may be constructed with a special form for a joint to match the manhole cylinder sections.
  - 2. Install precast bases as shown on Standard Detail MT2630-4.
    - a. Set the precast base on the crushed stone base.
    - b. Provide a sealed, flexible resilient connection between pipe and precast base section, such as PSX gasket manufactured by Press-Seal Gasket Corporation.
- C. Install the proper diameter watertight manholes on precast concrete or poured-in-place concrete bases shown on the drawings. Watertight manholes and covers shall be provided in and along all drainage swales, and areas subject to inundation.
- D. Construct drop connections shown on Standard Details MT02630-12, MT02630-13 & MT02630-14. Encase drop connection in concrete per Section 03000.
- E. Form flow channels in manhole bases. Slope channels uniformly from influent invert to effluent invert, minimum 0.1' drop. Construct bends of the largest possible radius. Form channel sides and invert smooth and uniform, free of cracks, holes or protrusions. Precast manhole channels for turns or angles are prohibited.
- F. Do not permit pipe to project more than 2" into the manhole.

- G. Where special gaskets or water stops are recommended by pipe manufacturers for connections at manhole walls, these facilities shall be provided. All pipe connection joints shall be watertight.
- H. Seal joints between precast concrete manhole sections with preformed rubber gaskets or joint sealant compound.
1. Place joint sealant compound on both sections to be compressed by the weight of the upper section.
  2. Place rubber gasket in groove formed in spigot end. Equalize gasket tension.
- I. Step placement:
1. Install manhole sections with steps in proper vertical alignment. Distance from top of rim to top step shall not be greater than 22". Distance from floor of manhole to bottom step shall not be greater than 24".
  2. Manhole steps shall be placed perpendicular to the mainline channel. Do not locate steps over channels.
- J. Install manhole frames and covers.
1. In all streets and private roadways the top rim elevation of all manhole frames and covers shall be depressed 1/8" below the elevation of the adjacent street surface.
  2. Seal joint between manhole frame and manhole with joint sealant compound.
  3. All manholes shall be adjusted to finished street grade utility no more than two (2) 2" (4" total thickness) concrete adjusting ring. Brick and stone adjustments or the use of metal extension rings shall not be permitted.
  4. If the proper adjustment cannot be achieved by the use of two rings, the cone section shall be removed and the proper barrel section inserted.
  5. All concrete adjusting rings shall be parged and plastered on the outside with cement mortar one-half (1/2") inch in thickness, carefully spread and thoroughly troweled to a smooth surface on the inside only.
- K. New manholes constructed on existing pipelines:
1. Only cast-in-place manhole bases shall be installed over existing storm sewers, unless prior approval is obtained from the Engineer.
  2. Carefully excavate around existing pipeline for placement of the new manhole base.
  3. Take all measures necessary to control flow through the existing pipeline and to prevent leakage into the new base.
  4. After completion of the manhole, carefully saw and remove the top portion of the existing pipeline. Remove all debris.

- 5. No materials, construction debris, or ground and surface water shall enter the existing pipelines.
- 6. Upon completion of the connections, a properly sized plumber's stopper shall be placed in the new line and be adequately braced to prevent a "blow out".
- 7. The stopper shall not be removed until written permission is granted by the Municipality.
- L. Concrete wall penetration shall be cored at the sizes and locations indicated on the drawings or as recommended by the seal manufacturer's requirements.
- M. New manholes constructed downstream of force main discharges must be lined. The Municipal Engineer will determine the number of lined manholes required in these locations.
  - 1. Lining system shop drawings must be approved prior to installation.
  - 2. Certified welders will perform any field welding of joints.
  - 3. All defects found during inspection will be repaired.
- N. All new wet wells for pump stations will be lined.

3.07 SUPPORT OF EXCAVATION: Section 02221

3.08 CONTROL OF EXCAVATED MATERIAL: Section 02221

3.09 DEWATERING: Section 02221

3.10 SHALLOW MANHOLES

- A. All manholes less than five (5) feet in vertical height shall have a flat top section without a cone transition section and shall be constructed in accordance with Standard Detail MT2630-5.

3.11 BACKFILLING

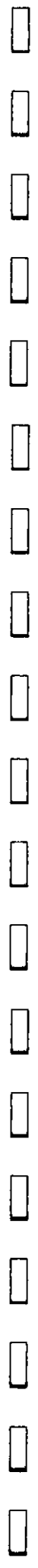
- A. Backfill structures only after inspection by the Municipality.
- B. Perform backfilling and compaction as specified in Section 02221.

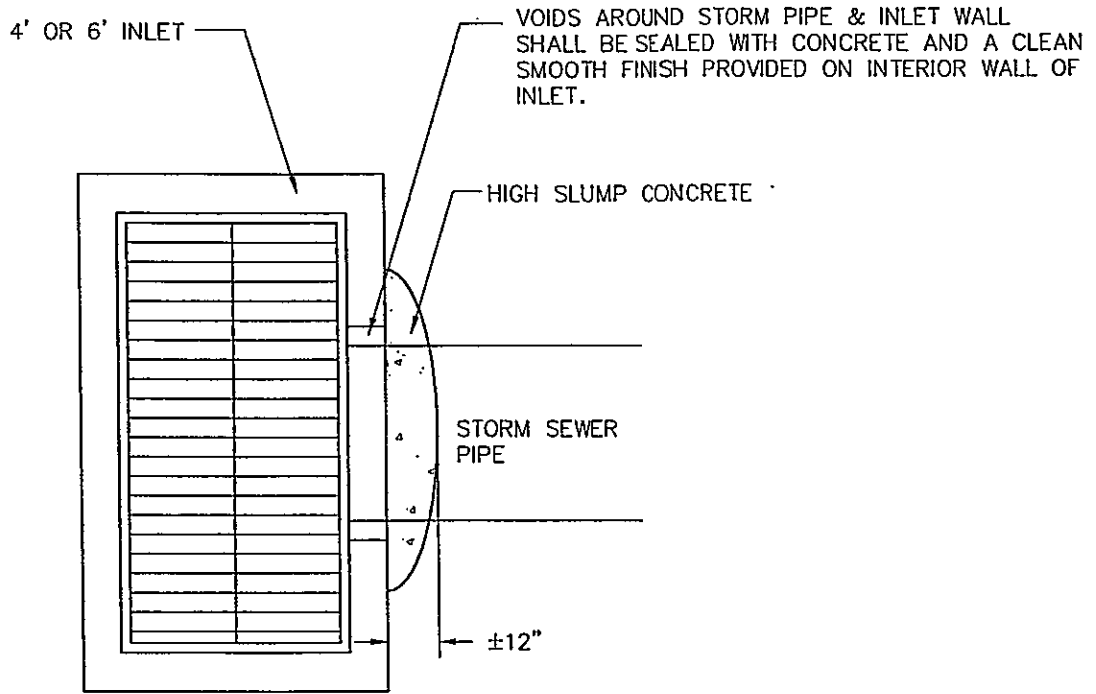
3.12 DISPOSAL OF EXCAVATED MATERIAL: Section 02221.

3.13 RESTORATION OF SURFACE AREAS

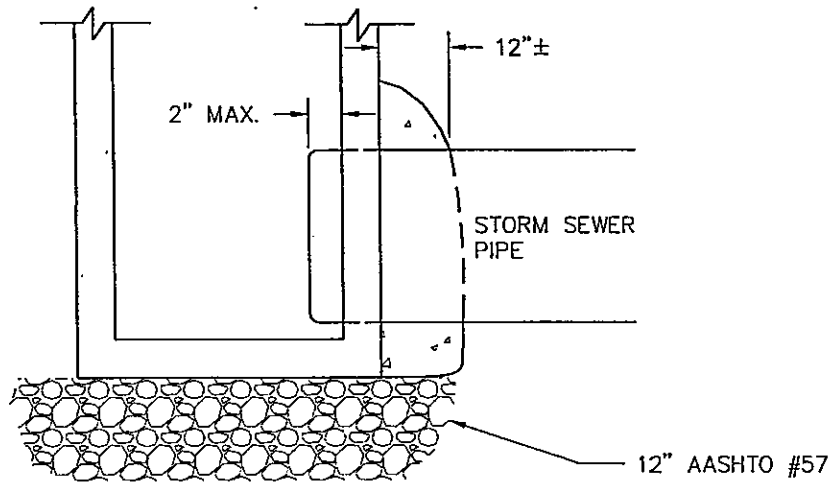
- A. Restore paved areas in accordance with Section 02575.
- B. Restore unpaved surfaces as specified in Section 02221.

END OF SECTION





PLAN VIEW



ELEVATION

NOTE: NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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 315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690  
 WWW.CSDAVIDSON.COM

INLET/STORM PIPE  
 INSTALLATION DETAIL

DATE:	12/27/2006
DRAWN BY:	JLD
CHK. BY:	
NO.	MT2630-1

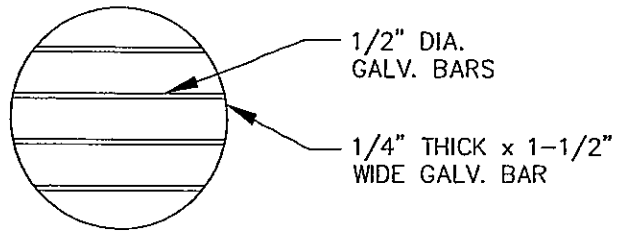
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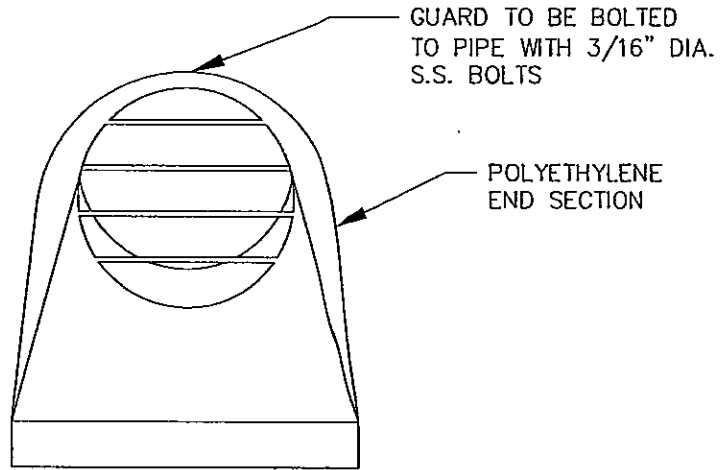


NOTE:

GUARD BARS SHALL BE PROVIDED ON ALL ENDWALLS AND END SECTIONS WITH A PIPE DIA. OF 18" OR LARGER.

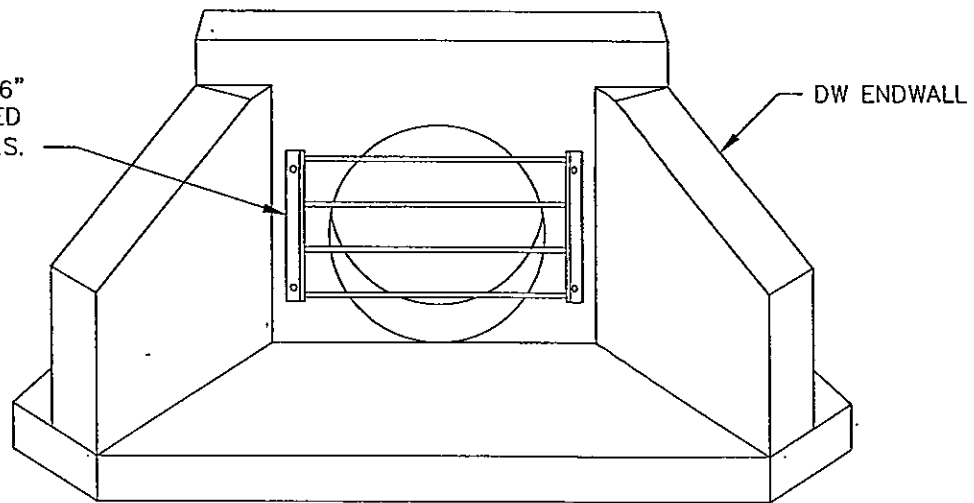


GUARD DETAIL



END SECTION GUARD BARS DETAIL

1/2" DIA. GALV. GUARD BARS ON 6" CENTERS ATTACHED WITH 3/8" DIA. S.S. ANCHORS.



DW ENDWALL GUARD BARS DETAIL

NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



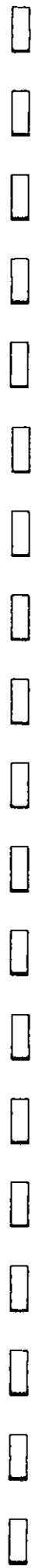
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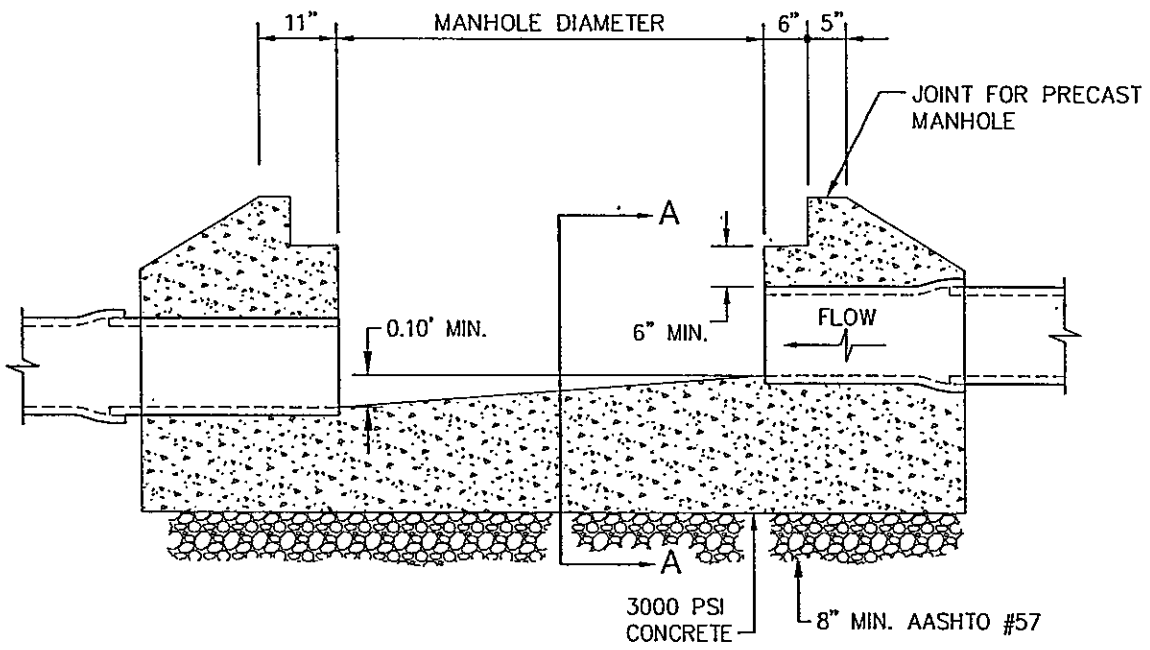
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GALVANIZED  
STEEL PIPE  
GUARD DETAILS

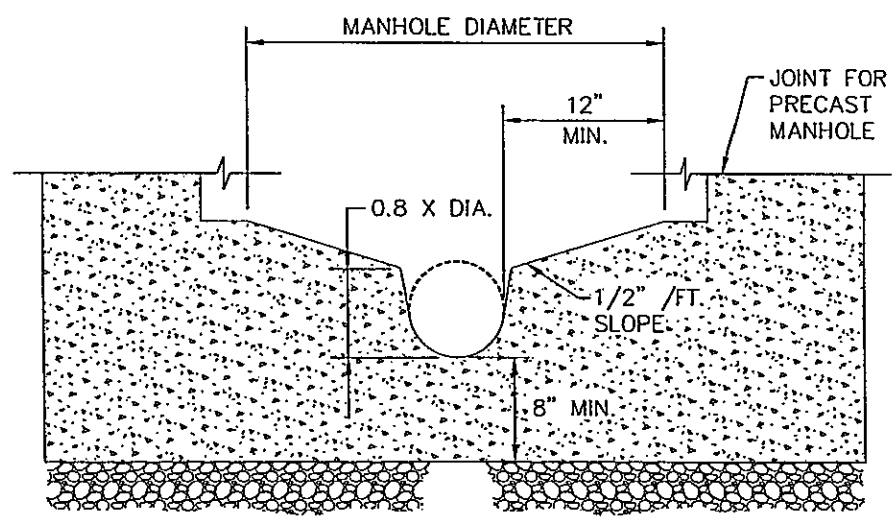
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DRAWN BY:	JLD
CHK. BY:	
NO.	MT2630-2

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ELEVATION



D = PIPE INSIDE DIAMETER

SECTION A-A

REVISED 12/27/2006

NOTE: NOT TO SCALE

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



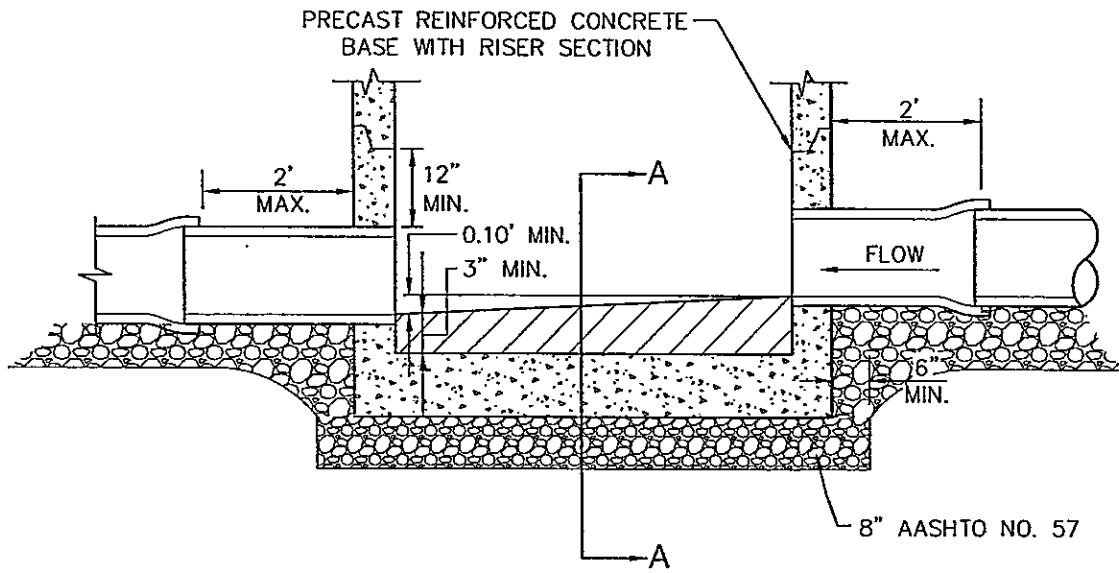
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**CAST-IN-PLACE  
 MANHOLE BASE DETAILS**

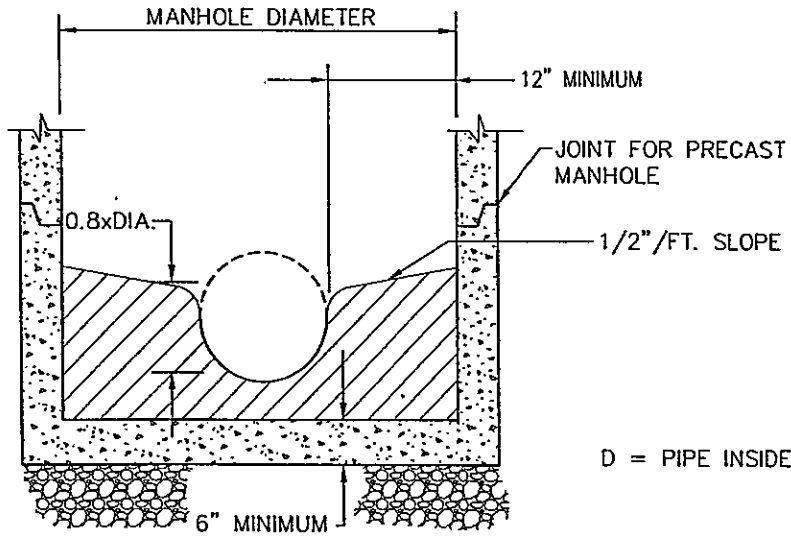
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DRAWN BY:	BAM/JLD
CHK. BY:	
NO.	MT2630-3

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ELEVATION



SECTION A-A

D = PIPE INSIDE DIAMETER

REVISED 12/27/2006

NOTE: NOT TO SCALE

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PRECAST MANHOLE  
 BASE DETAILS

DATE: 12/14/2005

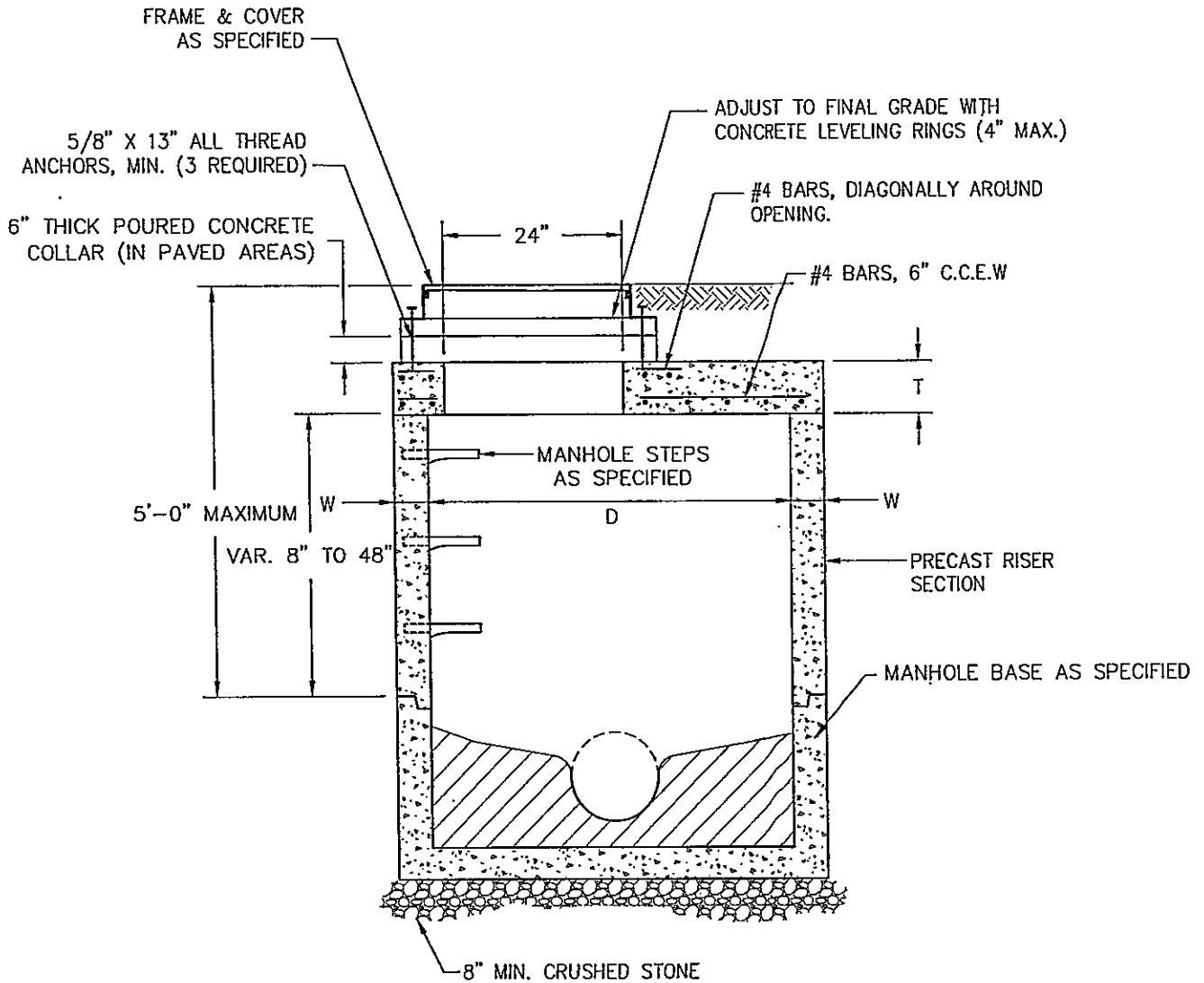
DRAWN BY: BAM/JLD

CHK. BY:

NO. MT2630-4

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

REVISED 12/27/2006

NOTE: NOT TO SCALE

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SHALLOW  
MANHOLE DETAIL

DATE: 12/14/2005

DRAWN BY: BAM/JLD

CHK. BY:

NO. MT2630-5

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FINISH GRADE

FRAME AND COVER AS SPECIFIED

PRECAST CONCRETE,  
HDPE ADJUSTING RINGS  
OR CAST-IN-PLACE  
CONCRETE (3,500 PSI)

6" MAX.

MANHOLE BASE  
AS SPECIFIED

W

D

VARIES

VARIES

4" MIN. AASHTO #57

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

REVISED 12/27/2006

NOT TO SCALE

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### STANDARD DEEP MANHOLE DETAIL

DATE: 12/14/2005

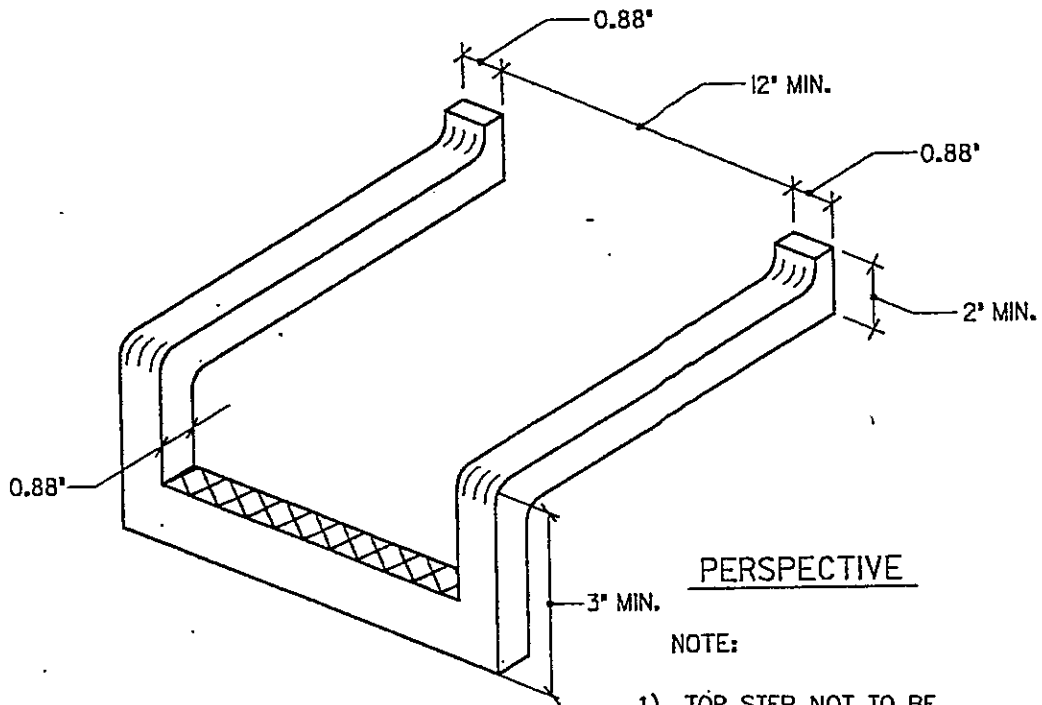
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CHK. BY:

NO. MT2630-6

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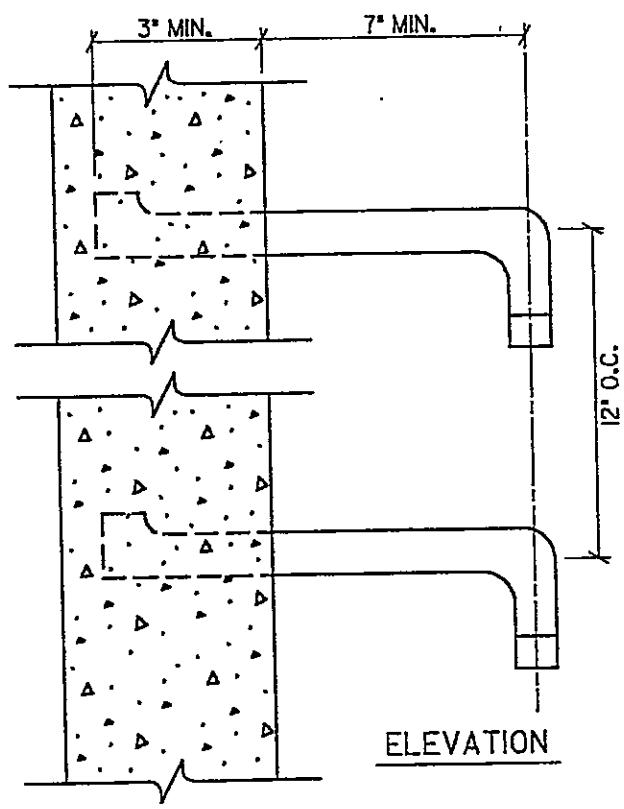




PERSPECTIVE

NOTE:

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



ELEVATION

MANHOLE STEP DETAIL

NOTE: NOT TO SCALE

REVISED 12/27/2006

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



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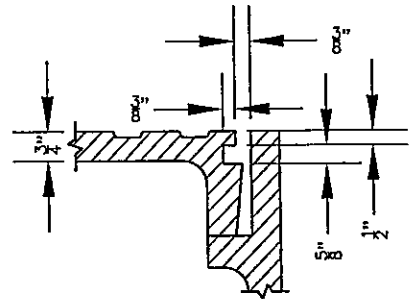
**MANHOLE  
STEP DETAIL**

DATE:	12/14/2005
DRAWN BY:	BAM/JLD
CHK. BY:	
NO.	MT2630-7

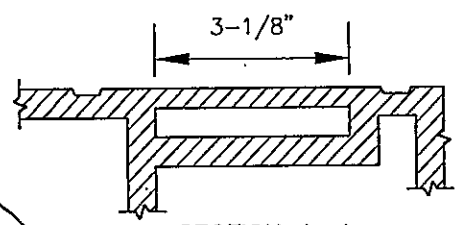
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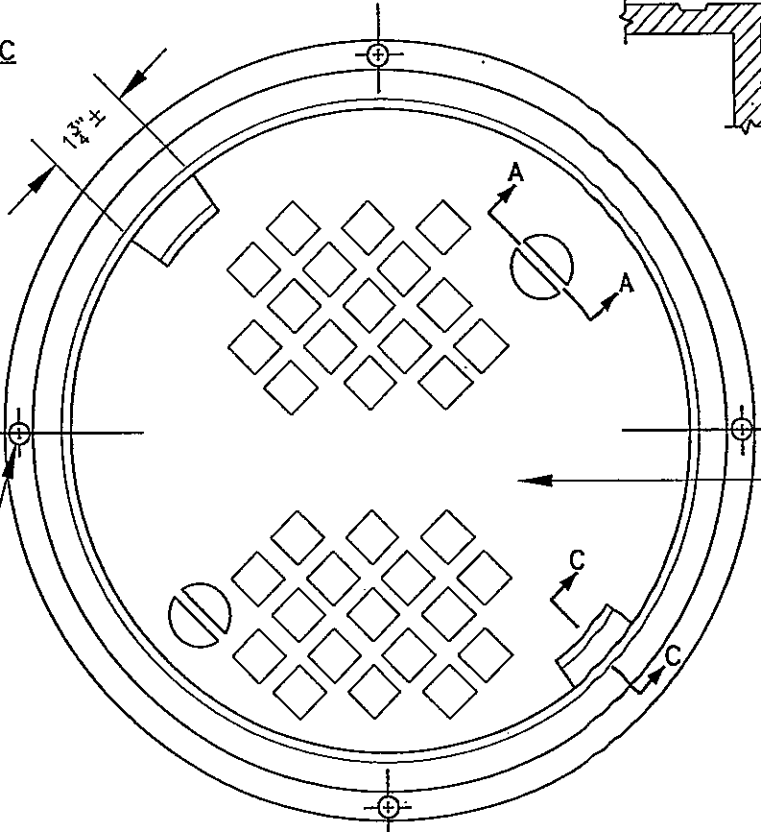
CONDITION	AASHTO LOAD RATING	COVER WEIGHT
HEAVY TRAFFIC	HS-25	>180 LBS.
LIGHT TRAFFIC	HS-20	≤135 LBS.
WATERTIGHT	HS-20	AS REQUIRED



SECTION C-C  
PICK HOLE



SECTION A-A  
5/8"  $\phi$  LIFTING BAR



PLAN

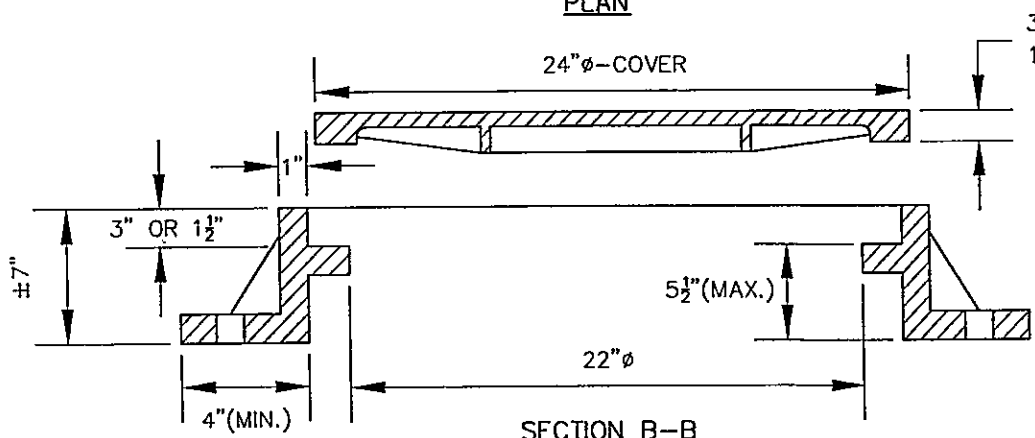
2" HIGH STANDARD  
FLAT GOTHIC LETTERS  
AS FOLLOWS:

MAN TWP  
SANITARY SEWERS

OR

MAN TWP  
STORM SEWERS

1" DIA. BOLT HOLES  
4 REQ'D ONLY WHEN  
FRAME IS ANCHORED  
TO MANHOLE. SEE  
DETAIL MT2630-10 &  
MT2630-11



SECTION B-B

3" HEAVY TRAFFIC  
1 1/2" LIGHT TRAFFIC

NOTE: NOT TO SCALE

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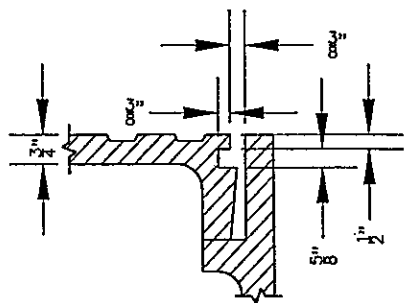
HEAVY TRAFFIC  
SANITARY SEWER  
MANHOLE FRAME &  
COVER

DATE:	2/6/07
DRAWN BY:	JLD
CHK. BY:	
NO.:	MT2630-8

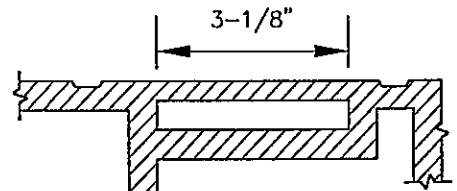
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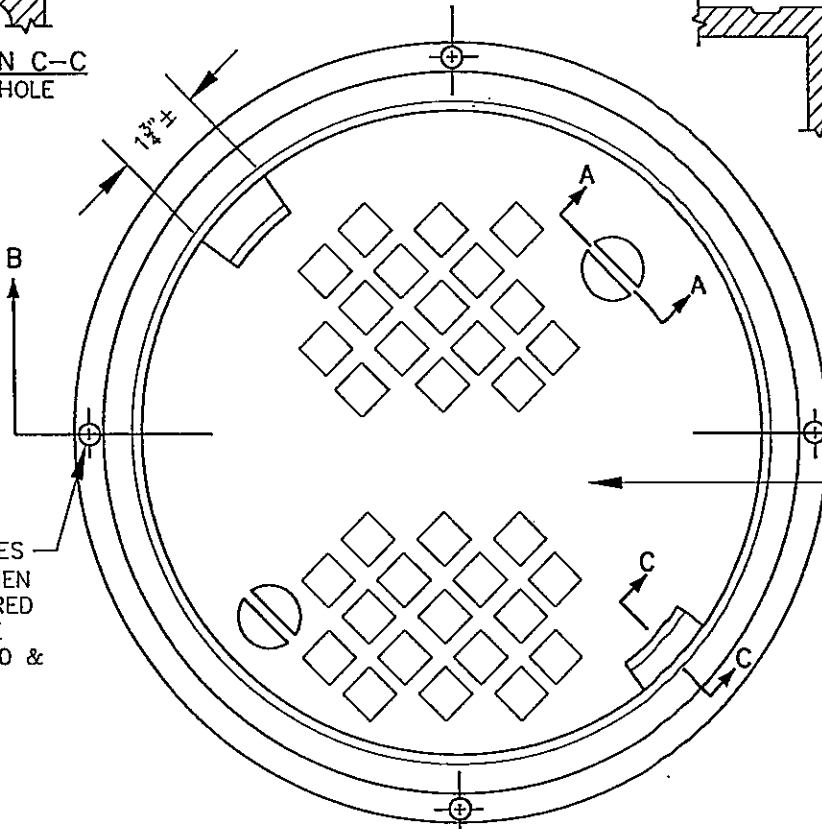
CONDITION	AASHTO LOAD RATING	COVER WEIGHT
HEAVY TRAFFIC	HS-25	>180 LBS.
LIGHT TRAFFIC	HS-20	≤135 LBS.
WATERTIGHT	HS-20	AS REQUIRED



SECTION C-C  
PICK HOLE



SECTION A-A  
5/8"  $\phi$  LIFTING BAR



PLAN

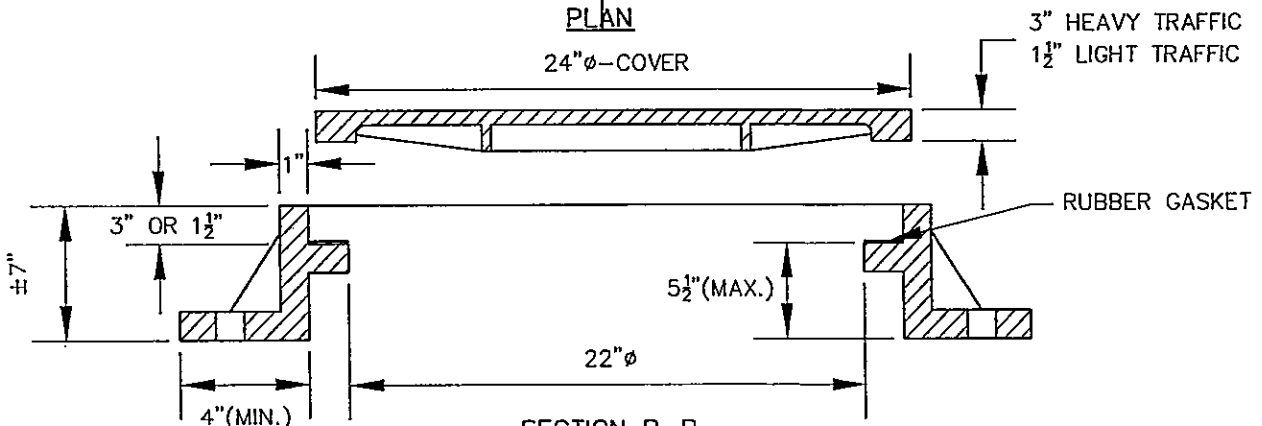
1" DIA. BOLT HOLES  
4 REQ'D ONLY WHEN  
FRAME IS ANCHORED  
TO MANHOLE. SEE  
DETAIL MT2630-10 &  
MT2630-11

2" HIGH STANDARD  
FLAT GOTHIC LETTERS  
AS FOLLOWS:

MAN TWP  
SANITARY SEWERS

OR

MAN TWP  
STORM SEWERS



SECTION B-B

**NOTES:**

- FURNISH LID WITH CONCEALED PICK-HOLE.
- WATERPROOF FRAME, SHALL BE FURNISHED COMPLETE WITH RUBBER GASKET.
- HEX HEAD BOLTS WILL BE BRONZE, COUNTERSUNK.

NOTE: NOT TO SCALE

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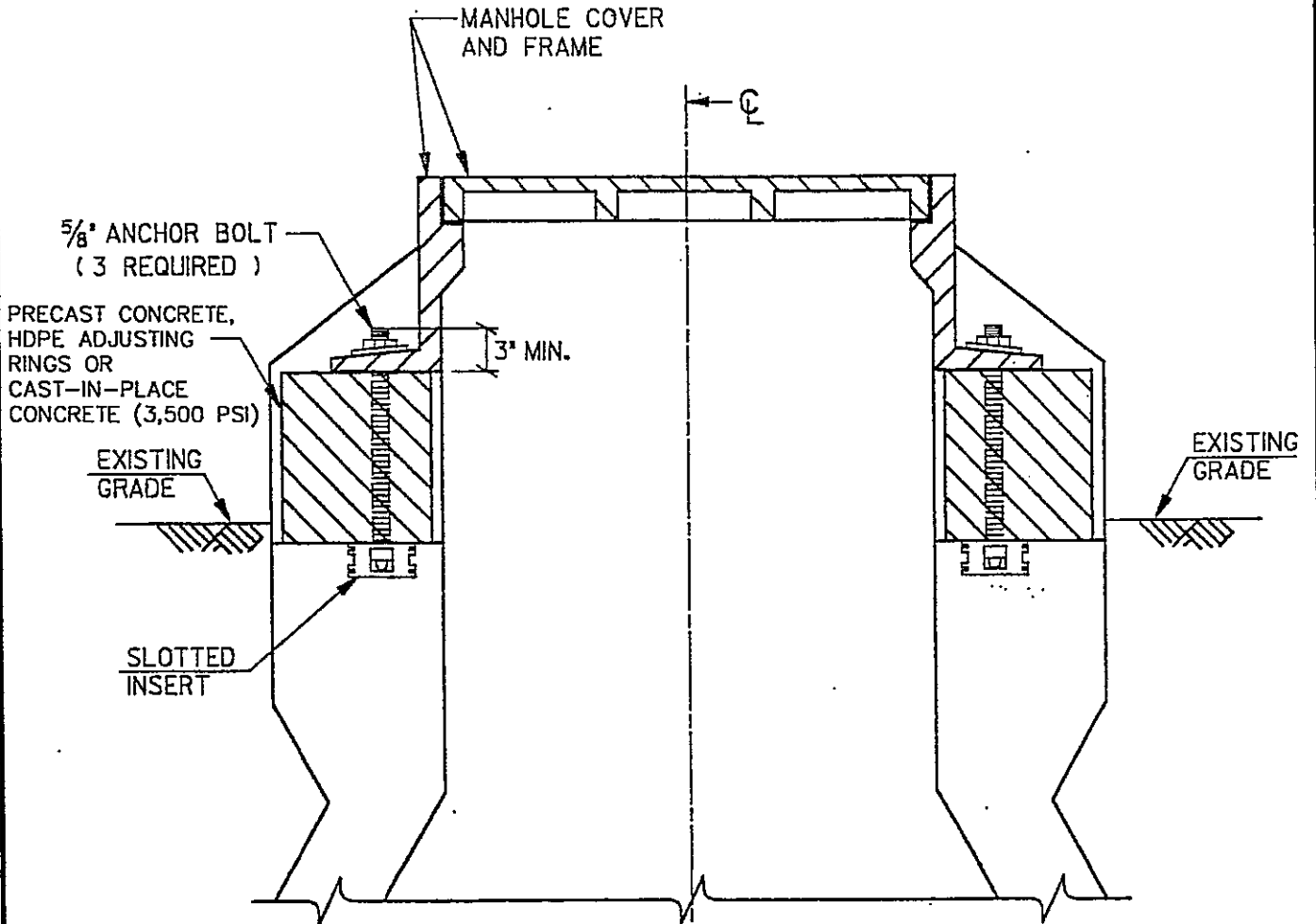
**BOLTED WATERPROOF  
MANHOLE FRAME &  
COVER TYPE 1**

DATE:	2/6/07
DRAWN BY:	JLD
CHK. BY:	
NO.:	MT2630-9

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MANHOLE COVER WITH ANCHOR BOLT

NO SCALE

NOTE: NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



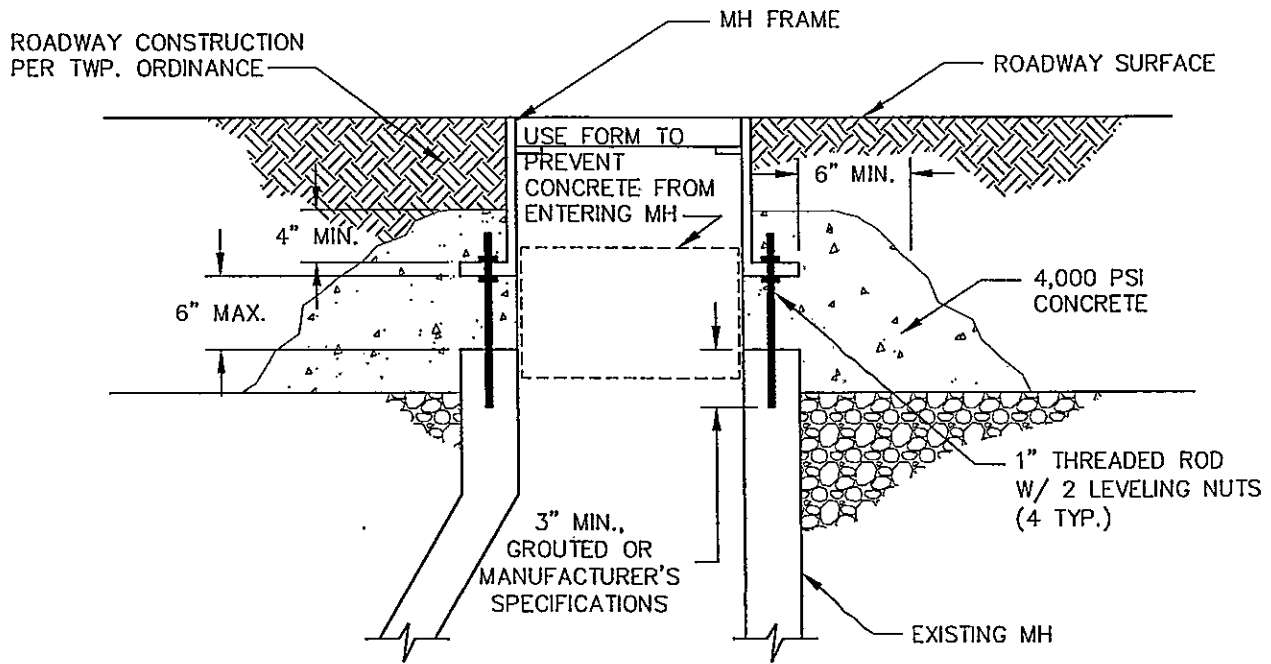
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MANHOLE COVER  
 ANCHOR BOLT

DATE:	12/27/2006
DRAWN BY:	JLD
CHK. BY:	
NO.	MT2630-10

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NOT TO SCALE

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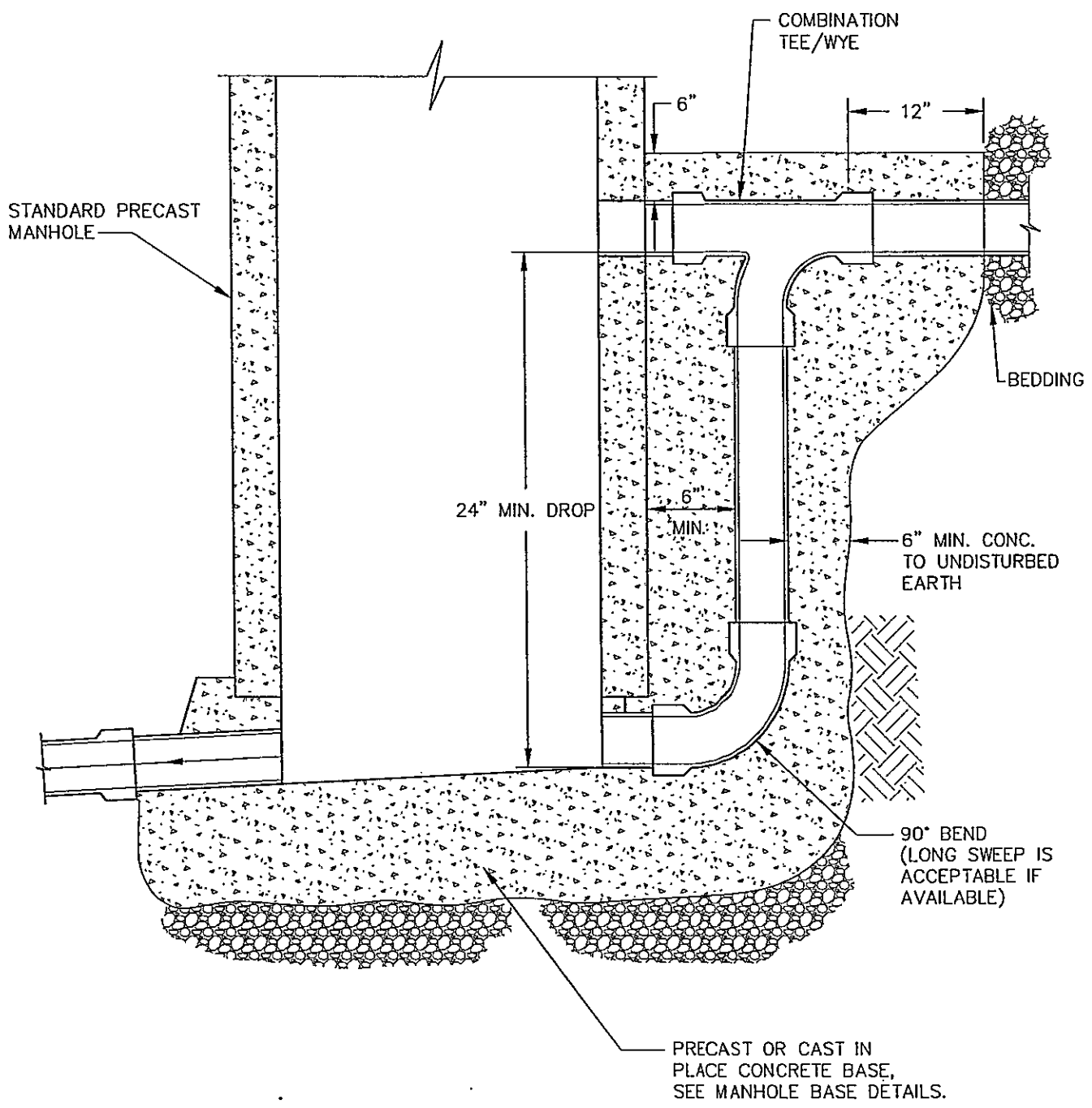
CAST-IN-PLACE  
 CONCRETE MANHOLE  
 ADJUSTMENT

DATE:	1/31/2007
DRAWN BY:	JLD
CHK. BY:	
NO.	MT2630-11

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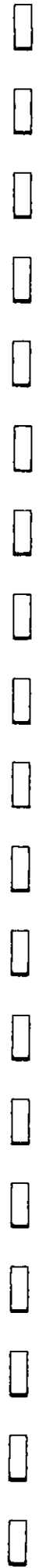
### MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

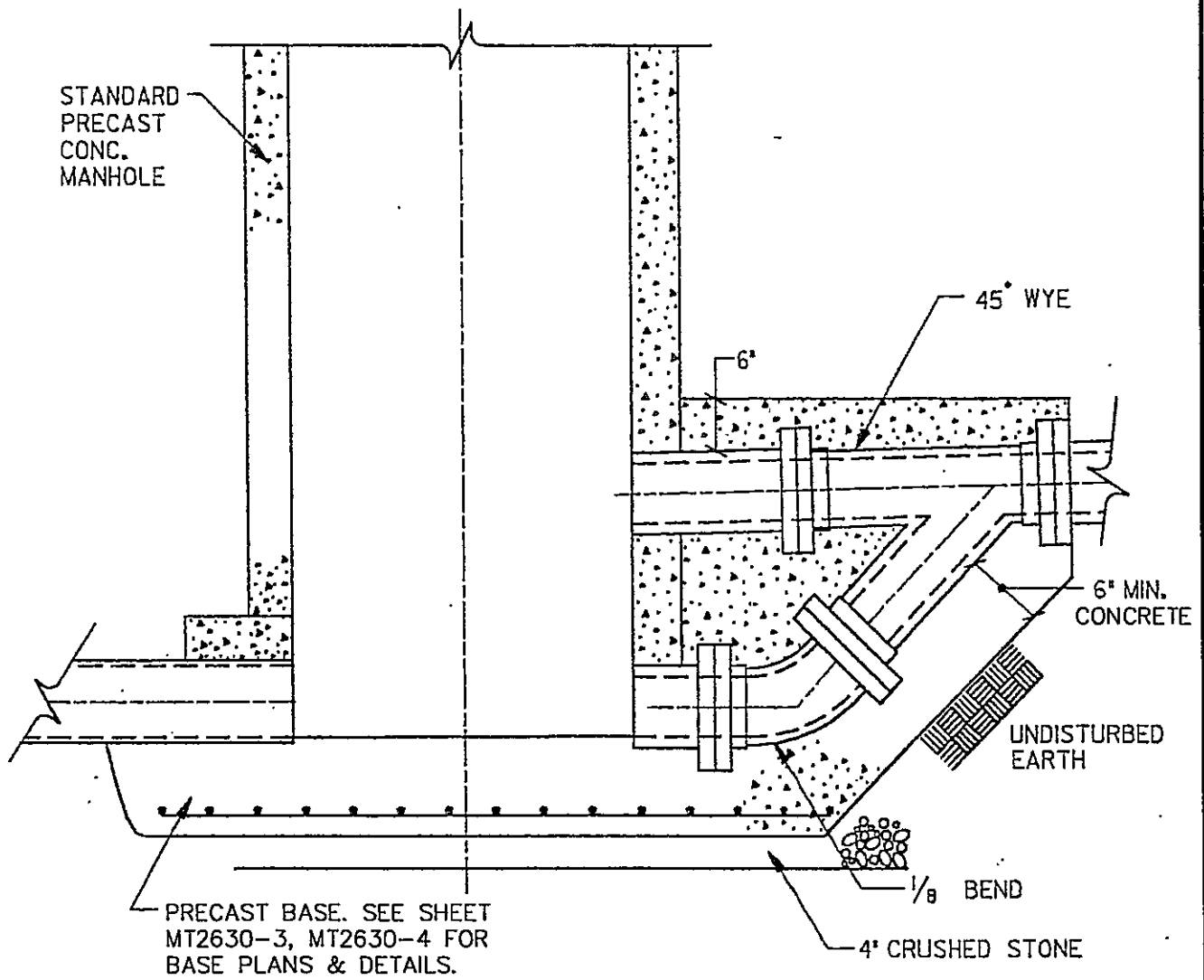


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## DROP CONNECTION DETAIL

DATE:	12/14/2005
DRAWN BY:	BAM/JLD
CHK. BY:	
NO.	MT2630-12





PRECAST BASE. SEE SHEET  
MT2630-3, MT2630-4 FOR  
BASE PLANS & DETAILS.

ELEVATION

TYPE A DROP MANHOLE DETAILS

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

NOTE: NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

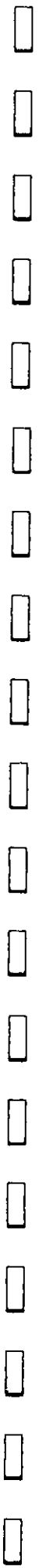


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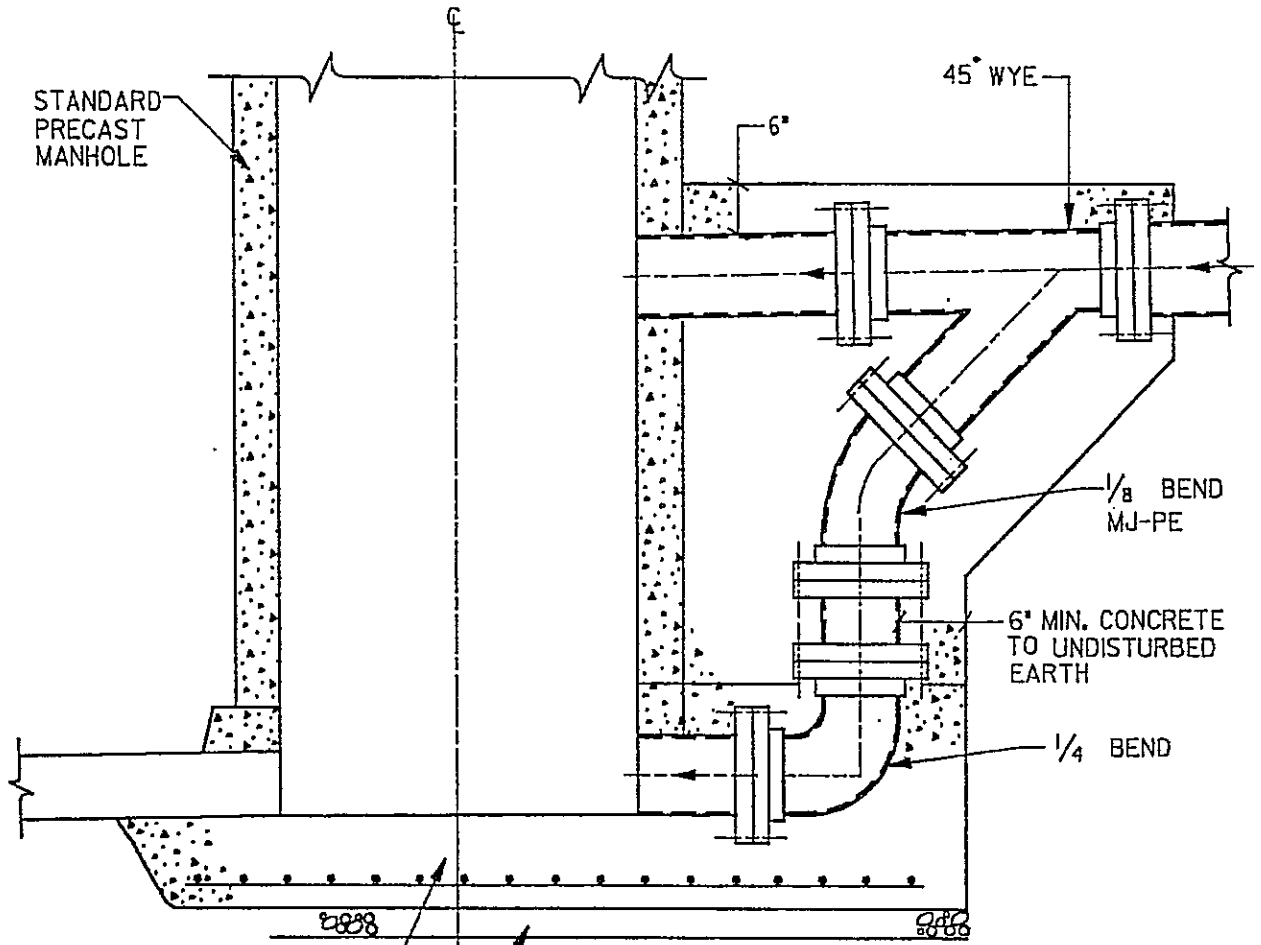
D.I.P. MECHANICAL  
JOINT TYPE A DROP  
MANHOLE DETAIL

DATE:	12/27/2006
DRAWN BY:	JLD
CHK. BY:	
NO.	MT2630-13

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PRECAST BASE;  
SEE SHEETS  
MT2630-3,  
MT2630-4 FOR  
BASE PLANS &  
DETAILS

4" CRUSHED STONE UNDER CONCRETE

ELEVATION  
TYPE B DROP MANHOLE DETAIL

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

NOTE: NOT TO SCALE

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

DATE:	12/27/2006
DRAWN BY:	JLD
CHK. BY:	
NO.	MT2630-14

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SECTION 02651

SANITARY SEWER TESTING

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Testing Gravity Sewer Pipelines:

- a. Lamping
- b. Low-pressure air test
- c. Infiltration test
- d. Deflection test - PVC pipe only

2. Testing Pressure Pipelines:

- a. Hydrostatic leakage test

3. Testing Manholes:

- a. Vacuum test

B. Related work specified elsewhere:

- 1. Manholes:
- 2. Sanitary sewer pipe:

Section 02601

Section 02610

C. Definitions: NONE

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE

A. Test Acceptance:

- 1. All testing will be conducted in the presence of the Municipal Engineer. No test will be accepted until the results are within the specified 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.

1.03 SUBMITTALS

- A. Submit contractor's list of equipment and testing schedule, including procedures and sequence and provisions for disposal of test and flushing water.
- B. Submit certificate of test gauge calibration.

1.04 JOB CONDITIONS:

- A. Do not allow personnel in manholes during pressure and vacuum testing.
- B. Provide relief valves set at 10 psig to avoid accidentally over-pressurizing gravity sewer line during low pressure air testing.

PART 2 PRODUCTS

2.01 AIR TEST EQUIPMENT

Air compressor  
Air supply line  
Shut-off valve  
Pressure regulator  
Pressure relief valve  
Stop watch  
Plugs  
Pressure gauge, calibrated to 0.1 lbs./sq. in.

2.02 INFILTRATION TEST EQUIPMENT

Weirs

2.03 DEFLECTION TEST EQUIPMENT

Go, No-Go mandrels - furnished by Contractor  
Pull/retrieval ropes - furnished by Contractor

2.04 VACUUM TEST EQUIPMENT

Vacuum pump  
Pipe plugs  
Vacuum hose  
Test connections  
Vacuum gauge  
Vacuum relief valve

PART 3 EXECUTION

3.01 PREPARATION

- A. Backfill trenches in accordance with Section 02221.
- B. Provide pressure pipeline with concrete reaction support blocking.

- C. Clean and flush pipeline with water to remove debris. Collect and dispose of flushing water and debris in accordance with Federal, State and local regulations. No temporary connection with potable water supply for flushing purposes shall be allowed. Measures shall be taken to prevent back siphonage through portable hose lines and similar avenues of possible contamination.
- D. Plug outlets, wye-branches and laterals. Brace plugs to offset thrust.

### 3.02 TESTING GRAVITY SEWER PIPELINES

#### A. Lamping:

1. After flushing and cleaning, lamp gravity pipeline in the presence of the Municipal inspector.
2. Assist the Municipal inspector in the lamping operation by shining a light at one end of each pipeline section between manholes. The Municipal inspector 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.

#### B. Low Pressure Air Test:

1. Test each newly installed section of gravity sewer line, including service connections.
2. Slowly introduce air pressure to approximately 5.0 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 0.5 psig. Do not increase pressure above 10 psig.
3. Allow pressure to stabilize for at least five minutes. Adjust pressure to 5.0 psig or the increased test-pressure as determined above if ground water is present.
4. Test:
  - a. Conduct the test for five (5) minutes. There shall be no drop in pressure during this period.
  - b. If the line fails, determine the source of the air leakage, make corrections and retest the entire section between manholes.

#### C. Testing Pipe Over 36" Diameter:

1. Pipe over 36" diameter shall be subjected to a visual interior inspection.

#### D. Infiltration Test:

1. No visible infiltration is allowed.

2. If infiltration is detected, make corrections and perform additional air test on entire section between manholes.

E. Deflection Testing of Plastic Sewer Pipe:

1. Perform vertical ring deflection testing on all portions of PVC sewer piping, in the presence of the Municipal inspector, after backfilling.
2. The maximum allowable deflection for installed plastic sewer pipe shall be limited to 5% of the original vertical internal diameter.
3. Perform deflection testing with a properly sized 'Go, No-Go' mandrel provided by the Municipality or with mandrel that has been approved by the Municipality. Contractor supplied mandrel shall be tested at the Municipal Public Works building.
4. Pipe exceeding the allowable deflection shall be located, excavated, replaced, and retested at the sole expense of the Contractor, including surface restoration.
5. During the 12th month of the warranty period, perform a second vertical ring deflection test on all portions of PVC sewer piping, in the presence of the Municipal inspector, including preparation in accordance with Article 3.01.

3.03 TESTING PRESSURE PIPELINES

A. Hydrostatic Leakage Test:

1. Test each newly laid pressure pipeline, including any valved section thereof, hydrostatically at 1.5 times the working pressure of the pipeline based on the elevation of the lowest point in the pipeline corrected to the elevation of the test gauge. Obtain test pressure from the Municipality's Engineer.
2. 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.
3. Observe joints, fittings and valves under test. Remove and replace cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
4. After visible deficiencies are corrected, continue testing at the same test pressure for an additional two hours to determine the leakage rate. Maintain pressure within plus or minus 5.0 psi of test pressure. Leakage is defined as the quantity of water supplied to the pipeline necessary to maintain test pressure during the period of the test.
5. Compute the maximum allowable leakage by the following formula:

$$L = \frac{ND(P)^{0.5}}{7,400}$$

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

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

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

### 3.04 TESTING MANHOLES

1. Test all new manholes for exfiltration utilizing the vacuum test method and equipment developed by NPC Systems, Inc., Milford, NH, or approved equal.
2. The Contractor shall provide the necessary labor, equipment or materials to conduct the vacuum test.
3. The testing shall be done after complete assembly of the manhole and after final frame adjustment and/or placement of the binder course.
4. The Contractor shall plug the pipe openings, taking care to securely brace the plugs and the pipe.
5. With the vacuum tester set in place:
  - a. Inflate the compression band to effect a seal between the vacuum base and the structure.
  - b. Connect the vacuum pump to the outlet port with the valve open.
  - c. Draw a vacuum to 10" of Hg. and close the valve.
6. A vacuum of 9in. of Hg. or more shall be maintained for at least the period of time indicated in the following table in order to successfully complete the test:

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

7. If the manhole fails the initial test, the Contractor shall locate the leak and make proper repairs. Leaks and lift holes shall be filled with Waterplug, manufactured by Thoro System Products, Inc., of Miami, Florida, or approved equal.

END OF SECTION



SECTION 02722

LOW-PRESSURE SEWER SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

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

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

B. Related Work Specified Elsewhere:

- |                                         |               |
|-----------------------------------------|---------------|
| 1. Trenching, backfilling & compacting: | Section 02221 |
| 2. Sanitary sewer pipe:                 | Section 02610 |
| 3. Sewer and manhole testing:           | Section 02651 |

C. Applicable Standard Details:

- |           |                                                  |
|-----------|--------------------------------------------------|
| MT02722-1 | Pressure Trench                                  |
| MT02722-2 | Service Valve Assembly for Pressure Sewer System |
| MT02722-3 | Valve Box Detail for Pressure Sewer              |
| MT02722-4 | In-line Cleanout Connection for Pressure Sewer   |
| MT02722-5 | Terminal Cleanout Connection for Pressure Sewer  |
| MT02722-6 | Thrust Block for Vertical Bends                  |
| MT02722-7 | Thrust Blocking Details                          |
| MT02722-8 | Air Release Valve                                |

1.02 REFERENCES

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

- |              |                                                                                                                     |
|--------------|---------------------------------------------------------------------------------------------------------------------|
| ASTM D1784 - | Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds                      |
| ASTM D2241 - | Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)                                                                     |
| ASTM D2466 - | Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40                                                        |
| ASTM D2564 - | Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings                                             |
| ASTM D3139 - | Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals                                                  |
| ASTM D1785 - | Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120                                                    |
| ASTM F477 -  | Elastomeric Seals (Gaskets) for Joints Plastic Pipe                                                                 |
| ASTM D3261 - | Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fitting for Polyethylene (PE) Pipe and Tubing |
| ASTM D3350 - | Standard Specification for Polyethylene Plastics Pipe and Fitting Materials                                         |

- ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based
- ASTM 1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing

### 1.03 SUBMITTALS

#### A. Shop Drawings and Product Data:

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

#### B. Certificates:

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

#### C. One (1) copy of the approved Soil Erosion & Sedimentation Pollution Control Plan, including approval letter.

### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

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

## PART 2 PRODUCTS

### 2.01 POLYVINYL CHLORIDE (PVC) SEWER PIPE

#### A. Pressure Sewer Pipe and Fittings:

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

2.02 HIGH DENSITY POLYETHYLENE PIPE

A. Pressure Sewer Force Main:

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

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

3. Materials used shall have a PPI/ASTM standard thermoplastic material designation code of PE3408 and a material classification conforming to Grade P34 for ASTM D-3350.
4. Pressure sewer force mains when installed in public right-of-ways shall have all pipe data heat indented in a "Green" stripe on the wall of the pipe.
5. Pipe shall be supplied in the maximum length available to avoid joints.
6. Field splices shall be in accordance with ASTM D3261 (Butt heat fusion) or by approved electrofusion fittings manufactured in accordance with ASTM F-1055 and rated at a minimum operating pressure of the pipe.
7. Fittings and adapters to valves and other equipment shall be in the strict accordance with the recommendations of the pipe manufacturer.

B. Pressure Sewer Service Laterals:

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

## 2.03 DETECTABLE WARNING TAPE

- A. Shall be provided as specified in Section 01010, installed at a depth of twelve (12) inches below the finished ground or street surface.

## 2.04 VALVES

### A. Ball Valves

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

### B. PVC Check Valves

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

## 2.05 ADJUSTABLE VALVE BOXES

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

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Perform trench excavation to the line and grade indicated on the Drawings and as specified in Section 02221 - Trenching, Backfilling and Compacting.
- B. Unless otherwise indicated on the Drawings, provide for a minimum cover of 4'-0" above the top of piping laid in trenches.
- C. Provide Type IV bedding as indicated on Standard Detail MT2221-1; 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 Municipal Engineer in advance of pipe laying operations, minimum 72 hours.

- B. Lower pipe into trench using handling equipment designated for the purpose to assure safety of personnel and to avoid damage to the pipe. Do not drop pipe.
- C. Lay pipe proceeding upgrade with the bell or groove pointing upstream.
- D. Excavate recesses in bedding material to accommodate joints, fittings and appurtenances. Do not subject pipe to a blow or shock to achieve solid bedding or grade.
- E. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.
- F. Clean and inspect each pipe and fitting before joining. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction and ground movement. Use lubricant recommended by the pipe or fitting manufacturer for mating joints. If unusual joining resistance is encountered or if the pipe cannot be fully inserted into the joint, disassemble joint, inspect for damage, re-clean joint components, and re-assemble joint.
- G. Do not deflect joints in pressure piping more than the maximum recommended by the pipe manufacturer.
- H. Place sufficient backfill on each section of pipe, as it is laid, to hold pipe firmly in place.
- I. Clean the interior of the pipe as the work progresses.
- J. Keep trenches and excavation free of water during construction.
- K. When the work is not in progress, and at the end of each workday, securely plug ends of pipe and fittings to prevent trench water, earth or other substances from entering the pipe or fittings.
- L. Deflection
  - 1. When it is necessary to deflect pressure sewer mains from a straight alignment horizontally or vertically, do not exceed the following limits:
    - a. Ductile Iron Pipe: <12" diameter – 5° maximum deflection per joint  
>12" diameter – 3° maximum deflection per joint
    - b. PVP Pipe: 4° maximum deflection per joint

### 3.03 THRUST RESTRAINT

- A. Provide pressure pipeline with restrained joints or concrete thrust blocking at all bends, tees, and changes in direction; construct concrete thrust blocking in accordance with Standard Details MT2722-7 and MT2722-8. Pour concrete thrust blocks against undisturbed earth. If restrained joints are utilized, submit design calculations showing determination of restrained lengths and submit joint restraint details. Methods of joints restraint shall utilize devices specifically designed for the application for which manufacturer's data is available for the application. Submit manufacturer's literature for approval. Protect metal restrained joint compounds against corrosion by applying a bituminous coating.

3.04 AIR RELEASE OR COMBINATION AIR RELEASE AND VACUUM VALVES

- A. Install air release or combination air release and air vacuum valves where shown on the drawings.
- B. Construct air release valves including valve vault as shown on Standard Detail MT2722-9. Valve and valve vault shall be vertical and plumb.

3.05 SERVICE VALVES AND CLEANOUTS

- A. Provide service valves, in-line cleanouts, and terminal cleanouts where indicated on the Drawings.
- B. Construct as indicated on Standard Details MT2722-3 through MT2722-6.

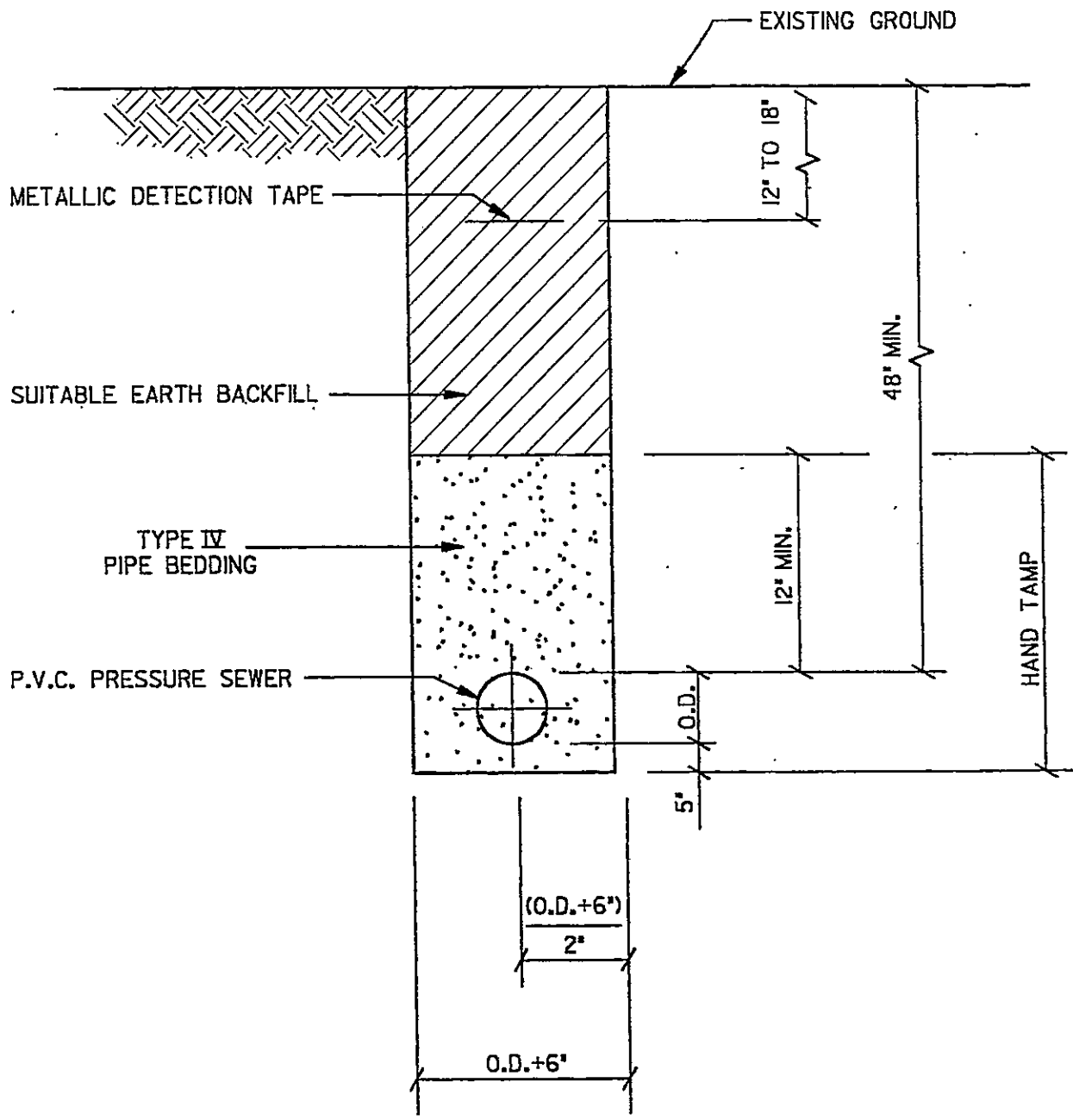
3.06 BACKFILLING TRENCHES

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

3.07 HYDROSTATIC LEAKAGE TEST

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

END OF SECTION



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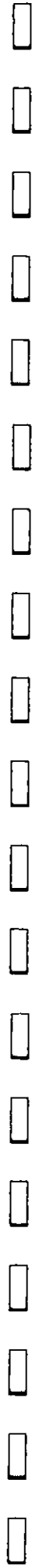


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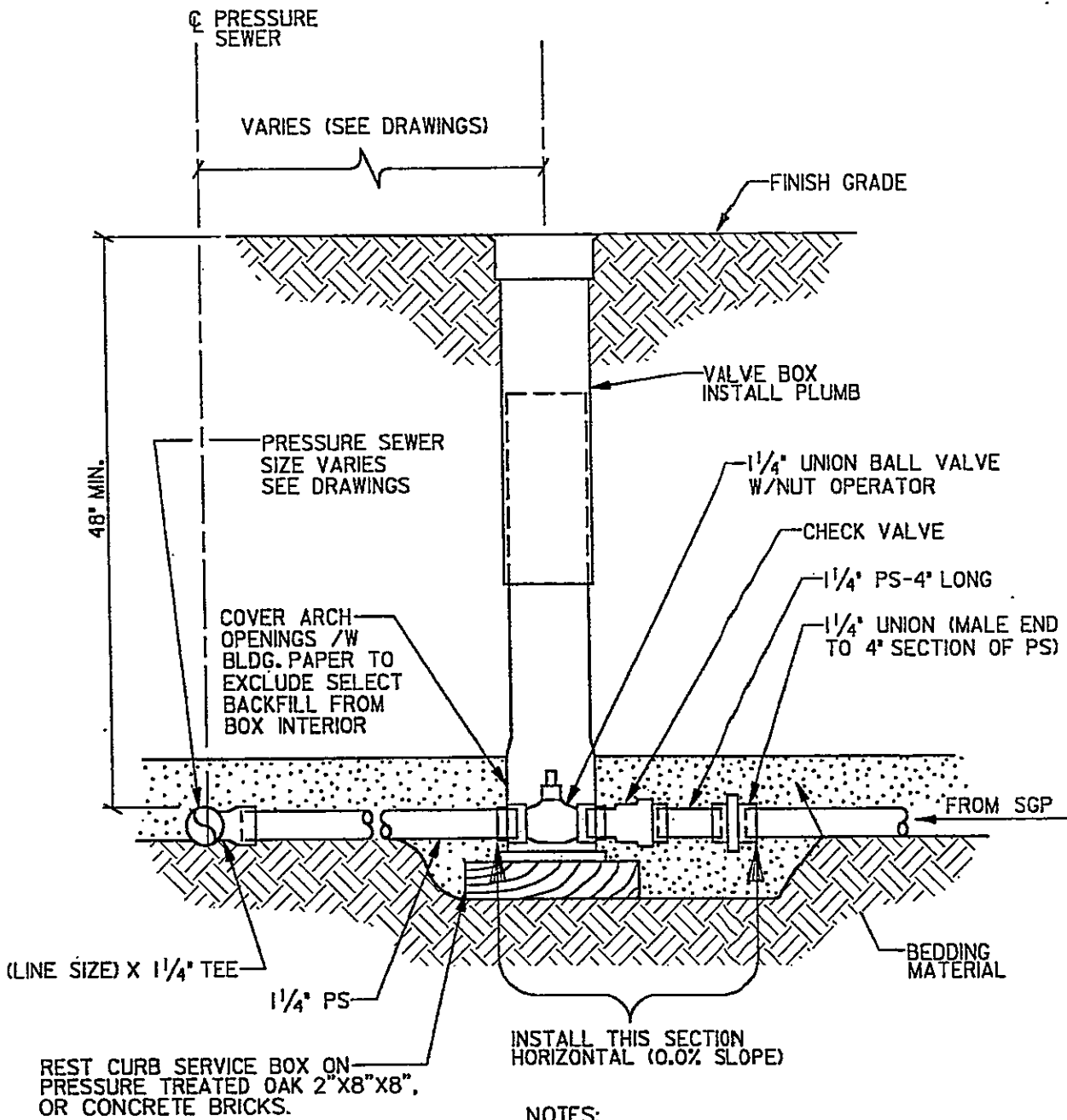
PRESSURE TRENCH

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NO.	MT2722-1

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**NOTES:**

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

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**SERVICE VALVE  
 ASSEMBLY FOR  
 PRESSURE SEWER  
 SYSTEM**

DATE: 1/31/2007

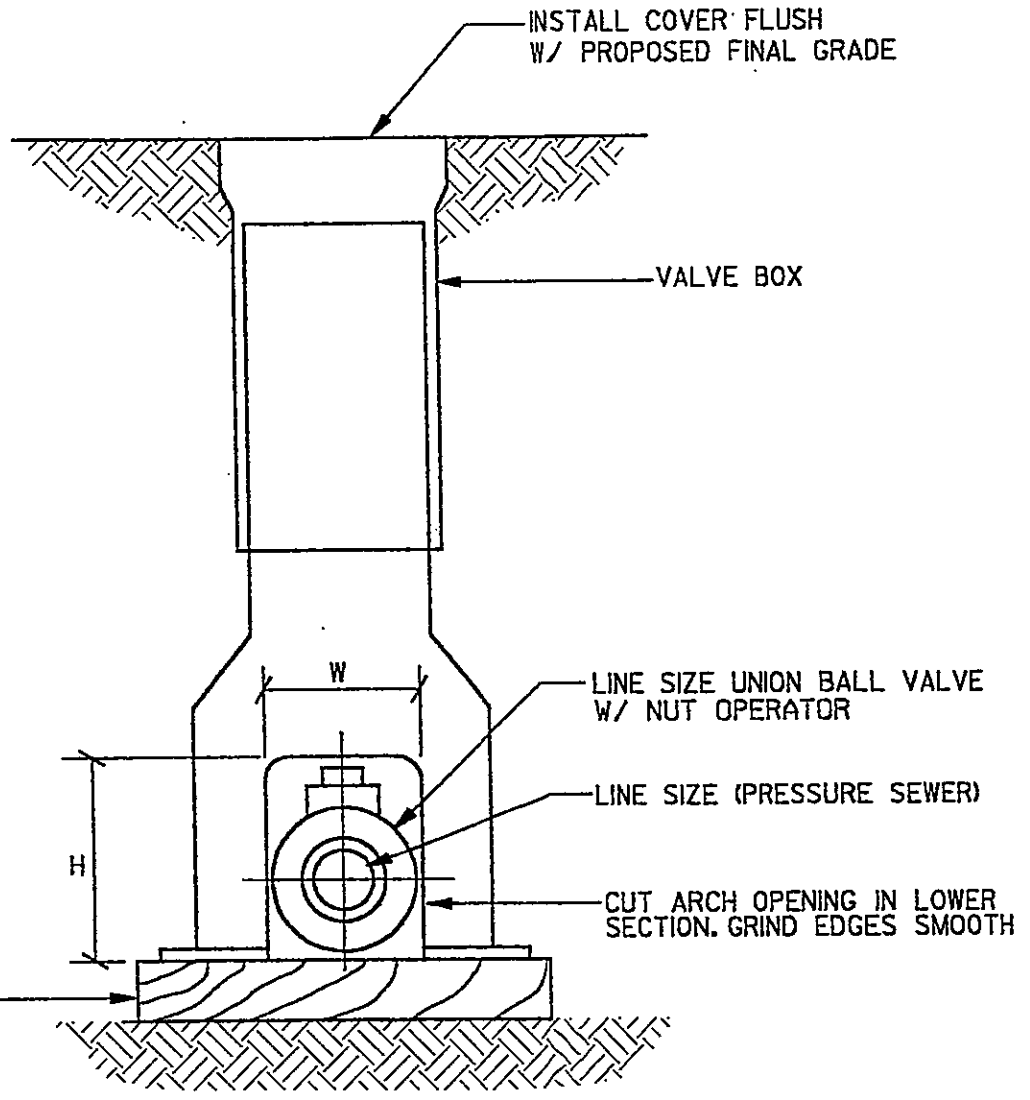
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NO. MT2722-2



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



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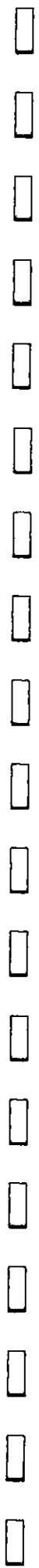
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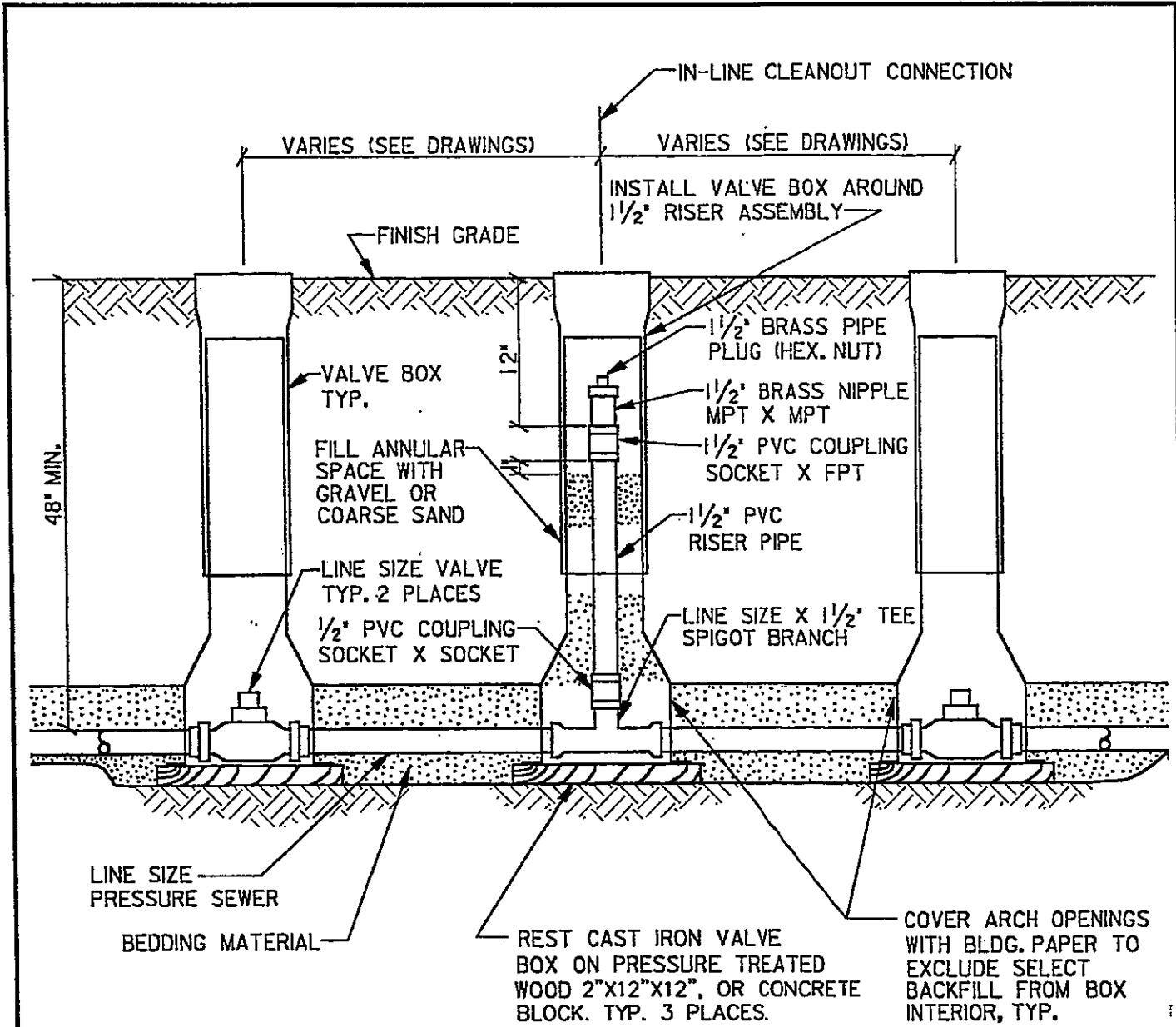
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VALVE BOX DETAIL FOR  
 PRESSURE SEWER  
 SYSTEM

DATE:	1/31/2007
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**NOTES:**

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

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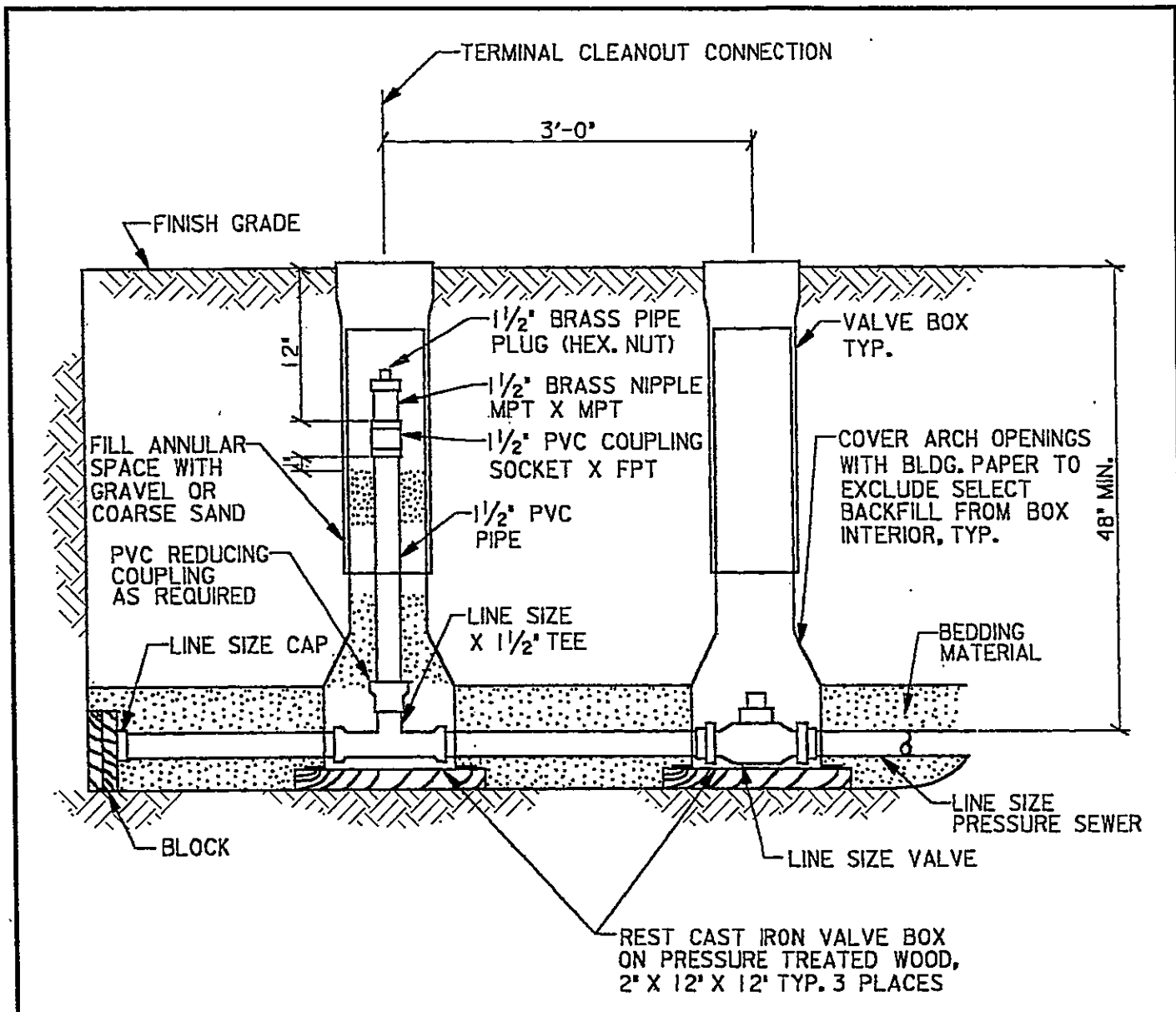
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**IN-LINE CLEANOUT CONNECTION FOR PRESSURE SEWER SYSTEM**

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**NOTES:**

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

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**TERMINAL CLEANOUT CONNECTION FOR PRESSURE SEWER SYSTEM**

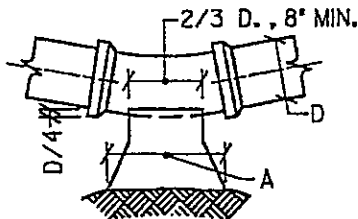
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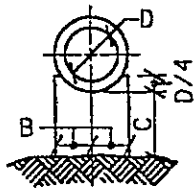




### BUTTRESS FOR VERTICAL BENDS

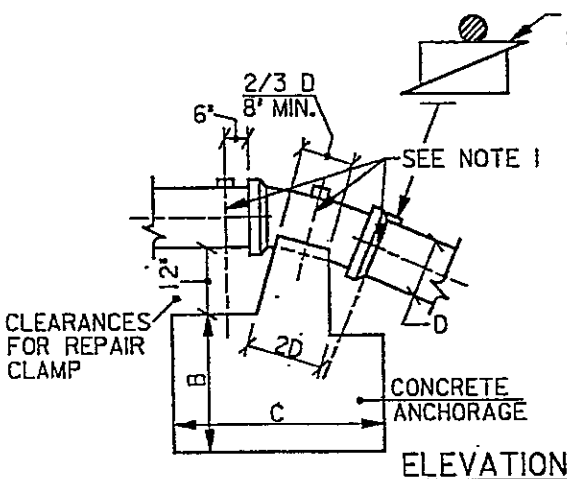


PLAN

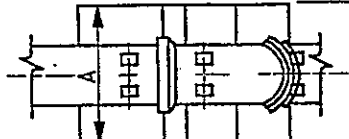


SECTION

BEND		BUTTRESS DIMENSIONS					
		SIZE					
		4'	6'	8'	10'	12'	16'
11 1/4°	A	4'	6'	8'	10'	1'-0"	1'-4"
	B	5'	7'	8'	9'	10'	1'-0"
1/32	C	5'	7'	7'	8'	8'	9'
22 1/2°	A	6'	9'	1'-0"	1'-6"	1'-9"	2'-3"
	B	6'	7'	7'	8'	10'	1'-0"
1/16	C	6'	7'	7'	8'	8'	9'
45°	A	10'	1'-3"	1'-8"	2'-1"	2'-6"	3'-4"
	B	7'	7'	8'	9'	11'	1'-3"
1/8	C	7'	7'	8'	10'	11'	1'-3"



ELEVATION



PLAN

DOUBLE ACTING  
STEEL WEDGES

### ANCHORAGE FOR VERTICAL BENDS

BEND		ANCHORAGE DIMENSIONS					
		SIZE					
		4'	6'	8'	10'	12'	16'
11 1/4°	A	1'-4"	1'-6"	1'-6"	2'-6"	3'-0"	4'-0"
	B	1'-0"	1'-6"	1'-9"	2'-0"	2'-6"	2'-6"
1/32	C	2'-0"	2'-0"	2'-6"	3'-0"	3'-0"	4'-0"
22 1/2°	A	1'-8"	2'-0"	3'-4"	3'-8"	4'-0"	4'-4"
	B	1'-6"	1'-9"	2'-3"	2'-3"	2'-3"	2'-6"
1/16	C	2'-0"	3'-0"	2'-8"	3'-10"	4'-0"	5'-9"
45°	A	2'-3"	2'-6"	3'-0"	4'-0"	4'-6"	5'-2"
	B	1'-9"	2'-6"	2'-9"	3'-0"	3'-6"	4'-0"
1/8	C	2'-6"	3'-0"	4'-0"	4'-6"	4'-9"	6'-6"

**NOTE:**

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

NOT TO SCALE

## MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



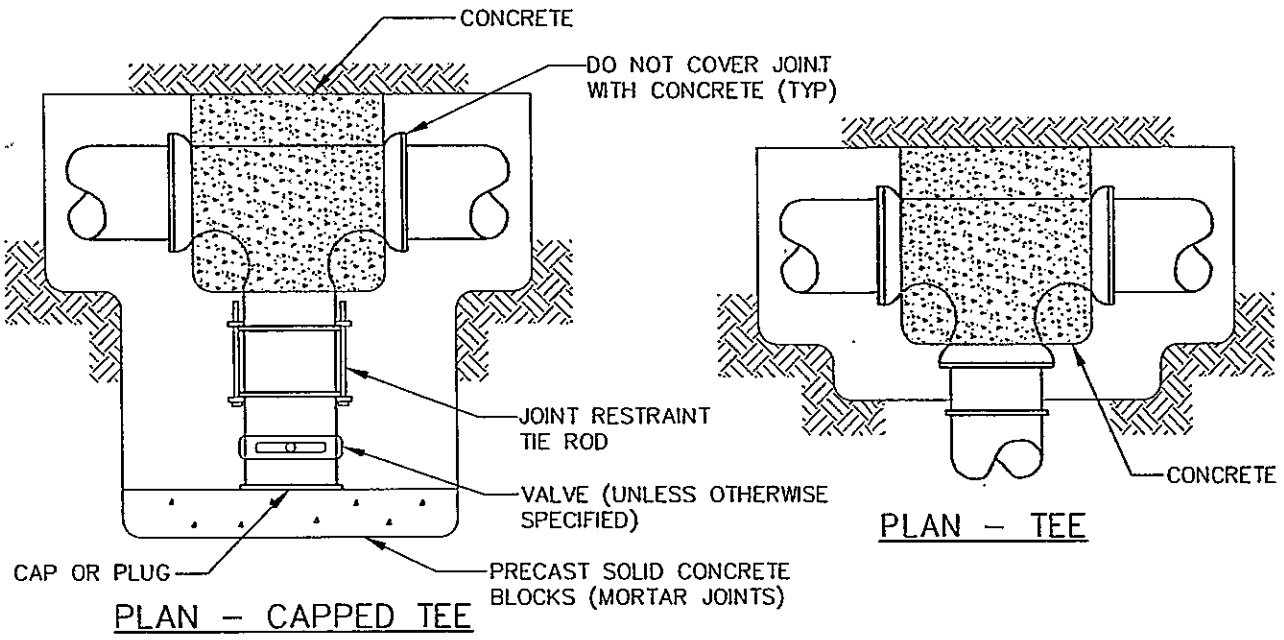
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### THRUST BLOCK FOR VERTICAL BENDS

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NO.	MT2722-6

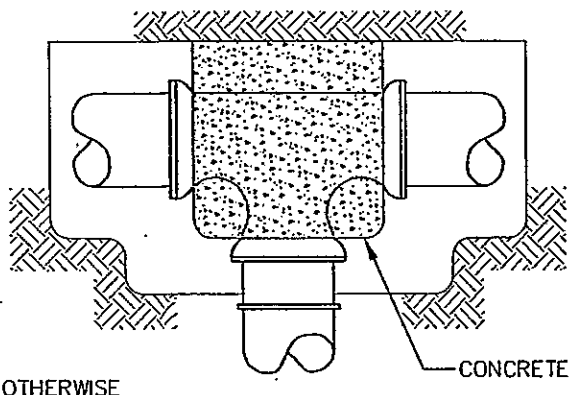
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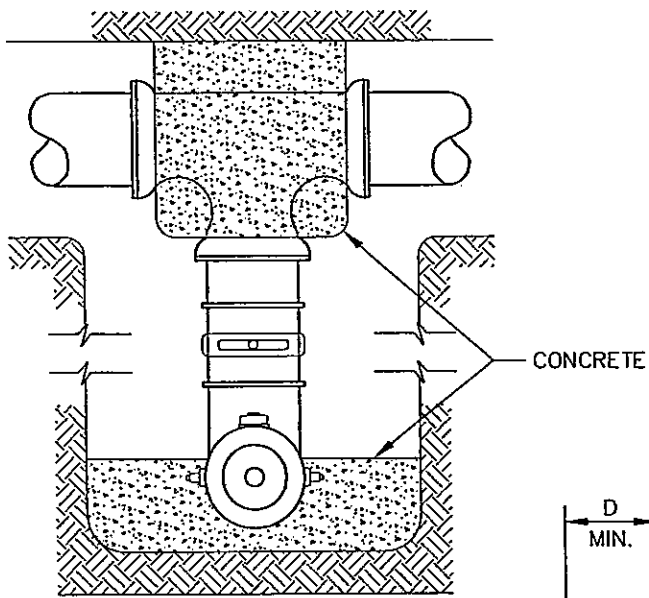


**PLAN - CAPPED TEE**

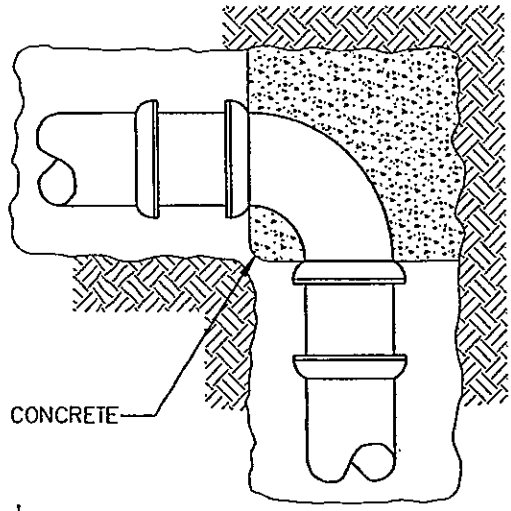
(CAPPED RUN OF TEE SIMILAR)



**PLAN - TEE**



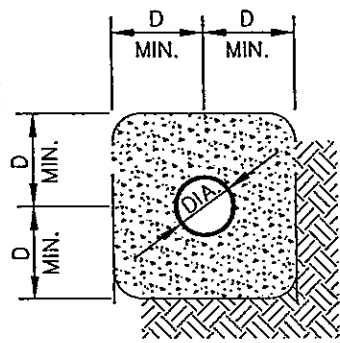
**PLAN - HYDRANT**



**PLAN - 90° BEND**

(LESSER BENDS SIMILAR)

D= OUTSIDE DIAMETER OF PIPE



**TYPICAL SECTION**

NOTE: NOT TO SCALE

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**

**C.S. Davidson, Inc.**  
*Excellence in Civil Engineering*  
 38 N. DUKE STREET YORK, PA • PHONE (717) 846-4805 • FAX (717) 846-5811  
 50 WEST MIDDLE ST. GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782  
 315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690  
 WWW.CSDAVIDSON.COM

**THRUST BLOCKING  
 DETAILS**

DATE:	1/31/2007
DRAWN BY:	JLD
CHK. BY:	
NO.	MT2722-7

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TWIST-TYPE QUICK  
DISCONNECT COUPLING

MANHOLE FRAME AND  
COVER AS SPECIFIED  
(MIN. OPENING 21-3/8")

STANDARD SHALLOW  
MANHOLE

MANHOLE STEPS

FORCE MAIN

MINIMUM 4"  
AASHTO #57

2'-0"

FINISHED GRADE

PVC SCREENED VENT,  
SAME SIZE AS TAP

AIR RELEASE VALVE OR  
COMBINATION AIR RELEASE  
AND AIR VACUUM VALVE

1" BLOW-OFF

BRONZE DOUBLE STRAP  
SADDLE ON FORCE MAIN

CONCRETE SUPPORT

CONCRETE BRICK UNDER  
MAIN

4'-0" DIA.

MAIN SIZE

TAP SIZE

4"-12"  
14"-20"  
24"-36"

2"  
3"  
4"

REVISED 12/27/2006

NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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38 N. DUKE STREET YORK, PA • PHONE (717) 846-4805 • FAX (717) 846-5811  
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315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690  
WWW.CSDAVIDSON.COM

AIR RELEASE VALVE

DATE: 12/14/2005

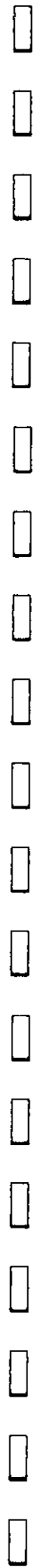
DRAWN BY: ARB/JLD

CHK. BY:

NO. MT2722-8

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SECTION 02852

GUIDE RAIL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The work of this section includes installation of steel guide rail on bridges and along roadways, including any excavation, concrete work and restoration of paved or unpaved surfaces.

B. Related work specified elsewhere:

1. Bituminous paving and surfacing: Section 02500
2. Plain and reinforced cement concrete: Section 03000

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation (latest revisions):

Publication 408, Specifications  
Publication 72M, Standards for Roadway Construction (RC)  
Publication 219M, Bridge Construction Standards (BC)

B. Qualifications:

1. Guide Rail Installer - shall be a firm that specializes in this work, has minimum 5 years experience and is PennDOT pre-qualified to perform this work.

1.03 JOB CONDITIONS

A. Control of traffic

1. Employ traffic control measures only after requesting traffic alterations, in writing to the Municipality, and receiving approval at a regularly scheduled Board of Supervisor's meeting.
2. The Contractor will employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.
3. Notify York County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to existing traffic patterns.

B. Protection of existing utilities and structures:

1. Take all precautions to protect existing utilities and structures. Comply with requirements of Pennsylvania Underground Utility Protection Law.

2. Advise each person operating power equipment for excavation of the type and location of utility lines at the job site.
3. Immediately notify utility owner and Municipality of any damage to a utility line.

## PART 2 PRODUCTS

### 2.01 GUIDE RAIL

- A. All rail elements, posts, offset brackets, base plates, other hardware and end sections shall be in accordance with PennDOT Publication 408, Section 1109, including galvanizing.

### 2.02 ANCHOR BOLTS

- A. Anchor bolts shall be in accordance with PennDOT Publication 408 Specifications, Section 1105 and as shown on approved drawings.

### 2.03 CONCRETE

- A. Concrete for end anchorage shall be Class A cement concrete in accordance with PennDOT Publication 408 Specifications, Section 704.

## PART 3 EXECUTION

### 3.01 APPROACH GUIDE RAIL

- A. Remove any existing railing and install new guide rail in accordance with PennDOT Publication 408 Specifications, Section 620.
- B. Install guide rail at the post spacings, lengths and with end treatments complying with Standard Drawings RC52M through RC54M of the PennDOT Publication 72M. Restore ground surface to pre-existing conditions.

### 3.02 STRUCTURE MOUNTED RAILING

- A. Install new guide rail on the new or existing structure as shown on the approved construction drawings.

### 3.03 CLEAN UP

- A. Clean up debris and unused material and remove from the site.

END OF SECTION



SECTION 02890

TRAFFIC SIGNAL EQUIPMENT

PART 1 GENERAL

1.01 DESCRIPTION

- A. The work of this section includes furnishing and installing operational traffic signals, including, but not limited to:
  - 1. Controller assemblies
  - 2. Traffic signal supports
  - 3. Electrical distribution
  - 4. Traffic signal heads
  - 5. Detectors
  - 6. Communications
  - 7. Systems
- B. In an effort to standardize equipment and provide for future Closed Loop System compatibility, all Traffic Signal Controllers shall be the ASC/2S-2100 Series, NEMA TS-2 Type II, manufactured by Econolite Control Products – no exceptions.
- C. Words and phrases peculiar to traffic signals, not defined in these specifications, or in the PennDOT regulations and specifications, are to be as defined in NEMA Standards Publication No. TS1.
- D. Related work specified elsewhere:
  - 1. Trenching, backfilling and compacting: Section 02221
  - 2. Paving and restoration: Section 02575
  - 3. Plain and reinforced cement concrete: Section 03000
  - 4. Cement concrete for utility construction: Section 03050
- E. Comply with the requirements of associations, societies, codes, and regulations, as applicable.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation (PennDOT):

Publication 408, Specifications. All work and materials shall conform to this publication.  
Publication 72M, Standard for Roadway Construction  
Publication 148, Traffic Standards, Signals, TC-7800  
Publication 111M, Traffic Signing Standards, TC-7700  
Publication 68, Regulations, Traffic Signs, Signals and Markings  
Publication 35, Approved Construction Materials (Bulletin 15)  
Publication 236M, Handbook of Approved Signs

2. National Electrical Code
  3. Institute of Transportation Engineers (ITE), Vehicle Traffic Control Signal Heads-LED Signal Modules (Interim)
- B. Testing:
1. After the traffic signal installation becomes operational there shall be a continuous, 24-hour operational test for not less than 30 consecutive calendar days. The initial turn-on shall be performed in the presence of PennDOT's District Traffic Engineer, or his representative, and a representative of the Municipality between the hours of 9 a.m. and 2 p.m., Tuesday through Thursday, except on holidays. Any and all failure during the test period shall be corrected by repairing or replacing malfunctioning parts or equipment of faulty workmanship, regardless of the cause, within 6 hours after having been notified by the Engineer or the Municipality. After correcting any failures caused by defective equipment, material, or faulty workmanship, the 30-day test will start over again.
- C. Guarantees:
1. Guarantee the satisfactory in-service operation of mechanical and electrical equipment, related components, and the controller assembly for a period of 365 days from the date of completion of the 30-day field test as outlined in Section 1.02.B. During this period:
    - a. Maintain equipment in the controller cabinet. Use additional locks, as necessary, to prevent entry by others.
    - b. Repair faulty workmanship, repair or replace defective materials or equipment and correct malfunctions in the controller cabinet within 6 hours after commencing repairs.
    - c. Commence repairs no later than four (4) hours following notification of failures or malfunctions.
    - d. Guarantee repairs or replacements for the balance of the 365-day guarantee period.
    - e. Provide the Municipality with the name and telephone number of the person(s) to be notified in the event of failures or malfunctions during the 30-day test period and the 365-day guarantee period.
- D. System installer shall be pre-qualified as a traffic signal installer by the Pennsylvania Department of Transportation and furnish owner with copy of said certificate.
- E. Pole manufacturer shall certify that the mast arms are designed to withstand loads imposed by signs attached to them and they meet or exceed the requirements of the 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals", and as modified by the Pennsylvania Department of Transportation.

## 1.03 SUBMITTALS

### A. Material Acceptance:

1. Verify that Certificates of Approval, permanent or provisional, have been issued by PennDOT as provided in 67 PA Code, Chapter 211. Within three (3) weeks after the Notice to Proceed, submit to the Municipality, for review and acceptance, a tabulation of all traffic signal materials to be used for the project that have a Certificate of Approval (permanent or provisions). Include the type of material, manufacturer's name, model number, and the Department's Certificate of Approval number for each item to be supplied. Provide catalog cuts only for further clarification of the material.
2. As applicable, and at a minimum, tabulate the following:
  - a. Controller Units, Timer, as manufactured at Econolite Control Products, and Cabinet(s)
  - b. Conflict Monitor
  - c. Flasher Units
  - d. Load Switch Units
  - e. Coordination Units
  - f. Signal Heads
  - g. Loop Detector Amplifiers, with time delays
  - h. Loop Detector Sealant
  - i. Detector Pushbuttons
  - j. Auxiliary Equipment
  - k. Signs including Electrically Operated
  - l. Junction Boxes
  - m. Conduit
  - n. Wiring
  - o. Preemption Equipment
  - p. Line Painting and Pavement Marking Materials
  - q. Pole Designs
  - r. Signal Support Coating System with Color Chip

### B. Wiring Diagrams and Timing Plans:

1. Provide three (3) copies of the cabinet wiring diagram and manufacturer's timing plan(s) for each controller assembly.

### C. Certification:

1. In accordance with Section 106.03(b)3 of PennDOT's Publication 408 Specifications, certify that all signal supports satisfy the Department's criteria and are adequate to support the loads specified. Certify the structural adequacy of all sign and signal brackets.
2. PennDOT Prequalification Signal Work Classification form for signal control work.
3. Engineering calculations, prepared by a Professional Engineer licensed in Pennsylvania for signal pole design conditions.

D. Warranties, Instruction Manuals and Guarantees

1. Furnish all warranties, instruction manuals and guarantees, as specified in Section 1104.01 of PennDOT's Publication 408 Specifications.

E. Shop Testing

1. Submit results from shop tests to the Engineer, as specified in Section 1104.01 of PennDOT's Publication 408 Specifications.
2. Provide conflict monitor bench test certification.

F. Field Testing

1. After installation of the electrical distribution system, test traffic signal wiring circuits, in the presence of the Municipal Engineer, before connecting to operating equipment. Satisfactorily demonstrate that:
  - a. Circuits are continuous and free from short circuits;
  - b. Circuits are free from unspecified grounds;
  - c. The resistance to earth-ground, for each ground rod that will be bonded to another rod, is not more than 25 ohms. If not met with one rod, supply and install an additional ground rod. Install the additional rod at least one ground rod length from the first rod. Use an ohmmeter designed for testing earth-ground resistance.

PART 2 PRODUCTS

2.01 MATERIALS

A. Controllers:

1. Provide pedestrian isolation circuitry on all controller inputs.
2. Provide surge protection on all controller inputs.

B. Controller Cabinets:

1. Size the cabinet for future Fiber Optic Telemetry equipment.

C. Master Controller, if required:

1. Master Controller shall be ASC-24M as manufactured by Econolite Control Products, if required.

D. Interconnect, if required:

1. Interconnection of signals shall be via Fiber Optic cable, 6-fiber 62.5/125-micron multimode, terminated in patch panels with ST connectors.

E. Pre-emption, if required:

1. All intersections shall be equipped with Optical Preemption for all approaches to the intersection.
2. Detectors shall be positioned to achieve the proper distance for activation and control of the intersection.
3. Optical preemption equipment shall be Strobecom II as manufactured by Tomar Electronics, Inc., or equivalent.

F. Traffic Signal Supports shall be Mastarms:

1. Must be capable of having an extension to the shaft, and a luminaire-mounting arm added at a future date.
2. The VOLMONT SMA42X Series of Traffic Signal Mastarms or equipment, meets this specification.
3. Twin mast arms will not be acceptable unless written authorization from the Municipality is obtained.
4. Anchor bolts shall be the type and size as per the manufacturer's certified design.
5. Maximum pole shaft length shall be 20 feet, unless otherwise noted. Mounting height of luminaire shall be 30 feet from roadway surface. Mast arms shall be supplied in five (5') foot increments.

G. Concrete Foundations:

1. Cement Concrete: For traffic signal and sign support foundations and equipment cabinet base, use Class A conforming to PennDOT Section 704.
2. Foundation reinforcing shall meet requirements of PennDOT Publication 408 Specifications, Section 709, and PennDOT TC-7802.

H. Signals:

1. All vehicular signal heads shall contain Dialight Red, Amber and Green DuraLED modules Model 433, or equivalent.
2. All arrow indications shall be Dialight Model 430, or equivalent.
3. All pedestrian signals shall be supplied with Dialight LED's, or equivalent.
4. PennDOT approval, if not already received, for the use of these LED signals must be procured as part of this project.
5. The housing of each section shall be a yellow, one-piece molded ultraviolet and heat stabilized polycarbonate unit.

I. Traffic Control Signs:

1. Contractor shall provide and install traffic control signs as shown on the plans and in accordance with PennDOT Publication 408 Specifications, PennDOT Section 1103 and Standard Drawings, TC-7700 and TC-9800.
2. Sign blank material shall be aluminum with Type III, IV or VII retroreflective sheeting material. All signs shall be one-sided. Post mounted street signs shall be attached to the post using drive rivets and shall have cherry mate rivets to secure ends of street name signs together.

J. Conduits:

1. Conduit runs shall be sized for future use.
2. All main street crossings shall, at a minimum, have 2-3" conduits.
3. Junction boxes shall be located at the intersection of conduit runs, and at the end of a conduit run.
4. Each controller foundation or pole foundation, if the controller is pole mounted, shall have the equivalent of 2-3" and 1-2" conduits entering it from an adjacent junction box.
5. All loop detectors must be terminated in a junction box, and there shall be at least one junction box on each corner.

K. Street Name Signs:

1. All intersections shall be signed with Street Name signs, attached to the mast arms, of the size and designation as required by PennDOT.

L. Pavement Markings:

1. Long lane line pavement markings are to be paint as specified in Section 962 of PennDOT Publication 408 Specifications.
2. Gore transverse stripping is to be epoxy, cold inlaid plastic, hot surface applied thermoplastic, or methyl methacrylate.
3. All other pavement markings are to be epoxy, cold inlaid plastic, hot surface applied thermoplastic, or methyl methacrylate.
4. Pavement marking eradication shall be performed with a shot-blast machine using only water or sand.

## PART 3 EXECUTION

### 1.01 CONSTRUCTION

- A. Perform work in accordance with applicable codes, regulations and standards.
- B. Existing signals are to remain in operation, as is, until the new signals are put into operation.
- C. Contractor shall notify the Municipal Engineer for a form inspection prior to placing concrete for traffic signal supports and/or controller foundation.
- D. Contractor shall not install poles on concrete bases until a minimum of 72 hours after placing concrete and/or the 3,300 psi compressive strength is achieved.
- E. All loop detectors shall be installed and tested prior to placement of the wearing course where applicable.
- F. Application of traffic lines, stop bars, and legends as specified in Signal permit drawings.
- G. All signals shall be completely and securely covered with burlap-type material, not plastic bags, until signal is approved by PennDOT to flash.
- H. Remove all existing traffic signal supports and signal equipment, unless otherwise indicated. This equipment shall remain the property of the Municipality, unless otherwise informed, and shall be transported to a place specified by the Municipality.
- I. Maintain existing controller assemblies, as a unit.
- J. Provide a listing of equipment for the jurisdictional owner that indicates when and where items can be obtained.
- K. Assume responsibility for damage to claimed items during removal and storage.
- L. Abandon underground conduit conductors, and detectors not interfering with new construction.
- M. Remove foundations and junction boxes to be abandoned in "off roadway" areas to 0.3m (1 foot) below final grade and satisfactorily dispose of such items.
- N. Satisfactorily repair damage to galvanized finishes.
- O. All existing traffic control signs to be relocated shall have new posts and hardware installed as per Section 2.01.I.
- P. Any sign removed and not replaced shall be transported to a place specified by the Municipality.

### 1.02 FIELD QUALITY CONTROL AND START-UP

- A. Contractor shall provide intersection map for Interconnect Software System, if required. Update Interconnect Software System Map and provide Interconnect Software System intersection database.

- B. Three (3) sets of record plans shall be provided to the Municipality upon final inspection and acceptance of the signal.
- C. Three (3) copies of the cabinet wiring diagram shall be provided to the Municipality as per PennDOT Section 954.3.(j).
- D. Contractor shall perform the following tests and inspections in the presence of the Municipality and the Municipal Engineer:
  - 1. Signals – in accordance with PennDOT Publication 408 Specifications.
  - 2. Ground Rods – in accordance with PennDOT Section 954.3(i).
  - 3. Switches and Push Buttons located within the switch compartment.
  - 4. Fiber Optic Cable – determine optical power loss in the cable after installation.
  - 5. Preemption Equipment – using a motor vehicle with hand held or vehicle mounted emitter, when applicable.

END OF SECTION



SECTION 03000

PLAIN AND REINFORCED CEMENT CONCRETE

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Construction of cast-in-place plain and reinforced cement concrete structures.
2. Concrete curbs and sidewalks.
3. Trench restoration of concrete roadways and driveways.
4. Testing of cast-in-place concrete for curbs, sidewalks, and utility related structures.
5. Work within public right-of-way.

B. Related Work Specified Elsewhere:

1. Cement concrete curb and sidewalk: Section 02525
2. Cement concrete for utility construction: Section 03050

C. Definitions:

1. Exposed construction - Permanently exposed to view.
2. Concrete - Normal weight concrete for which density is not a controlling attribute, made with aggregates of the types covered by ASTM C33, and having unit weights in the range of 135 to 160 lb. per cubic foot.
3.  $f_c$  - The design compressive strength of the hardened concrete at an age of 28-days.

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. American Concrete Institute (ACI)

- ACI 117 Standard Specifications for Tolerance for Concrete Construction and Materials.  
ACI 301 Specifications for Structural Concrete.  
ACI 315 Details and Detailing of Concrete Reinforcement.  
ACI 318 Building Code Requirements for Reinforced Concrete.

2. American Society for Testing and Materials (ASTM)

- A185 Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement  
A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement  
C31 Standard Method of Making and Curing Concrete Test Specimens in the Field

- C33 Standard Specification for Concrete Aggregates
- C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- C42 Standard Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- C94 Standard Specification for Ready-Mixed Concrete
- C138 Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
- C143 Standard Test Method for Slump of Portland Cement Concrete
- C150 Standard Specification for Portland Cement
- C171 Standard Specification for Sheet Materials for Curing Concrete
- C172 Standard Method of Sampling Freshly Mixed Concrete
- C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- C192 Standard Method of Making and Curing Concrete Test Specimens in the Laboratory
- C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- C260 Standard Specification for Air-Entraining Admixtures for Concrete
- C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- C494 Standard Specification for Chemical Admixtures for Concrete
- D698 Tests For Moisture-Density Relations of Soils
- D994 Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
- D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- D1752 Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
- E329 Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction

- 3. National Ready-Mixed Concrete Association, 900 Spring Street, Silver Spring, MD 20910: Check list for certification of ready-mixed concrete production facilities.

B. Testing Agencies:

- 1. Testing services shall be performed by an independent testing agency acceptable to the Municipality at the Contractor's expense.
- 2. All testing agencies shall meet the requirements of ASTM E329.

1.03 SUBMITTALS

- A. Submit manufacturer's or supplier's certification for the following materials verifying compliance with these Specifications:

- 1. Portland cement
- 2. Coarse and fine aggregates

3. Any specified concrete admixtures
  4. Reinforcing steel
  5. Joint forming and filling materials
  6. Form coating materials
  7. Concrete curing compounds
- B. Submit concrete mix designs, including strength test records, for review and approval.
- C. Submit certified results of compressive strength cylinder tests.
- D. Submit copies of concrete batch slips.
- E. Submit to the Municipality, for review and approval, detailed Shop Drawings for the fabrication and placement of all reinforcement steel. Marked-up copies of drawing details will not be accepted for review. Approval shall be obtained before fabrication commences.

## PART 2 PRODUCTS

### 2.01 CONCRETE

- A. Cement - Unless otherwise specified, portland cement shall be Type I cement conforming to ASTM C150.
- B. Aggregates - Aggregates for normal weight concrete shall meet the requirements of ASTM C33.
- C. Water - Mixing water for concrete shall be clean, potable water meeting the requirements of ASTM C94.
- D. Admixtures - Concrete admixtures, when required and/or approved for use by the Municipality Engineer, shall conform to the following Specifications:
1. Air-entraining admixtures - ASTM C260.
  2. Water-reducing, retarding and accelerating admixtures - ASTM C494.

### 2.02 REINFORCEMENT

- A. Reinforcing Bars - All reinforcing bars shall be deformed, except spirals, which may be plain bars. Reinforcing bars shall be Grade 60, billet-steel conforming to the requirements of ASTM A615, including supplementary requirement on the Contract Drawings.
- B. Welded Wire Fabric - Welded wire fabric shall be fabricated from smooth or deformed wire of the size and spacing required on the drawings and shall conform to the requirements of ASTM A185, except welded intersections shall be spaced not farther apart than 12 inches in the direction of the principal reinforcement.

### 2.03 JOINT MATERIALS

- A. Joint Filler - Premolded expansion joint filler shall be of the type required by the drawings and shall conform to ASTM D994, ASTM D1751, or ASTM D1752.

- B. Waterstop - The material, design and location of waterstops in joints shall be as indicated on the drawings.

2.04 FORM COATING MATERIALS

- A. Form release agents shall be non-staining, liquid chemical coatings free of kerosene, oil and wax which effectively prevent absorption of moisture into the forms and bonding of the concrete to the forms.

2.05 CONCRETE CURING COMPOUNDS

- A. Curing compounds shall be clear, non-staining liquid coatings containing no oil or wax and conforming to ASTM C309, such as Safe-Cure, Sealtight 1100, Klear Seal R-75 or Envirocure Clear 500, or similar product.

PART 3 EXECUTION

3.01 PROPORTIONING

- A. General - Concrete for all parts of the work shall be of the specified quality and capable of being placed without excessive segregation. When hardened, concrete shall develop all characteristics required by these Specifications.
- B. Strength - Unless otherwise specified, the minimum 28-day compressive strength of the concrete,  $f_c$ , shall be 3000 psi.
- C. Durability - All concrete which will be subjected to potentially destructive exposure, including freezing and thawing, weather, and/or deicer chemicals, shall be air-entrained and shall conform to the following air content limits:

Nominal Maximum Size of Coarse Aggregate, Inches	Total Air Content, Percent by Volume
3/8	6-10
1/2	5-9
3/4	4-8
1	3.5-6.5

Measurement of air content shall meet the requirements of ASTM C231, ASTM C173 or ASTM C138.

- D. Cement Content - The water-cement ratio shall not exceed 0.50 by weight and the cement factor shall not be less than 6.0 bags of cement (94 pounds each) per cubic yard of concrete.
- E. Slump - The concrete shall be proportioned and produced to have a slump of not less than 1 inch and not more than 4 inches if consolidation is to be by vibration. Maximum slump may be 5 inches if consolidation is to be by methods other than vibration. The slump shall be determined by ASTM C143.

- F. Maximum size of coarse aggregate - The nominal maximum size of coarse aggregate shall not be more than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of the minimum clear spacing between reinforcing bars, and shall in no case exceed 1 inch.
- G. Admixtures - All concrete admixtures, when required or approved for use, shall be used in strict conformance with the manufacturer's instructions.
- H. Selection of Proportions - Proposed concrete proportions shall be subject to acceptance by the Municipality based on demonstrated ability to produce concrete meeting all requirements of this Specification. Proportions of materials for concrete shall be established to provide adequate workability and proper consistency to permit concrete to be worked readily into the forms and around reinforcement without excessive segregation or bleeding under conditions of placement to be employed. Concrete proportions shall be established on the basis of previous field experience or laboratory trial batches as specified in ACI 301.

### 3.02 FORMWORK

- A. Forms shall be used, wherever necessary, to confine the concrete and shape it to the required dimensions. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall have sufficient rigidity to maintain specified tolerances.
- B. Earth cuts shall not be used as forms for vertical surfaces unless required or permitted.
- C. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the contractor. The formwork shall be designed for loads and lateral pressure and for design considerations, wind loads, allowable stresses, and other applicable requirements of the controlling local building code.
- D. Forms shall be sufficiently tight to prevent loss of mortar from the concrete. Chamfer strips shall be placed in the corners of forms to produce beveled edges on permanently exposed surfaces. Interior corners on such surfaces and the edges of formed joints will not require beveling unless required by the drawings.
- E. Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be of a commercially manufactured type. Non-fabricated wire shall not be used. Form ties shall be constructed so that the ends or end fasteners can be removed without causing appreciable spalling at the surface of the concrete. After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 2 diameters or twice the minimum dimension of the tie from the formed surface of concrete to be permanently exposed to view except that in no case shall this distance be less than 3/4 in. When the formed surface of the concrete is not to be permanently exposed to view, form ties may be cut off flush with the formed surfaces.
- H. Tolerances:
  - 1. Unless otherwise specified, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits listed in ACI 301.

2. The Contractor shall establish and maintain in an undisturbed condition and until final completion and acceptance of the project sufficient control points and bench marks to be used for reference purposes to check tolerances.

I. Preparation of Form Surfaces:

1. All surfaces of forms and embedded materials shall be cleaned of all accumulated mortar or grout from previous concreting and of all other foreign material before concrete is placed.
2. Before placing the reinforcing steel or the concrete, the surfaces of the forms shall be covered with an acceptable coating material that will effectively prevent absorption of moisture, prevent bond with the concrete, and not stain the concrete surfaces.

J. Removal of Forms:

1. When repair of surface defects or finishing is required at an early age, forms shall be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.
2. Top forms on sloping surfaces of concrete shall be removed as soon as the concrete has attained sufficient stiffness to prevent sagging. Any needed repairs or treatment required on such sloping surfaces shall be performed at once and be followed by the specified curing.
3. Wood forms for wall openings shall be loosened as soon as this can be accomplished without damage to the concrete.
4. Formwork for columns, walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.
5. Forms and shoring in the formwork used to support the weight of concrete in beams, slabs and other structural members shall remain in place until the concrete has reached the minimum 28-day compressive strength.

3.03 REINFORCEMENT

- A. Welding - Welding of crossing bars (tack welding) for assembly of reinforcement is prohibited.
- B. Fabricate and place all reinforcing in accordance with ACI 117.
- C. Templates shall be furnished for placement of all column dowels and anchor bolts.
- D. Bending or straightening of bars partially embedded in concrete shall not be permitted.

3.04 JOINTS AND EMBEDDED ITEMS

- A. Construction, control, and expansion joints shall be constructed in accordance with the drawings.

- B. All contractors whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.
- C. Placing Embedded Items - Expansion joint material, waterstops, and other embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

### 3.05 PRODUCTION OF CONCRETE

- A. Production Method - All concrete shall be ready-mixed concrete batched, mixed and transported in accordance with ASTM C94. Plant equipment and facilities shall conform to "Certification of Ready-Mixed Concrete Production Facilities (Checklist with Instructions)" of the National Ready-Mixed Concrete Association.
- B. When concrete arrives at the project with slump below that suitable for placing, as indicated by the designer's Specifications, water may be added only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. The water shall be incorporated by additional mixing equal to at least half of the total mixing required. Discharge of the concrete shall be completed within 1-1/2 hours, or before the truck drum has revolved 300 revolutions, whichever comes first, after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates. Truck batch slips must include time of batching, total drum revolutions upon arrival at site, and quantity of water (in gallons) per cubic yard available to be added to attain the maximum design water-cement ratio.

### 3.06 PLACING

#### A. Preparation Before Placing:

1. Hardened concrete and foreign materials shall be removed from the inner surfaces of the conveying equipment.
2. Formwork shall be completed; snow, ice and water shall be removed; reinforcement shall be secured in place; expansion joint material, anchors, and other embedded items shall be positioned; and the entire preparation shall be accepted.
3. Concrete shall not be placed on frozen ground.

#### B. Conveying:

1. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.
2. Conveying equipment shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operations shall conform to the following additional requirements:

- a. Truck mixers, agitators and nonagitating units and their manner of operation shall conform to the applicable requirements of ASTM C94.
- b. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. An acceptable arrangement shall be used at the discharge end to prevent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.
- c. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 ft. long and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.
- d. Pumping or pneumatic conveying equipment shall be capable of pumping the specified mix with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete. The loss of slump in pumping or pneumatic conveying equipment shall not exceed 2 in. Concrete shall not be conveyed through pipe made of aluminum or aluminum alloy.

C. Depositing:

1. General - Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, construction joints shall be located as indicated on the drawings. Placing shall be carried on at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Temporary spreaders in forms shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. They may remain embedded in the concrete only if made of metal or concrete and if prior acceptance has been obtained.
2. Segregation - Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to any procedure which will cause segregation.
3. Consolidation - All concrete shall be consolidated by vibration, spading, rodding or forking so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honey-combing, pitting, or planes of weakness. Internal vibrators used shall be the largest size and the most powerful that can be properly used in the work. They shall be operated by competent workmen. Use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at points approximately 18 in. apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not sufficient to cause segregation, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operations. Where the concrete is to have an as-cast finish, a full surface of mortar shall be brought against the form by the vibration process, supplemented if necessary by spading to work the coarse aggregate back from the formed surface.



D. Protection:

1. Unless adequate protection is provided, concrete shall not be placed during rain, sleet, or snow.
2. Rainwater shall not be allowed to increase the mixing water nor to damage the surface finish.
3. The temperature of the concrete as placed shall not be so high as to cause difficulty from loss of slump, flash set, or cold joints and should not exceed 90°F. When the temperature of the steel is greater than 120°F, steel forms and reinforcement shall be sprayed with water just prior to placing the concrete.

3.07 REPAIR OF SURFACE DEFECTS

A. General - Surface defects, including tie holes, shall be repaired immediately after form removal.

B. Repair of Defective Areas:

1. All honeycombed and other defective concrete shall be removed down to sound concrete. If chipping is necessary the edges shall be perpendicular to the surface or slightly undercut. No feathered edges will be permitted. The area to be patched and an area at least 6 in. wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bonding grout shall be prepared using a mix of approximately 1 part cement to 1 part fine sand passing a No. 30 mesh sieve, mixed to the consistency of thick cream, and then well brushed into the surface.
2. The patching mixture shall be made of the same materials and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2-1/2 parts sand by damp loose volume. White portland cement shall be substituted for a part of the gray portland cement on exposed concrete in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling and placing. The patching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.
3. After surface water has evaporated from the area to be patched, the bond coat shall be well brushed into the surface. When the bond coat begins to lose the water sheen, the pre-mixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, it shall be left undisturbed for at least 1 hr. before being finally finished. The patched area shall be kept damp for 7 days. Metal tools shall not be used in finishing a patch in a formed wall which will be exposed.

C. Tie Holes - After being cleaned and thoroughly dampened, the tie holes shall be filled solid with patching mortar.

- D. Proprietary Materials - If approved by the Municipality, proprietary compounds for adhesion or as patching ingredients may be used in lieu of or in addition to the foregoing patching procedures. Such compounds shall be used in accordance with the manufacturer's recommendations.

### 3.08 FINISHING OF FORMED SURFACES

#### A. General:

1. After removal of forms the surfaces of concrete shall be given one or more of the finishes specified below in locations designated by the drawings.
2. When finishing is required to match a small sample furnished to the Contractor, the sample finish shall be reproduced on an area at least 100 sq. ft. in an inconspicuous location designated by the Municipality before proceeding with the finish in the specified location.

#### B. As-Cast Finishes:

1. Rough form finish - No selected form facing materials shall be specified for rough form finish surfaces. Tie holes and defects shall be patched. Fins exceeding 1/4 in. in height shall be chipped off or rubbed off. Otherwise, surfaces shall be left with the texture imparted by the forms.
2. Smooth form finish - The form facing material shall produce a smooth, hard, uniform texture on the concrete. It may be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper or other acceptable material capable of producing the desired finish. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the practical minimum. It shall be supported by studs or other backing capable of preventing excessive deflection. Material with raised grain, torn surfaces, worn edges, dents, patches, or other defects which will impair the texture of the concrete surface shall not be used. Tie holes and defects shall be patched. All fins shall be completely removed.

#### C. Rubbed Finishes - The following finishes shall be produced on concrete with a smooth form finish. Where a smooth rubbed finish is to be applied, the forms shall have been removed and necessary patching completed as soon after placement as possible without jeopardizing the structure.

1. Smooth rubbed finish - Smooth rubbed finish shall be produced on newly hardened concrete no later than the day following form removal. Surfaces shall be wetted and rubbed with carborundum brick or other abrasive until uniform color and texture are produced. No cement grout shall be used other than the cement paste drawn from the concrete itself by the rubbing process.
2. Grout cleaned finish - No cleaning operations shall be under taken until all contiguous surfaces to be cleaned are completed and accessible. Cleaning as the work progresses shall not be permitted. Mix one part portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint. White portland cement shall be substituted for a part of the gray portland cement in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. Wet the surface of the

concrete sufficiently to prevent absorption of water from the grout and apply the grout uniformly with brushes or a spray gun. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, burlap, or other means. After the surface whitens from drying (about 30 minutes at normal temperatures), rub vigorously with clean burlap. The finish shall be kept damp for at least 36 hours after final rubbing.

3. Cork floated finish - Remove forms at an early stage, within 2 to 3 days of placement where possible. Remove ties. Remove all burrs and fins. Mix one part portland cement and one part fine sand with sufficient water to produce a stiff mortar. Dampen wall surface. Apply mortar with firm rubber float or with trowel, filling all surface voids. Compress mortar into voids using a slow-speed grinder or stone. If the mortar surface dries too rapidly to permit proper compaction and finishing, apply a small amount of water with a fog sprayer. Produce the final texture with a cork float using a swirling motion.
- D. Unspecified Finish - If the finish is not designated on the drawings, the following finishes shall be used as applicable:
1. Rough form finish - For all concrete surfaces not permanently exposed.
  2. Smooth rubbed finish - For all concrete surfaces permanently exposed.
- E. Related Unformed Surfaces - Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of the formed surfaces. Final treatment on formed surfaces shall continue uniformly across the unformed surfaces.

### 3.09 SLABS

- A. General - Concrete for slabs shall be as specified in Article 3.01.
- B. Preparation of subgrade for slabs on ground within public rights-of-way:
1. The subgrade shall be well drained and of adequate and uniform loadbearing capacity. The minimum in-place density of the subgrade soils shall be not less than 95% of its maximum dry weight density at its optimum moisture content, plus or minus 2%, as determined by ASTM D698.
  2. The subgrade shall be free of frost before concrete placing begins. If the temperature inside a building where concrete is to be placed is below freezing it shall be raised and maintained above 50°F long enough to remove all frost from the subgrade.
  3. The subgrade shall be moist at the time of concreting. If necessary, it shall be dampened with water in advance of concreting, but there shall not be standing water on the subgrade nor any muddy or soft spots when the concrete is placed.

C. Edge Forms and Screeds:

1. Edge forms and intermediate screed strips shall be set accurately to produce the designated elevations and contours of the finished surface, and shall be sufficiently strong to support vibrating screeds or roller pipe screeds if the nature of the finish specified requires the use of such equipment. The concrete surface shall be aligned to the contours of screed strips by the use of strike-off templates or acceptable compacting type screeds.
2. When formwork is cambered, screeds shall be set to a like camber to maintain the proper concrete thicknesses.

D. Placement:

1. Mixing and placing shall be carefully coordinated with finishing. Concrete shall not be placed on the subgrade or forms more rapidly than it can be spread, straightedged, and darried or bull floated. These operations must be performed before bleeding water has an opportunity to collect on the surface.
2. To obtain good surfaces and avoid cold joints, the size of finishing crews shall be planned with due regard for the effects of concrete temperature and atmospheric conditions on the rate of hardening of the concrete.

E. Jointing - Joints in slabs on grade shall be located and detailed as indicated on the drawings. If saw-cut joints are required, cutting shall be timed properly with the set of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking.

F. Consolidation - Concrete in slabs shall be thoroughly consolidated. Internal vibration shall be used in beams and girders of framed slabs and along the bulkheads of slabs on grade. Consolidation of slabs shall be obtained with vibrating screeds, roller pipe screeds, internal vibrators, or other acceptable means.

G. Finishes:

1. Scratched finish - After the concrete has been placed, consolidated, struck off and leveled, the surface shall be roughened with stiff brushes or rakes before final set.
2. Floated finish - After the concrete has been placed, consolidated, struck off, and leveled, the concrete shall not be worked further until ready for floating. Floating with a hand float or with a bladed power trowel equipped with float shoes, or with a powered disc float shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation. During or after the first floating, planeness of surface shall be checked with a 10-ft. straightedge applied at not less than two different angles. All high spots shall be cut down and all low spots filled. The slab shall then be refloated immediately to a uniform sandy texture.

3. Troweled finish - The surface shall first be float-finished. It shall next be power troweled, and finally hand troweled. The first troweling after power floating shall produce a smooth surface which is relatively free of defects but which may still show some trowel marks. Additional trowelings shall be done by hand after the surface has hardened sufficiently. The final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be thoroughly consolidated by the hand troweling operations. The finished surface shall be free of trowel marks, uniform in texture and appearance. On surfaces intended to support floor coverings, any defects of sufficient magnitude to show through the floor covering shall be removed by grinding.

4. Broom or belt finish - Immediately after the concrete has received a float finish, it shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface.

H. Unspecified Finish - When type of finish is not specified on the drawings, the following finishes shall be used as applicable:

1. Scratched finish - For surfaces intended to receive bonded applied cementitious applications.

2. Floated finish - For surfaces intended to receive roofing, waterproofing membranes, or sand bed terrazzo.

3. Trowel finish - For floors intended as walking surfaces or for reception of floor coverings.

4. Broom or belt finish - For sidewalks and garage floors and ramps.

I. Finishing Tolerances - as specified on the Contract Drawings.

### 3.10 CURING AND PROTECTION

A. General - Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures, and mechanical injury, and shall be maintained with minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete.

B. Preservation of Moisture:

1. For concrete surfaces not in contact with forms, one of the following procedures shall be applied immediately after completion of placement and finishing:

a. Application of acceptable moisture-retaining covering as approved by the Engineer.

b. Application of a curing compound conforming to ASTM C309. The compound shall be applied in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing has disappeared from the concrete surface. It shall not be used on any surface against which additional concrete or other material is to be bonded unless it is proven that the curing compound will not prevent bond, or unless positive measures are taken to remove it completely from areas to receive bonded applications.

2. Moisture loss from surfaces placed against wooden forms or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed. After form removal the concrete shall be cured.
3. Curing shall be continued for at least 7 days. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached 70 percent of the strength, fc. Moisture retention measures may also be terminated when the temperature of the concrete is maintained at least at 50oF for the same length of time that laboratory-cured cylinders, representative of the concrete in-place, require to achieve 85 percent of fc.

C. Temperature, Wind, and Humidity:

1. Cold weather - When the mean daily outdoor temperature is less than 40°F, the temperature of the concrete shall be maintained between 50° and 70°F for the required curing period. When necessary, arrangements for heating, covering, insulating, or housing the concrete work shall be made in advance of placement and shall be adequate to maintain the required temperature without injury due to concentration of heat. Combustion heaters shall not be used during the first 24 hr. unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.
  2. Hot weather - When necessary, provision for windbreaks, shading, fog spraying, sprinkling, ponding, or wet covering with a light colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.
  3. Rate of temperature change - Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 5°F in any 1 hr. or 50°F in any 24-hr. period.
- D. Protection from mechanical injury - During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials or methods, by application of curing procedures, and by rain or running water.

3.11 TESTING

- A. General - Concrete materials and operations will be tested and inspected as the work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered nor shall it obligate the Municipality for final acceptance.
- B. Testing Services - The following testing services shall be performed by the designated testing agency:
  1. Conduct strength tests of the concrete during construction in accordance with the following procedures:

- a. Secure composite samples in accordance with ASTM C172. Each sample shall be obtained from a different batch of concrete on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.
  - b. Mold and cure four (4) specimens from each sample in accordance with ASTM C31. Any deviations from the requirements of this Standard shall be recorded in the test report.
  - c. Test specimens in accordance with ASTM C39. Two (2) specimens shall be tested at 28 days for acceptance and two (2) shall be tested at 7 days for information. The acceptance test results shall be the average of the strengths of the specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result. Should both specimens in a test show any of the above defects, the entire test shall be discarded.
  - d. Make at least one strength test for each 50 cu. yd., or fraction thereof, of each mixture design of concrete placed in any 1 day. When the total quantity of concrete with a given mixture design is less than 20 cu. yd., the strength tests may be waived by the Municipal Engineer if, in his judgment, adequate evidence of satisfactory strength is provided, such as strength test results for the same kind of concrete supplied on the same day and under comparable conditions to other work or other projects.
2. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, using ASTM C143.
  3. Determine air content of the concrete sample for each strength test in accordance with either ASTM C231, ASTM C173, or ASTM C138.
  4. Determine temperature of the concrete sample for each strength test.
- C. Additional Services When Required - The following services shall be performed by the testing agency when required by the Municipality at the Contractor's expense:
1. Inspect concrete batching, mixing and delivery operations to the extent deemed necessary by the Municipal Engineer.
  2. Sample concrete at point of placement and perform required tests.
  3. Review the manufacturer's report for each shipment of cement and reinforcing steel and conduct laboratory tests or spot checks of the materials as received for compliance with specifications.
  4. Mold four (4) additional specimens from each sample in accordance with ASTM C31 and field cure in or on the structure providing the same method of cure for the specimens as that which the structure receives.
- D. Other Services As Needed - The following services shall be performed by the testing agency at the Contractor's expense:

1. Additional testing of materials or concrete occasioned by their failure by test or inspection to meet specification requirements.

E. Duties and Authorities of Designated Testing Agency:

1. Representatives of the agency shall inspect, sample and test the materials and the production of concrete as required by the Municipality. When it appears that any material furnished or work performed by the Contractor fails to fulfill specification requirements, the testing agency shall report such deficiency to the Municipality and the Contractor.
2. The agency shall report all test and inspection results to the Municipality and Contractor immediately after they are performed. All test reports shall include the exact location in the work at which the batch represented by a test was deposited. Reports of strength tests shall include detailed information on storage and curing of specimens prior to testing.
3. The testing agency and its representatives are not authorized to revoke, alter, relax, enlarge or release any requirement of the Documents, nor to approve or accept any portion of the work.

F. Responsibilities and Duties of Contractor:

1. The Contractor shall provide the necessary testing services for the following:
  - a. Qualification of proposed materials and the establishment of mixture designs.
  - b. Other testing services needed or required by the Contractor.
2. The use of testing services shall in no way relieve the Contractor of the responsibility to furnish materials and construction in full compliance with these specifications.
3. The Contractor shall submit to the Municipal Engineer the concrete materials and the concrete mix designs proposed for use with a written request for acceptance. This submittal shall include the results of all testing performed to qualify the materials and to establish the mix designs. No concrete shall be placed in the work until the Contractor has received such acceptance in writing.
4. To facilitate testing and inspection, the Contractor shall:
  - a. Furnish any necessary labor to assist the testing agency in obtaining and handling samples at the project or other sources of materials.
  - b. Advise the testing agency sufficiently in advance of operations to allow for completion of quality tests and for the assignment of personnel.
  - c. Provide and maintain for the sole use of the testing agency adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the first 24 hrs. as required by ASTM C31.



### 3.12 EVALUATION AND ACCEPTANCE OF CONCRETE

#### A. Evaluation of Test Results:

1. Test results for standard molded and standard cured test cylinders shall be evaluated separately for each specified concrete mixture design. Such evaluation shall be valid only if tests have been conducted in accordance with procedures specified herein.
2. For evaluation, each specified mixture design shall be represented by at least five tests.

B. Acceptance of Concrete - The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength  $f_c$ , and no individual strength test result falls below the specified strength  $f_c$  by more than 500 psi.

#### C. Testing of Concrete In Place:

1. Testing by impact hammer, Windsor probe, sonoscope, or other nondestructive device may be permitted by the Municipality to determine relative strengths at various locations in the structure as an aid in evaluating concrete strength in place or for selecting areas to be cored. Such tests, unless properly calibrated and correlated with other test data, shall not be used as a basis for acceptance or rejection.
2. Core tests
  - a. Where required, cores at least 2 in. in diameter shall be obtained and tested in accordance with ASTM C42. If the concrete in the structure will be dry under service conditions, the cores shall be air dried (temperature 60o to 80oF, relative humidity less than 60 percent) for 7 days before testing and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be tested after moisture conditioning in accordance with ASTM C42.
  - b. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores shall be determined by the Municipality to least impair the strength of the structure. If, before testing, one or more of the cores shows evidence of having been damaged subsequent to or during removal from the structure, it shall be replaced with a new core.
  - c. Concrete in the area represented by a core test will be considered adequate if the average strength of the cores is equal to at least 85 percent of specified strength  $f_c$  and if no single core is less than 75 percent of the specified strength  $f_c$ .
  - d. Core holes shall be filled with low slump concrete or mortar. See Article 3.07, Repair of Surface Defects.

### 3.13 ACCEPTANCE OF STRUCTURE

#### A. General:

1. Completed concrete work which meets all applicable requirements will be accepted without qualification.
2. Completed concrete work which fails to meet one or more requirements but which has been repaired to bring it into compliance will be accepted without qualification.
3. Completed concrete work which fails to meet one or more requirements and which cannot be brought into compliance may be accepted or rejected as provided in these Specifications. In this event, modifications may be required to assure that the work complies with the design intent.

#### B. Dimensional Tolerances:

1. Formed surfaces resulting in concrete outlines smaller than permitted by the tolerances of ACI 301 shall be considered potentially deficient in strength and subject to the provisions of Article 3.13.D, herein.
2. Formed surfaces resulting in concrete outlines larger than permitted by the tolerances of ACI may be rejected and the excess material shall be subject to removal. If removal of the excess material is permitted, it shall be accomplished in such a manner as to maintain the strength of the section and to meet all other applicable requirements of function and appearance.
3. Concrete members cast in the wrong location may be rejected if the strength, appearance or function of the structure is adversely affected or misplaced items interfere with other construction.
4. Inaccurately formed concrete surfaces exceeding the limits of ACI 301, and which are exposed to view, may be rejected and shall be repaired or removed and replaced if required.
5. Finished slabs exceeding the allowable tolerances may be repaired provided that strength or appearance is not adversely affected. High spots may be removed with a terrazzo grinder, low spots filled with a patching compound, or other remedial measures performed as permitted.

#### C. Appearance:

1. Other concrete exposed to view with defects which adversely affect the appearance of the specified finish may be repaired only by acceptable methods.
2. Concrete not exposed to view is not subject to rejection for defective appearance.

D. Strength of Structure:

1. The strength of the structure in place will be considered potentially deficient if it fails to comply with any requirements which control the strength of the structure, including but not necessarily limited to the following conditions:
  - a. Low concrete strength as designated in Article 3.12.
  - b. Reinforcing steel size, quantity, strength, position, or arrangement at variance with the requirements of Article 3.03, Reinforcement, or the drawings.
  - c. Concrete which differs from the required dimensions or location in such a manner as to reduce the strength.
  - d. Curing less than that specified.
  - e. Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.
  - f. Mechanical injury, construction fires, accidents or premature removal of formwork likely to result in deficient strength.
  - g. Poor workmanship likely to result in deficient strength.
2. Structural analysis and/or additional testing may be required when the strength of the structure is considered potentially deficient.
3. Core tests may be required when the strength of the concrete in place is considered potentially deficient.
4. If core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be required and their results evaluated in accordance with ACI 318.
5. Concrete work judged inadequate by structural analysis or by results of a load test shall be reinforced with additional construction if so directed by the Municipality, or shall be replaced, at the Contractor's expense.
6. The Contractor shall pay all costs incurred in providing the additional testing, analysis and/or engineering services required by this section.
7. The Municipality will pay all costs of additional testing and/or analysis which is made at his request and which is not required by these Specifications.

END OF SECTION



SECTION 03050

CEMENT CONCRETE FOR UTILITY CONSTRUCTION

PART 1 GENERAL

1.01 DESCRIPTION

A. The work of this section includes, but is not limited to cast-in-place cement concrete for:

1. Reaction and support blocking
2. Cradles and encasements
3. Miscellaneous utility related cast-in-place cement concrete construction

B. Related work specified elsewhere:

- |                                           |               |
|-------------------------------------------|---------------|
| 1. Trenching, backfilling and compaction: | Section 02221 |
| 2. Trench paving and restoration:         | Section 02575 |
| 3. Manholes:                              | Section 02601 |
| 4. Storm inlets, catch basins, endwalls:  | Section 02602 |
| 5. Sanitary sewer pipe:                   | Section 02610 |
| 6. Plain and reinforced cement concrete:  | Section 03000 |

C. Definitions: NONE

D. Applicable Standard Details:

- MT3050-1 Concrete Encasement Details
- MT3050-2 Concrete Anchor Details
- MT3050-3 Thrust Blocking Details
- MT3050-4 Special Concrete Encasement for Frost Protection

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation (PennDOT), latest revision:  
Publication 408, Specifications

B. Inspections:

1. Inspections by the Municipality will, at a minimum, be made of the subgrade, formwork, supports, and reinforcement prior to placement of the concrete; and of the concrete prior to backfilling.

C. Testing:

1. As specified in Section 03000.

1.03 SUBMITTALS

- A. Submit concrete mix designs, including strength test records, for review and approval.
- B. Submit certified results of compressive strength cylinder tests.
- C. Submit copies of concrete batch slips.

PART 2 PRODUCTS

2.01 CEMENT CONCRETE

- A. As specified in Section 03000.
- B. For work involving a time constraint, use PennDOT Class HES (High Early Strength).

2.02 REINFORCEMENT STEEL

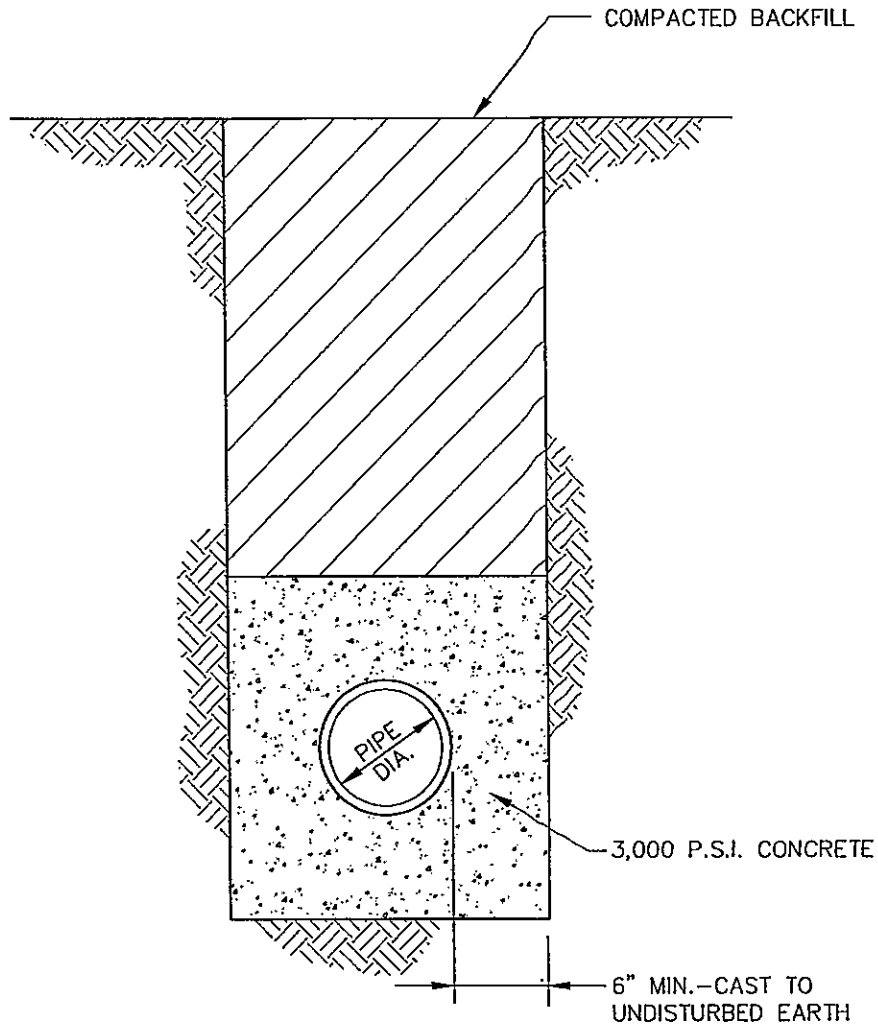
- A. As specified in Section 03000.

PART 3 - EXECUTION

3.01 CONSTRUCTION

- A. Comply with Section 03000 for construction requirements including formwork, placement, curing, and protection of cement concrete.
- B. Excavate and shape trench bottoms and sides to accommodate thrust block forms, encasements, manhole bases, drop connections, inlets and vaults.
- C. Support pipes, valves and fittings at the required elevation with brick or concrete block. Do not use earth, rock, wood, or organic materials as supports.
- D. Provide spacers, chairs, bolsters, ties and other devices for properly placing, spacing, supporting and fastening reinforcement in place.
- E. Place concrete utilizing all possible care to prevent displacement of pipes or fittings. Return displaced pipes or fittings to line and grade immediately.
- F. Insure tie rods, nuts, bolts and flanges are free and clear of concrete.
- G. Do not backfill structures until concrete has achieved its initial set and forms are removed..
- H. Perform backfilling and compaction as specified in Section 02221.

END OF SECTION



SECTION

REVISED 12/27/2006

NOTE: NOT TO SCALE

MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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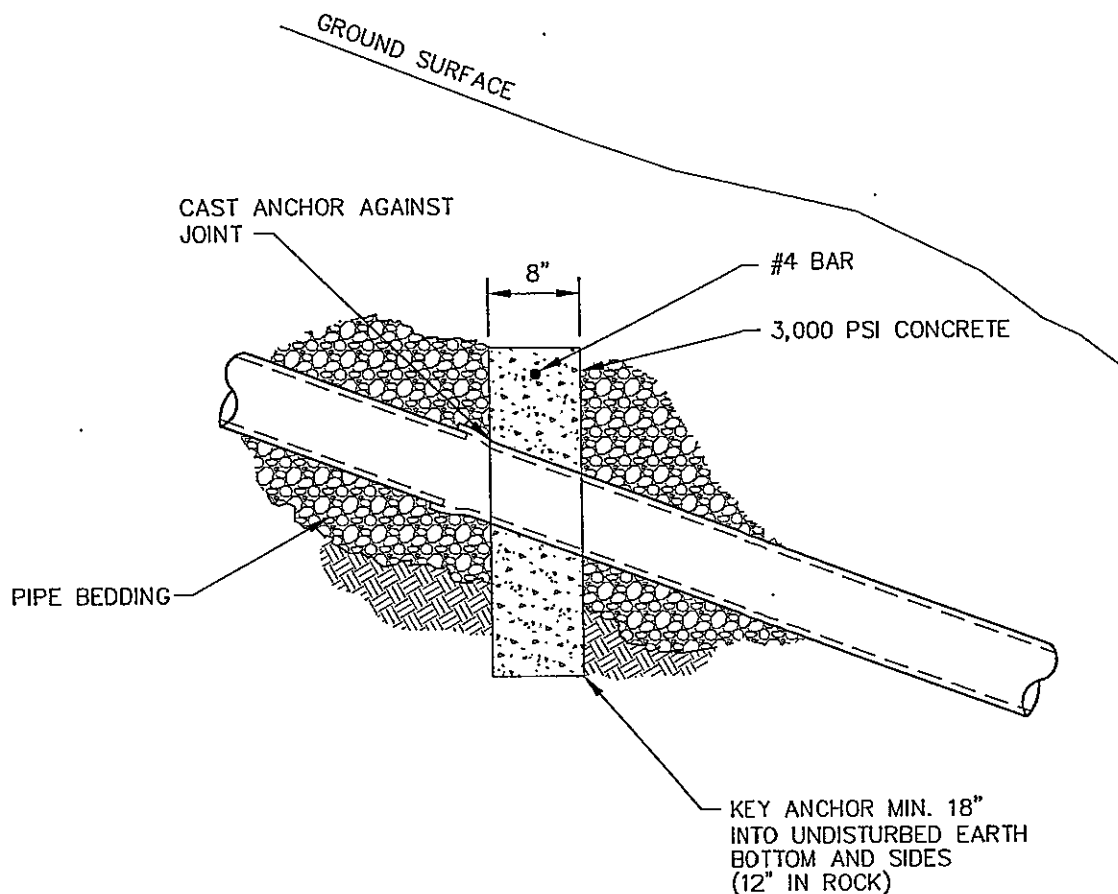
CONCRETE  
ENCASEMENT  
DETAIL

DATE:	12/14/2005
DRAWN BY:	BAM/JLD
CHK. BY:	
NO.	MT3050-1

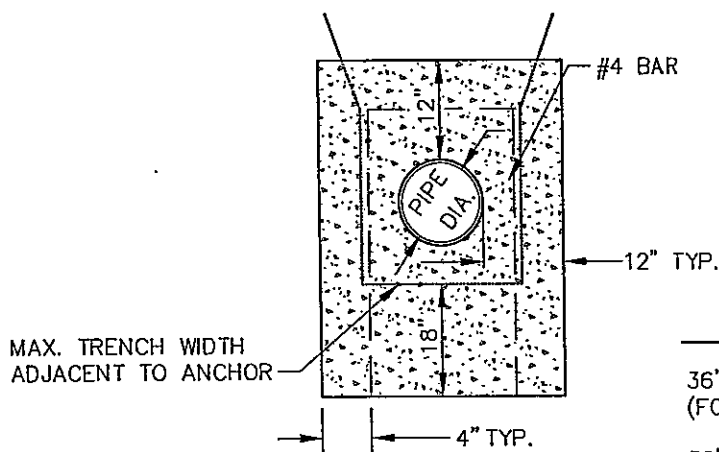
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ELEVATION



SECTION

MAXIMUM SPACING

36' O.C. 15% TO 20% SLOPES  
(FOR STORM SEWERS ONLY)

36' O.C. 20% TO 35% SLOPES  
24' O.C. OVER 35% TO 50% SLOPES  
16' O.C. OVER 50% SLOPES

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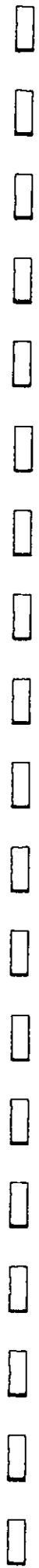
**CONCRETE ANCHOR  
DETAILS**

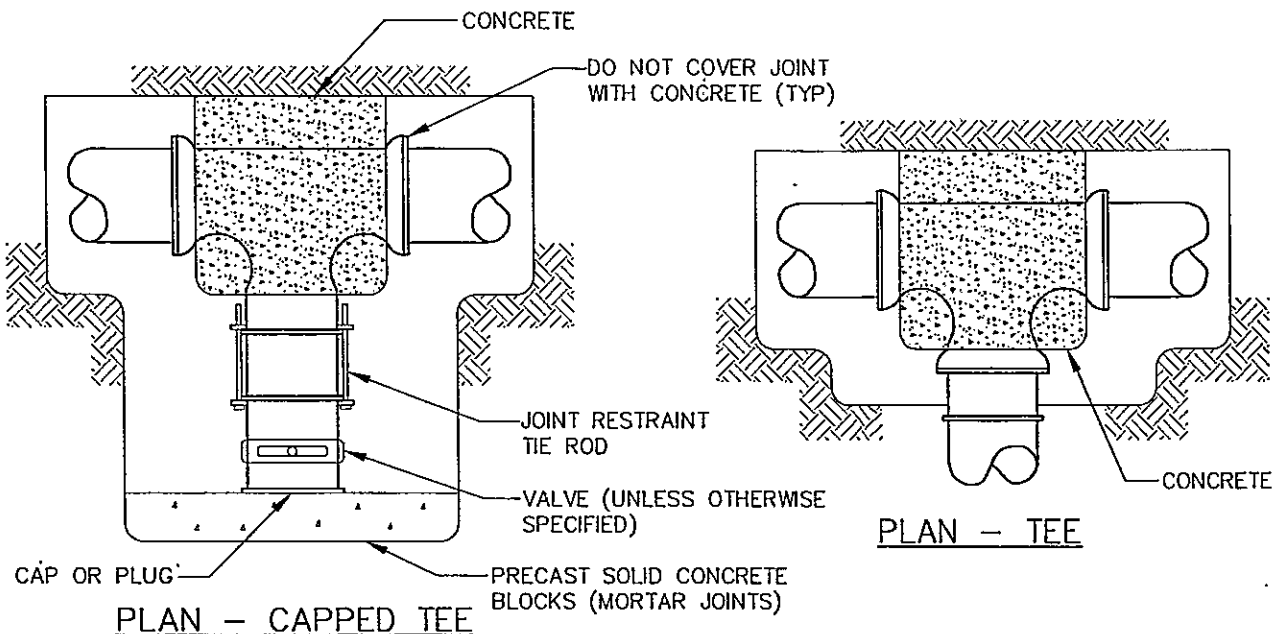
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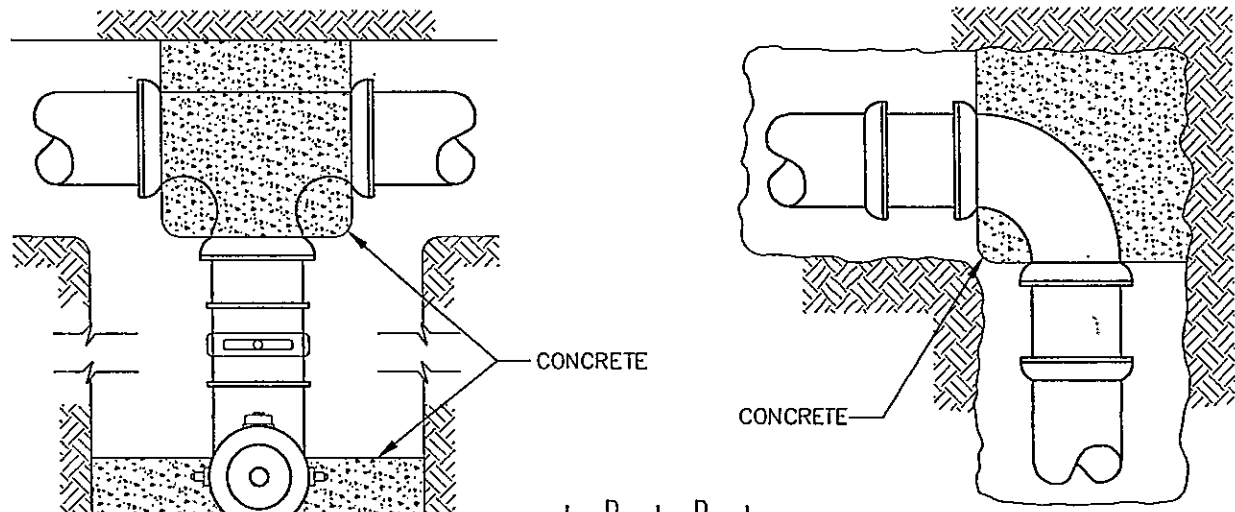
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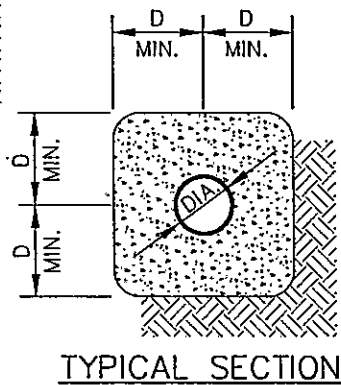


(CAPPED RUN OF TEE SIMILAR)



(LESSER BENDS SIMILAR)

D = OUTSIDE DIAMETER OF PIPE



REVISED 12/27/2006

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MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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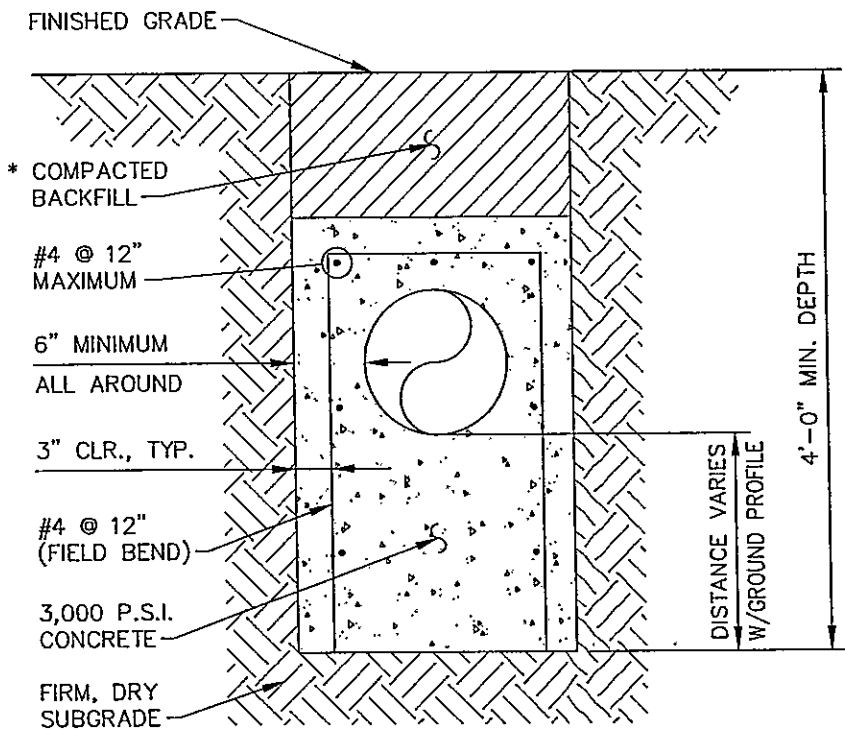
38 N. DUKE STREET YORK, PA • PHONE (717) 846-4805 • FAX (717) 846-5811  
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THRUST BLOCKING  
 DETAILS

DATE:	12/14/2005
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NO.	MT3050-3

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**NOTES:**

- STABILIZE PIPE & REINFORCEMENT WITHIN EXCAVATION TO PREVENT MOVEMENT DURING CONCRETE PLACEMENT.

\* SEE SECTION 02221 FOR COMPACTION REQUIREMENTS.

NOTE: NOT TO SCALE

**MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS**



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**SPECIAL CONCRETE  
 ENCASEMENT  
 FOR FROST  
 PROTECTION DETAIL**

DATE:	12/27/2006
DRAWN BY:	JLD
CHK. BY:	
NO.	MT3050-4

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SECTION 16500

STREET LIGHTING

PART 1 GENERAL

1.01 DESCRIPTION

A. The work of this section includes, but is not limited to installation of conduits, poles, controls, lighting fixtures, lamps and wire necessary for a complete and functioning street light system.

B. Related work specified elsewhere:

- |                                              |               |
|----------------------------------------------|---------------|
| 1. Trenching, backfilling and compacting:    | Section 02221 |
| 2. Paving and restoration:                   | Section 02575 |
| 3. Plain and reinforced cement concrete:     | Section 03000 |
| 4. Cement concrete for utility construction: | Section 03050 |

C. Definitions: NONE

D. Applicable Standard Details:

- MT16500-1 Street Lighting Installation Details  
MT16500-2 Light Pole Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

- |       |                                                 |
|-------|-------------------------------------------------|
| ANSI  | American National Standards Institute           |
| ASTM  | American Society for Testing and Materials      |
| NEMA  | National Electrical Manufacturers Association   |
| NECS  | National Electric Safety Code                   |
| NFPA  | National Fire Protection Association            |
| UL    | Underwriters' Laboratories, Inc.                |
| IES   | Illuminating Engineering Society                |
| IEEE  | Institute of Electrical & Electronics Engineers |
| IPCEA | Insulated Power Cable Engineers Association     |
| OSHA  | Occupational Safety & Health Administration     |
| NEC   | National Electrical Code                        |

B. Inspections:

1. Upon completion of the work, customer/developer shall secure an electrical inspection from an electrical inspection agency acceptable to GPU Energy, Inc. and the Municipality.

C. Testing:

1. All electrical conductors, after installation of wiring and apparatus has been completed, shall be tested by the Contractor to insure continuity, proper splicing, freedom from ground (except "made ground" and those required for protection) and insulation resistance in accordance with Underwriters requirements. The Contractor shall furnish and employ suitable instruments such as ammeters, volt meters, meggers, etc. Preliminary testing with magnetos will be permitted but will not be accepted as a final or conclusive test.
2. Prior to testing or adjusting, the Contractor shall consult with the Municipality to determine the intended function of any equipment, wiring or systems: The Contractor shall then perform such tests and make the necessary adjustments to ensure that the required function is obtained.
3. Where specific tests are specified to be performed on equipment or materials, test records shall be made by the Contractor in a neat and legible form on a 8-1/2" paper. Records shall properly identify the equipment or system and the test date. Three copies shall be delivered to the Municipality at the completion of the test.
4. Equipment and wiring systems not specified as requiring a specific test shall be tested in operation to determine that all design functions are satisfactorily performed.

1.03 SUBMITTALS

A. General Layout

1. Prior to construction, the developer shall furnish a proposed lighting system layout showing service, standards and conduit locations for review and approval by the Municipality.

B. Shop Drawings

1. Shop drawing submittals will be required for any substitution of the manufacturer named in the following specifications.
2. A minimum of five (5) sets will be required.
3. The Municipality shall have thirty (30) days to approve or reject the proposed substitutions.

1.04 JOB CONDITIONS

A. Codes and Standards:

1. All electrical Work shall meet the requirements of the National Electric Code of the National Fire Protection Association. In addition, any state, municipal or other authority's laws, rules or regulations applicable to the work shall be followed.
2. Where applicable, all materials and equipment shall bear the label of approval of the Underwriters Laboratory, Inc.



3. Reference to the codes and standards listed herein shall constitute the minimum acceptable requirements. Where drawings and specification requirements exceed those of the codes listed herein, the Contractor shall follow the drawings and specifications.

#### 1.05 COORDINATION - DEVELOPMENT STREET LIGHTING

- A. GPU Energy's street lighting service is only available to the Municipality. The developer must coordinate street lighting requests with the Municipality and all street lighting must conform to the Municipality's and GPU Energy's street lighting specifications.
- B. The Customer/developer shall provide GPU Energy with a preliminary plan showing the proposed locations(s) of street light standards. GPU Energy does not design or approve design of street lighting systems.
- C. GPU Energy returns the plan showing the available source(s) for the street light feed(s) and, if not previously provided, a document which lists material requirements.
- D. The Customer/developer shall provide street light luminaire(s) which are equipped to operate with the material, as specified herein and as approved by GPU Energy.
- E. Requirements:
  1. Street lights shall be spaced at intervals of approximately 200 feet. Minor adjustments to spacing may be made to accommodate lot lines, driveways, etc.
  2. The street light fixtures shall be mounted at a minimum height of 15'-6" from the street surface to the bottom of the fixture, if the fixture overhangs the cartway.
  3. The Customer/developer shall provide GPU Energy with a final plan showing the location of facilities (street light, service equipment, conduit and cable routing, etc.) and the size and type of cables and fusing.
  4. Prior to excavating, the contractor shall comply with the requirements of the Pennsylvania Underground Utility Protection Law, PA Act No. 287, and call the PA One Call System.
  5. The Customer/developer shall install facilities in accordance with the requirements of GPU Energy, the Municipality, the manufacturer, the National Electric Code, and the final plan. The customer/developer is required to provide and/or install:
    - a. All trenching and backfilling, including service cable from source to junction box.
    - b. All cable, conduit, foundations, standards, luminaires, lamps, and photoelectric controls as per developer agreement with the Municipality.
    - c. Service equipment at each source location designated by GPU Energy to facilitate street lighting cable connections.
  6. The Customer/developer shall secure an electrical inspection from a GPU Energy accepted electrical inspection agency before GPU Energy will energize.
  7. Upon receipt of a street lighting agreement from the Municipality and the electrical inspection certificate, GPU Energy will:

- a. Install service to the line side of the service equipment.
  - b. Install on each streetlight standard an identification tag to show grid location and an additional tag to show the maintenance agreement, lamp type and size.
8. Note that a contract for energy and maintenance of sodium vapor fixtures with the Municipality and GPU Energy is required prior to GPU Energy energizing the street lighting system.

#### 1.06 CALCULATIONS

- A. The Voltage drop shall be calculated to ensure that it will not exceed the requirements of the National Electrical Code.
- B. Point by point footcandle calculations shall be performed to ensure light distribution conforms to IES recommendations.

### PART 2 PRODUCTS

#### 2.01 LAMPS

- A. High pressure sodium meeting the following requirements:

Lamp Watts:	150W
Ballast Code:	S55
Lamp Volts:	55V
Light Center Length:	5"
Burning Position:	Any
Base Type:	Mogul

#### 2.02 BALLASTS

- A. HID Fixture Ballast: Conforming to the following:

High power factor.  
No inrush current condition.  
Current during warm-up shall be less than normal operating current.  
Lamp starting to -20° F for outdoor ballasts.  
Input line voltage range plus or minus 10 percent, minimum.  
Fused, with fuse located in hand hole at bottom of pole.

Manufacturer: Advance

Substitutions: General Electric, Universal, (or same manufacturer as lighting fixture manufacturer)

#### 2.03 POLES

- A. Street Light Pole Type 1:

1. All poles shall have a hand hole near base of pole.
  2. All anchor bolt nuts shall be covered, either by metal pole base cover furnished with pole or by nut covers furnished by pole manufacturer.
  3. Lighting standards shall have each luminaire separately ballasted. Each ballast shall be separately fused with all fuses located near the hand hole of the pole base, where easily accessible.
  4. Weep holes shall be provided in the base of the pole shaft to prevent any accumulation of water.
  5. The pole base shall contain a hand hole sufficiently large to allow inspection of splices, ground connection, and fuses, and ability to repull circuitry between poles. A ground pad shall be welded inside, ground smooth and tapped to receive a 1/4-20 thread, for lugged connection to ground rod.
  6. Pole finish shall be anodized aluminum and shall not be painted.
  7. Pole shall be 12' high including base.
  8. Manufacturer: Craftlite, Inc. P2070
  9. Substitution: As approved
  10. If the named manufacturer and type is not used, the developer will be required to furnish to the Municipality two (2) replacement light poles for each ten (10) light poles in the system prior to acceptance by the Municipality.
- B. Street Lighting Pole Type 2:
1. Southern pine lumber.
  2. Treated with preservative for in ground contact.
  3. Striated surface.
  4. Pole shall be 12' high above ground line.
  5. Top pole turned down to accept lighting fixture.
  6. Manufacturer: Apollo 159T
  7. Substitution: As approved
  8. If the named manufacturer and type is not used, the developer will be required to furnish to the Municipality two (2) replacement light poles for each ten (10) light poles in the system prior to acceptance by the Municipality.

2.04 FUSE AND FUSE HOLDER

- A. Fuse and fuse holder for the fuse disconnect in the customer's junction box shall be per GPU Energy requirements, fuse size as required.

2.05 STRUCTURAL

- A. All poles, concrete bases, and fixtures shall be installed as an integral unit to withstand 90 mph winds, for three (3) seconds.
- B. The depth of all embedded poles and/or concrete bases shall be designed in accordance with the soil conditions of the location and shall be shown on the design drawings. The design drawings shall be sealed by a Registered Professional Engineer.
- C. All dimensions of the pole, base plate, material type and thickness, and welding information shall appear on the shop drawings along with wind loading for pole and lighting fixture.

2.06 PHOTO ELECTRIC CONTROL

- A. Photo electric controls must be suitable for use with an EEL-NEMA standard twist lock receptacle, shall have a maximum load capability of 1800 volt-amperes, shall be equipped with suitable type surge protection, and have the following characteristics:

Operating Voltage: 120V  
Voltage Range: 105-130V  
Time Delay: 10 Sec. Max.

2.07 CONDUIT

- A. Conduit shall conform with the following:

Polyvinyl Chloride (PVC) - Schedule 40

Extruded from virgin polyvinyl chloride compound.

Resistant to water, oil, outdoor aging, exposure to sunlight, underground environments, and corrosive atmospheres.

Flame retardant for use above ground, resistant to low temperatures, and resistant to distortion due to heat under conditions likely to be encountered in intended service.

Sufficient strength to withstand abuse, such as impact and crushing during handling, installation, and service. Ten foot lengths with one coupling furnished for each length.

Minimum size: 1 inch.

Each length clearly and durably marked with manufacturer's name. Markings shall be permanent for PVC used above ground.

PVC conduit shall be UL listed.

Comply with applicable ASTM testing procedures and specifications.

B. Fittings:

Conform to applicable PVC Conduit Specifications above.  
Manufacturer: Same as PVC conduit manufacturers.

2.08 WIRE

A. All wire and cable shall conform to the following:

Copper, not less than 98 percent conductivity.  
Single conductor, unless otherwise indicated.  
Color coded.  
Marked with classification type, conductor size, and voltage rating every foot, where applicable.  
Minimum Size: #12 AWG, unless otherwise specified.

Sizes #8 and larger shall be stranded  
UL listed.

B. Wire Specification No. 1

Type THW insulation, UL listed.  
600 volt insulation.  
Ampacity based upon maximum conductor temperature of 75<sup>0</sup> C in wet or dry locations, continuous operation.  
Conform to ASTM B3 for solid conductors and ASTM B8 for stranded conductor.  
Annealed, uncoated copper conductor.  
Flame retardant, moisture and heat resistant thermoplastic (PVC) insulation.

C. Wire Specification No. 2

Type XHHW insulation, UL listed.  
600 volt insulation.  
Ampacity based upon maximum conductor temperature of 90<sup>o</sup> C dry locations and 75<sup>o</sup> C wet locations, continuous operation.  
Moisture and heat resistant cross linked polyethylene (XLP) insulation.  
Conform to applicable NEMA and IPCEA requirements.  
Conform to ASTM B3 for solid conductors and ASTM B8 for stranded conductors.  
Soft copper conductor.

D. Wire Specification No. 4

Type THHN/THWN insulation, UL listed.  
600 volt insulation.  
Ampacity based upon maximum conductor temperature of 90<sup>o</sup> C dry locations (THHN) and 75<sup>o</sup> C dry and wet locations (THWN), continuous operation.  
Flame retardant, moisture and heat resistant thermoplastic (PVC) insulation with nylon jacket.  
Soft copper conductor.  
Conform to applicable NEMA and IPCEA requirements.  
Conform to ASTM B3 for solid conductors and ASTM B8 for stranded conductors.

## 2.09 CONNECTORS

### A. Connector Specification no. 1 - Splice Connectors

For insulated wire, 600 volt and under, #8 AWG and smaller.

Compression solderless connector.

Insulated or non-insulated.

UL listed.

Manufacturer: Buchanan B-cap

Substitutions: Ideal Wing-nut, Scotchlok

### B. Connector Specification No. 2 - Splice Connectors

For insulated wire, 600 volt and under, #6 AWG and larger.

Split bolt pressure connector.

Bronze.

U.L. listed.

Manufacturer: Anderson

Substitutions: Thomas & Betts, Penn-Union, Dossert, Burndy, Reliable Electric, Ideal

### C. Connector Specification No. 3 - Splice Connectors

For insulated wire, 600 volt and under, #6 AWG and larger.

Compression or crimp connector, short sleeve.

Copper.

UL listed.

Manufacturer: Anderson

Substitutions: Thomas & Betts, Dossert, Burndy, MAC, 3M, Ideal

### D. Connector Specification No. 4 - Lug Connector

For insulated wire, 600 volt and under, #8 AWG and larger.

Compression or crimp connector, short sleeve.

Copper.

UL listed.

Manufacturer: Anderson

Substitutions: Thomas & Betts, Penn-Union, Dossert, Burney, MAC, 3M, Ideal

### E. Connector Specification No. 5 - Lug Connector

For insulated wire, 600 volt and under, #8 AWG and larger.

Bolted type pressure connection, hex head or hex socket pressure bolts.

Copper.

UL listed.

Manufacturer: Penn-Union

Substitutions: Thomas & Betts, Anderson, Dossert, Burndy, Ideal

### F. Connector Specification No. 6 - Lug Connector

For insulated wire, 600 volt and under, #10 AWG and smaller.

Compression or crimp type.

Standard barrel, insulated for 600 volts.  
Ring terminal or flanged or flared block spade terminal.  
UL listed.

Copper.

Manufacturer: Penn-Union Penn Crimp

Substitutions: Ideal Crimp Terminal, Thomas & Betts, Sta-Kon, Burndy Insulug, MAC  
MiniDent, 3M Scotchlok Terminals

#### G. Connector Application

Unless otherwise noted, connectors shall be used for insulated wire, 600 volts and under, as follows:

Application	Connector Spec No.
Splice Connectors: #8 AWG and smaller #6 AWG and larger	1 2 or 3
Lug Connectors: Stranded wire connection under head of binding screw or bolt Connection to screw or bolt terminals	4 or 6 4, 5, 6

#### 2.10 TAPE

##### A. Tape specification No. 1 - Tape for Insulation 600 Volts or Less

Vinyl plastic all weather electrical tape.

Manufacturer: 3M Scotch 33+

Substitutions: Tomic, Okonite

##### B. Tape specification No. 2 - Underground Marker Tape

Material: Red, plastic, 6 inches wide.

Marking: CAUTION - BURIED ELECTRIC LINE BELOW, or similar wording.

Manufacturer: Griffolyn, Inc.

Substitutions: Allen Company

#### 2.11 WIRE MARKERS

##### A. Wire Marker Specification No. 2 - Vinyl plastic or vinyl polyester.

Temperature Range: to 250 degrees F.

Self-sticking adhesive backing.

Waterproof, solvent proof.

Printing permanently protected.

Manufacturer: Thomas & Betts E-Z-Code, Type WSL

Substitutions: W. H. Brady Co. Type CAB

## 2.12 GROUND RODS

### A. Type: High strength steel core.

Construction: Copper exterior welded to the steel core. Chamfered top to prevent mushrooming. Pointed end.

Minimum Diameter:

10 foot rod - 3/4 inch diameter.

Above 10 feet - 1 inch diameter.

For lengths over 10 feet, sectional rods with steel driving bolt may be furnished.

Manufacturer: Copperweld

Substitutions: Penn-Union, Weaver

## 2.13 GROUND CONNECTORS

### A. Ground Connector Specification No. 2:

Type: Ground grid clamps. Compression connection to cable or rod.

High conductivity cast copper fittings.

Cable, rod, plate or combination connector, as required.

Suitable for direct burial or imbedded in concrete.

Manufacturer: Thomas & Betts

Substitutions: Cadweld

### B. Ground Connector Application:

Unless otherwise noted, ground connectors shall be installed as follows:

Connection of ground wire or ground grid cable to ground rod, building steel or another ground grid cable.

## 2.14 LIGHTING FIXTURES

### A. Street Light Fixture:

1. Volts: 120V

2. Mounting: Post-top

3. Type: High pressure sodium

4. Description: Cast aluminum, fully enclosed and gasketed. UL listed "suitable for wet locations". Traditional style with white diffuser.

5. Lamps: 150 watt high pressure sodium

6. Manufacturer: McPhilben 12T11631

7. Substitutions: As approved



8. If the named manufacturer is not used, the developer will be required to furnish to the Municipality two (2) replacement lighting fixtures for each ten (10) lighting fixtures in the system prior to acceptance by the Municipality.

### PART 3 EXECUTION

#### 3.01 RACEWAY INSTALLATION

##### A. PVC conduit shall be installed as follows:

1. Expansion joints shall be installed where expansion and contraction of PVC occurs due to changing temperature conditions.
2. Joints in PVC conduit runs shall be in accordance with manufacturer's recommendations.
3. PVC conduit shall not be used where subject to ambient temperature exceeding those which conduit has been approved.
4. Fittings as specified under Raceway Specification No. 4 shall be used when installing PVC conduit.
5. Install ground wire, sized per NEC in all PVC conduit runs.
6. Underground raceways or duct banks shall have a marker or warning tape installed above raceway, 12 inches below finished grade. Use Tape Specification No. 2. Duct banks with widths over 12 inches shall have 6 inch wide tape runs installed side-by-side on 12 inch (maximum) centers.

#### 3.02 WIRING METHODS

- A. Wiring shall be installed in raceways unless otherwise noted.
- B. Use color coded wire throughout as required by National Electric Code for convenience in testing and maintenance. Neutral conductors shall be color coded neutral gray or white; grounding conductors shall be green.
- C. Pull wire into conduit so that insulation will not be damaged. Approved pulling compound shall be used to assist in pulling of 600 volt wire into conduit. Oil or grease will not be permitted. Pulling compound shall be compatible with wire insulation and conduit.
- D. Conductors shall be installed continuous from outlet to outlet, without splicing except within outlet or junction boxes.
- E. Noninsulated splices in insulated wire, 600 volts and under shall have insulation of a factory fabricated type or shall be insulated as follows:
  1. Rubber and friction tape coated with Scotchkote or similar coating.
  2. Scotchfil or equivalent electrical putty with tape as specified under Tape Specification No. 1.

3. Insulation of splices shall provide same insulation qualities as insulation of wire being spliced.
- F. Stranded wire shall not be placed under the head of a binding screw or bolt. Refer to Part 2 - Products, this Section, for connectors used in stranded wire connections under head of binding screw or bolt.
- G. Wire shall be identified by use of wire markers at termination points, including outlet boxes, pull boxes, junction boxes, wireways and at locations where wire changes direction within an enclosure. Unless otherwise specified, wire markers shall be as specified under Wire Marker Specification No. 2.

### 3.03 GROUND ROD INSTALLATION

- A. Ground rods shall be installed as required by National Electric Code near the customer's junction box for the electrical service ground.
- B. Ground rods shall be driven to a depth so that top of rod is 2 feet below grade.

### 3.04 GROUNDING

#### A. Equipment Grounding:

1. Unless otherwise specified, conductive noncurrent carrying electrical materials and equipment shall be grounded. Non-electrical items of equipment shall be grounded as indicated on Drawings. Grounding shall be in accordance with NEC requirements.
2. Grounding shall be by separate insulated grounding conductors pulled with phase conductors. Grounding system shall be electrically and mechanically continuous from all lighting poles and distribution equipment to service ground point.
3. Bonds and jumpers shall be furnished and installed where required during construction and where necessary to ensure both operation and safety.
4. Service ground point shall be ground rods near the customer's junction box.
5. Neutral conductors shall be continuous throughout system and shall be grounded only at the service neutral.
6. Ground wire shall be installed in all PVC raceway runs. Ground wires shall be insulated.

#### B. Grounding Tests:

1. Ground resistance of service grounding point shall be inspected and shall not exceed values required by NEC. Inspection shall be made using two auxiliary ground rod (three point) method or other approved method. If resistance is found to be higher than that allowed by NEC, additional ground rods shall be driven until a resistance below allowed value is obtained.
2. Outside inspections shall not be performed during unusually wet conditions. Checks shall be made during dry weather conditions.

3. Complete inspection record shall be submitted to the Municipality showing resistance values and calculations and shall indicate method of test.

3.05 EXCAVATION

- A. Excavate trenches and for pole bases as specified in Section 02221. Provide 30" cover from the top of the conduit to the finished grade elevation.

3.06 PAVING AND RESTORATION

- A. Paving and restoration shall be as specified in Section 02575.

3.07 CONCRETE

- A. Cement concrete shall be as specified in Sections 03000 and 03050.

3.08 AS-BUILTS

- A. "As-Built" electric conduit layout drawings shall be submitted to the Municipal Engineer for approval.

END OF SECTION



## INSTALLATION REQUIREMENTS

① SERVICE SUPPORT

Service support shall be a solid 6 inch by 6inch pressure treated timber with a minimum setting depth of 36 inches. If service is from underground facilities, the service support must be located a minimum of 24 inches and a maximum of 72 inches from the rear of the transformer foundation, handhole or pedestal. If service is from overhead facilities, the service support must be a minimum of 60 inches or a maximum of 72 inches from the pole.

② SERVICE DISCONNECT EQUIPMENT

Provide a manual reset breaker or fused disconnect with associated grounding installed in accordance with the requirements of the National Electrical Code (NEC) and any local terminal lugs must accept #12 AWG solid through #4 AWG stranded on disconnect equipment rated greater than 30 amps. Enclosure must prevent access by unauthorized persons and shall be a NEMA Type 3R.

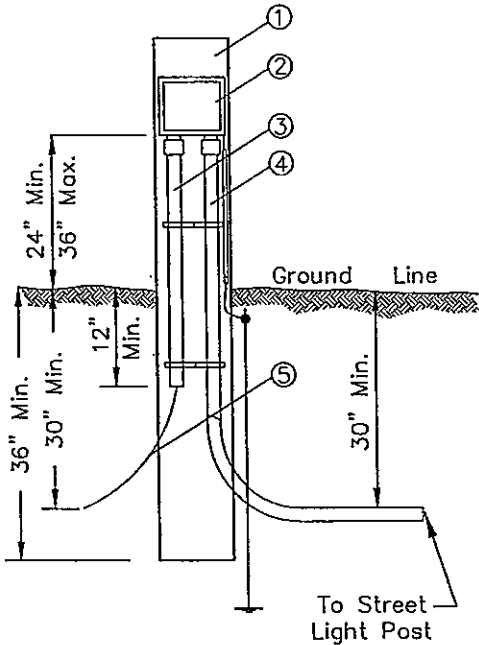
③ SERVICE LATERAL CONDUIT, CONNECTORS AND CLAMPS

The minimum size service lateral conduit is 3/4 inch schedule 40 PVC on 30 amp disconnect equipment and 1 inch schedule 40 PVC on disconnect equipment rated greater than 30 amps. This conduit must extend from the service disconnect to 12 inches below ground line.

④ DISTRIBUTION CONDUIT, CABLE, CONNECTORS AND CLAMPS

This equipment must meet the requirements of the NEC and any local municipal codes.

⑤ Service Lateral Conductors (Provided by electric company)



NOTE: NOT TO SCALE

### MANCHESTER TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



*Excellence in Civil Engineering*

38 N. DUKE STREET YORK, PA • PHONE (717) 846-4805 • FAX (717) 846-5811

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

• 315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690

WWW.CSDAVIDSON.COM

## STREET LIGHTING SERVICE DETAIL

DATE: 12/27/2006

DRAWN BY: JLD

CHK. BY:

NO. MT16500-1



SHOEBOX  
FIXTURE  
(90° CUTOFF)\*

METAL POLE, PAINT COLOR  
SELECTED BY TOWNSHIP

12' HIGH (14' AT INTERSECTIONS)

FINISH GRADE

COVERED ANCHOR BOLTS

CONCRETE FOUNDATION

\* REQUIRED STYLE ON COLLECTOR/ARTERIAL  
AND MAJOR THOROUGHFARES. OTHER STYLES  
MAY BE USED ON LOCAL ROADS AS APPROVED  
BY TOWNSHIP.

NOTE: NOT TO SCALE

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LIGHT POLE DETAIL

DATE: 12/27/2006

DRAWN BY: JLD

CHK. BY:

NO. MT16500-2

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