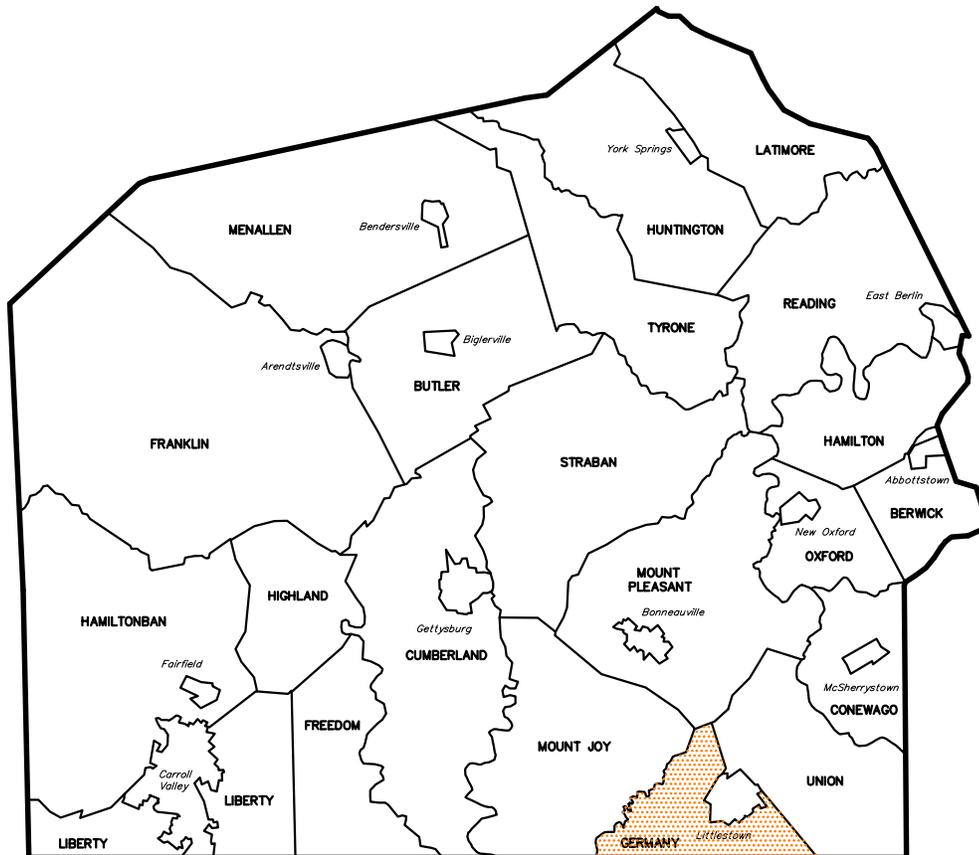


CONSTRUCTION AND MATERIAL SPECIFICATIONS



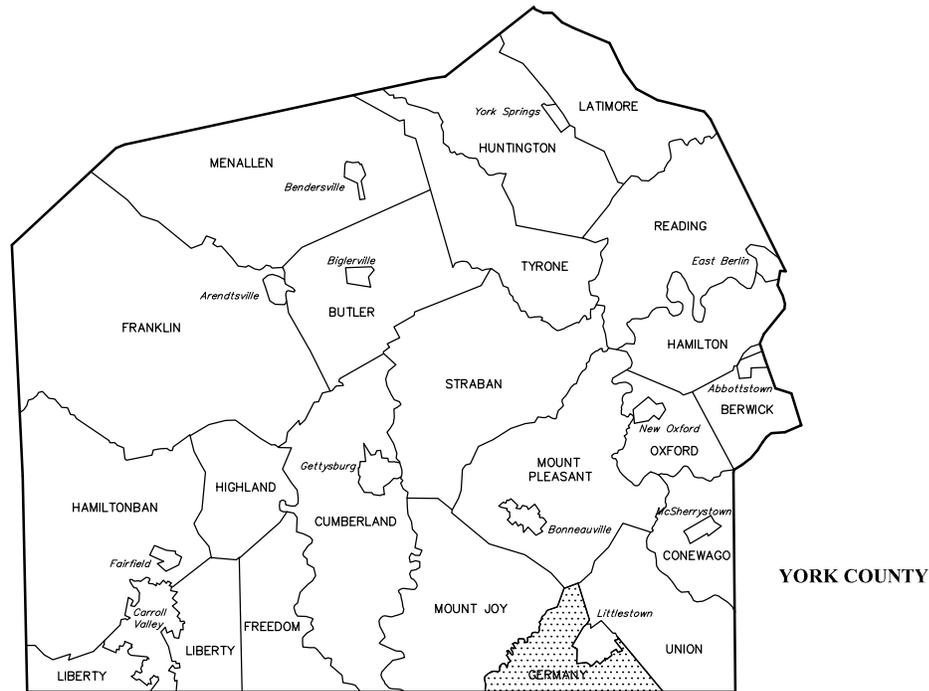
GERMANY TOWNSHIP ADAMS COUNTY, PENNSYLVANIA MAY 2011



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CONSTRUCTION AND MATERIAL SPECIFICATIONS



The purpose of the Germany Township Construction and Materials Specifications is to organize and standardize technical information and products that are acceptable for use within the Township. This document is intended to portray Township expectations in a clear manner to ensure that public improvements are being installed correctly. The Specifications are to be used for all construction activities that propose public improvements within Germany Township, PA.

References to PennDOT Publication 408 Specifications are made throughout this document, but the standards presented within are tailored to meet local preferences and are Township specific. Several details are provided throughout this document to help clearly describe specific construction procedures to be used within the Township.

GERMANY TOWNSHIP ADAMS COUNTY, PENNSYLVANIA

MAY 2011



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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 Germany Township and its full time employees, elected officials and appointed representative(s).

Township is defined as Germany 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

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SECTION 01010
GENERAL REQUIREMENTS

PART 1 GENERAL

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, "Temporary 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 2nd Class Township Code. Refer to the 2nd Class Township Code Section 2308 for proper procedures.
 - 2. Notify Adams County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to existing traffic patterns.

1.05 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 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.

2.04 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 ²
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 ² O @ 100°C	5 hours w/o peel
Colors	APWA code	See below

C. Color Code shall be as follows:

1. Safety Red: Electric power, distribution and transmission and municipal electric systems.
2. High Visibility Safety Yellow: Gas and oil distribution and transmission, dangerous materials, product and 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 Adams 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.

- F. 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.
- G. 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

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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. 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. Construction Limits

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.

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 will employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.
3. Notify Adams County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to existing traffic patterns.

C. 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 Adams County Conservation District.
- C. Protect benchmarks, property corners, 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 property corners, 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, flush cut 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:

GT2150-1 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 Adams 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.

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 GT2150-1. 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 weephole (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

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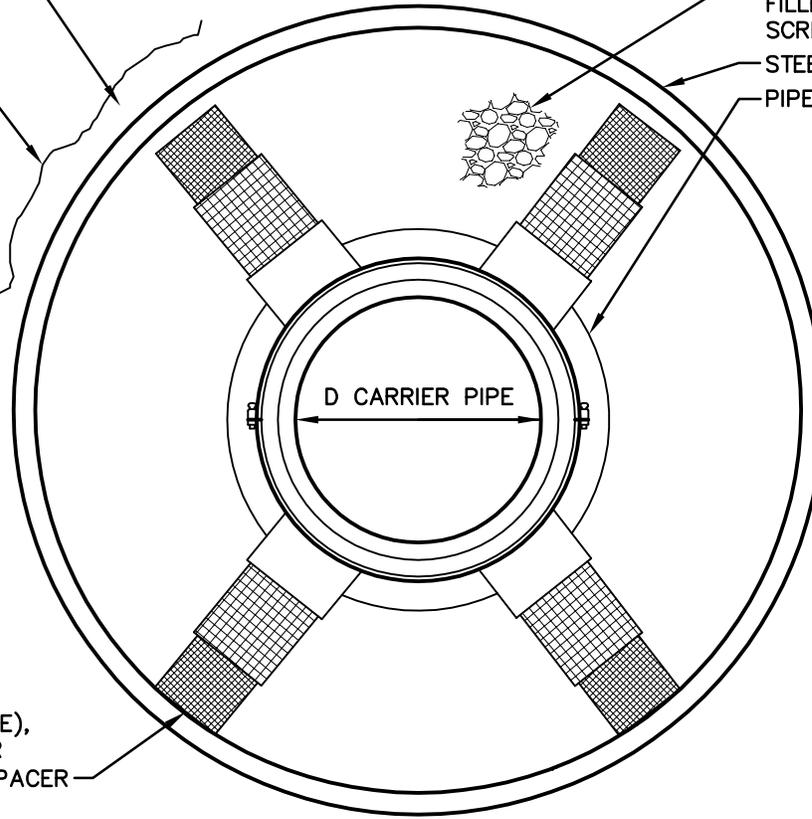
PUMP GROUT BETWEEN CASING AND EXCAVATION IF GREATER THAN 1"

EXCAVATION

ANNULAR SPACE TO BE FILLED WITH LIMESTONE SCREENINGS *

STEEL CASING PIPE

PIPE BELL



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

NOTE:

DO NOT SUPPORT CARRIER PIPE ON BELLS

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

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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CASING INSTALLATION

GERMANY TOWNSHIP ADAMS COUNTY , PENNSYLVANIA

DRAWN BY	CRP
CHECKED BY	
SCALE	N.T.S.
DATE	3/19/2010
DWG. NO.	GT02150-1
FILE NO.	2680.1.01.00

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, Temporary Traffic Control Guidelines

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 an 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. The CONTRACTOR shall employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.
3. Notify Adams 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 to 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 top-soiling 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 re-compacted. 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 non-movement 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 and Littlestown Borough. 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, re-grade area, if necessary, to prevent erosion.

3.05 BLASTING

- A. No blasting is permitted without a State permit and advance notice to the Municipality and Littlestown Borough 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 Adams 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 Adams County Conservation District.

3.08 TOPSOILING

- A. Top-soiling 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

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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. Utility Conflict Statement | Section 00160 |
| 2. Clearing and grubbing: | Section 02100 |
| 3. Boring and jacking: | Section 02150 |
| 4. Finish grading, seeding and sodding: | Section 02485 |
| 5. Trench paving & restoration: | Section 02575 |

C. Definitions: NONE

D. Applicable Standard Details:

- GT2221-1 Pipe Bedding Details
- GT2221-2 Flowable Backfill Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

- Publication 408, Specifications
- Publication 213, Temporary 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

3. Pennsylvania Code Title 67, Transportation, Chapter 459 occupancy of highways by utilities.

B. Testing Agency:

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

C. Inspections/Compaction Testing:

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

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 3.11.

C. Control of Traffic:

1. The CONTRACTOR will employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.
2. Notify Adams County Emergency Control (911) at least 72 hours in advance of any operations requiring changes to existing 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.

E. Site Inspection:

1. Prior to entering upon any private property, the CONTRACTOR shall have arranged for and completed a site inspection of each property with Municipality, at which time the Municipality will advise the CONTRACTOR as to what area is available for work; as to the trees, planting, and improvements which may be removed or disturbed during the work; and as to any special conditions or requirements which shall govern the work on each property.

PART 2 PRODUCTS

2.01 PIPE BEDDING MATERIAL

A. Type III and Type IV Bedding Material:

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

B. Type V Bedding:

1. AASHTO No. 8 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. Flowable Backfill Material:

1. Material conforming to PennDOT special provisions S94 (S2060130), Type A or B as shown in Table 1.
2. Flowable backfill inside casing pipe shall be Type D.

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 6" 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. Suitable Backfill Material (Highways, Driveways, and Shoulders)

1. From top of pipe bedding material to subgrade elevation:
 - a. Select material backfill
 - b. Flowable backfill material – where directed or approved.

Table 1 – Mix Design

Properties & Criteria	Type A	Type B	Type C	Type D
Mix Design (/CY) <ul style="list-style-type: none"> • Cement (lbs)* • Fly Ash (lbs)* • Bottom Ash (lbs)* or Coarse Aggregate or Fine Aggregate	100 2000 0	50 300 2600	150-200 300 2600	300-700 100-400 **
Slump (inches) PTM No. 600		11	11	11
Flow Cone (Seconds) ASTM C939	30-60	--	--	30-60 ****
Density (pcf)	95-110 *** PTM No. 613	120-135 ***	125 min ***	30-70 or as specified ***
Water Absorption of Aggregate, PTM No. 506	25	25	-300 min.	40 (max %)
Compressive Strength (psi) PTM No. 604 3 days (minimum) 28 days (range)	50-125	50-125	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.
- **** As appropriate depending on whether light weight aggregate or air entraining admixture is used to obtain lightweight properties.

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 to 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 Municipality Fire Chief and Littlestown Borough 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. 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.
 3. 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.

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 Adams 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 GT2221-2.
- B. Type III Bedding:
 - 1. Depth of pipe bedding aggregate as shown on Standard Detail GT2221-1.
 - 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 GT2221-1.
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 GT2221-1.
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, shoulders, driveways 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 GT2221-1 or GT2221-2.
- B. Lay pipe as specified in the appropriate Section of these Specifications for pipeline construction.

3.10 THRUST RESTRAINT

- A. Provide pressure pipe with concrete thrust blocking (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 specified backfill materials, as per pipe bedding detail (GT-02221-1), placed and carefully compact with approved compaction equipment in layers of suitable thickness to provide specified compaction. Backfill and compact the remainder of the trench with specified backfill material. Refer to Backfill and Surface Restoration Requirements Table in Section 02575 for trench backfill material and compaction requirements at each specific location.

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.

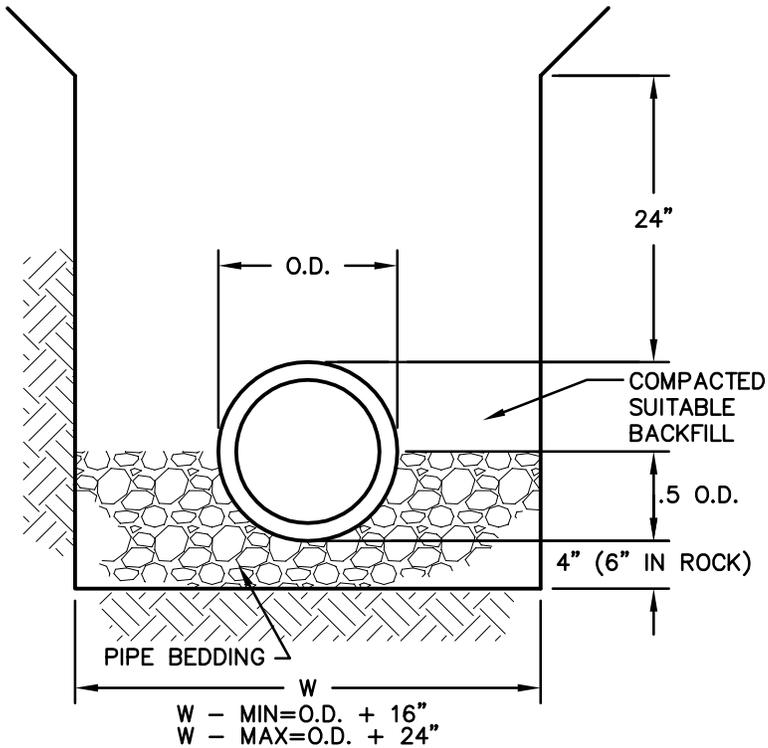
- B. Restore grassed areas in accordance with Section 02485.

3.15 LIMITS OF WORK

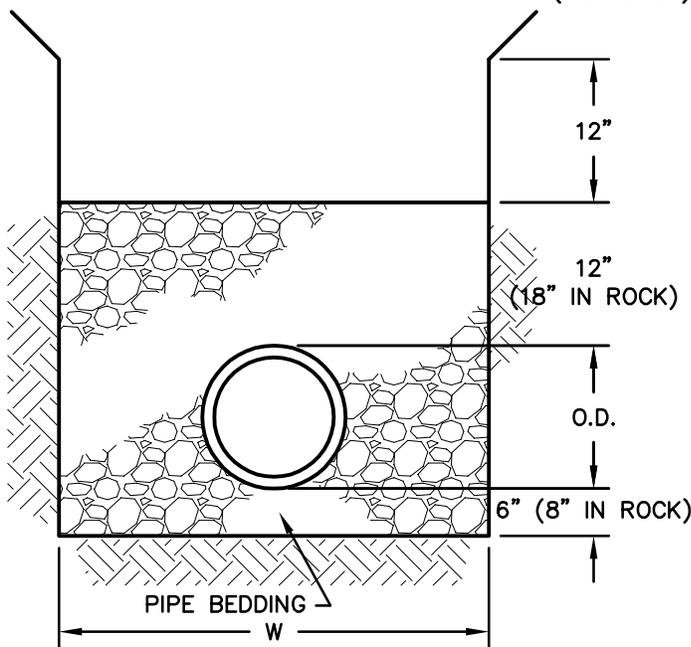
- A. All disturbances shall be confined to OWNER's property, street rights-of-way, permanent easements, and temporary construction easements shown on the Contract Drawings.
- B. The CONTRACTOR shall not permit trucks and equipment to enter private driveways.
- C. All work shall be confined to the Municipal or state highway rights-of-way and permanent rights-of-way or temporary construction rights-of-way shown on the Contract Drawings.
- D. The CONTRACTOR shall not permit trucks and equipment to enter private property except where easements are provided or prior written permission from the OWNER has been obtained by the CONTRACTOR.

END OF SECTION

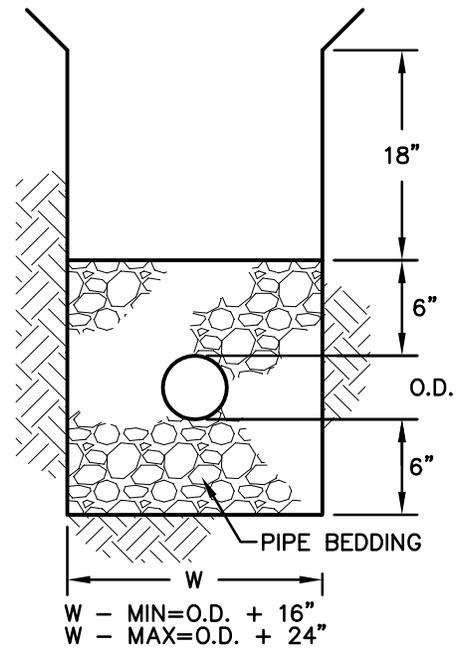
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TYPE III
(RCP ONLY)



TYPE IV



TYPE V
(2" DIA. AND SMALLER)

NOTE: TYPE I AND II NOT PERMITTED.

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



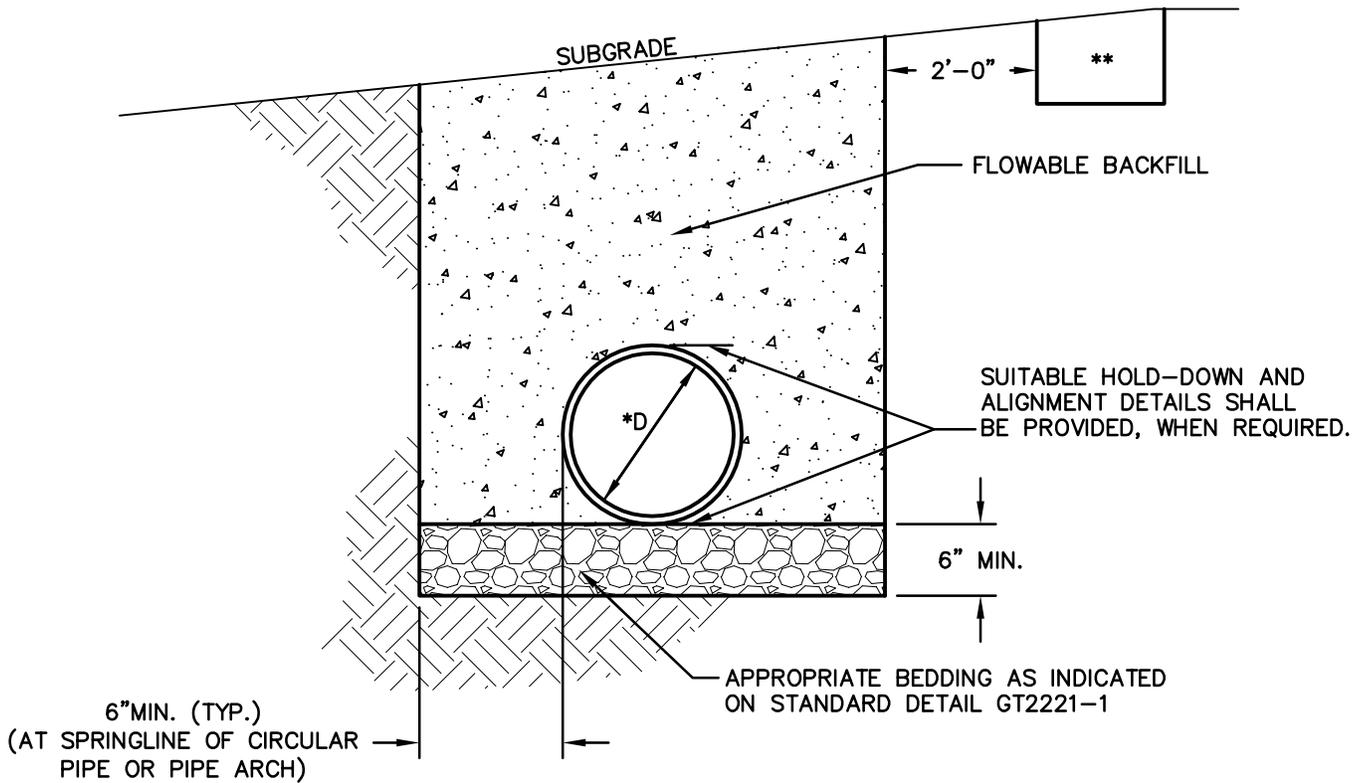
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 50 WEST MIDDLE ST. GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782
 315 W. JAMES ST., SUITE 102 LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690
 WWW.CSDAVIDSON.COM

PIPE BEDDING DETAILS

GERMANY TOWNSHIP ADAMS COUNTY, PENNSYLVANIA

DRAWN BY	CRP
CHECKED BY	
SCALE	N.T.S.
DATE	3/19/2010
DWG. NO.	GT02221-1
FILE NO.	2680.1.01.00



*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.

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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FLOWABLE BACKFILL DETAIL

GERMANY TOWNSHIP ADAMS COUNTY , PENNSYLVANIA

DRAWN BY	CRP
CHECKED BY	
SCALE	N.T.S.
DATE	3/19/2010
DWG. NO.	GT02221-2
FILE NO.	2680.1.01.00

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:

1. See Section 02500.
2. The "Backfill and surface Restoration Requirements" Table in Section 02575 lists the specific paving requirements.

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.

B. Control of Traffic:

1. Reasonable access must be maintained for adjacent property Owner's and Commercial properties.
2. All excavations in access drive, driveways and State Highway right-of-way shall be backfilled or plated at the end of each work day.

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.
- C. Excavated Areas: Suitability of material for subgrade purposes shall be determined by non-movement of the material under compaction equipment.
- D. Coarse Aggregate: Hard, tough, durable, and uncoated inert particles reasonably free from clay, silt, vegetation other deleterious substances coarse aggregate shall be obtained from approved source.

2.03 GEOTEXTILES

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

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.
 - 4. Place geotextile layer in wet areas prior to placing final base course.
- 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% per ASTM D698 or D1557. 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% per ASTM D698 or D1557. 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% per ASTM D698 or D1557. 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 Municipality, construct subbase in accordance with PennDOT Publication 408 Specifications, Section 350.

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, and 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 (Type B)

1. On prepared subgrade (or subbase if required), construct stone base of PennDOT 2A and 3A Modified coarse aggregate. Initial layer to include 5" compacted depth of 3A aggregate topped with a 3" compacted depth of 2A aggregate.

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 super elevated 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 – See Section 02618

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 ½ 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 (Type A Bases) 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 ½ 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 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.
7. Pennsylvania Department of Agriculture.

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. <i>Pennfine</i>)	98	0.15	90
Kentucky 31 Fescue (<i>Festuca elatior arundinacea</i>)	98	0.15	85
Crownvetch (<i>Coronilla varia</i> , var. <i>Penngift</i>)	99	0.10	65
Pennlawn Red Fescue (<i>Festuca rubra</i> , var. <i>Pennlawn</i>)	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: 100%

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.

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 re-rake.

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 and moisten prepared surface to receive sod.
- 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.
- B. Those areas which do not show a prompt catch of grass within 14 days of seeding or sodding shall be reseeded or re-sodded 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.

SEEDING RESTORATION TABLE

<u>RESTORATION CONDITION</u>	<u>TOPSOIL</u>	<u>LIME*</u>	<u>BASIC FERTILIZER</u>	<u>STARTER FERTILIZER</u>	<u>SEED MIX & SOWING RATE _____(% BY WEIGHT)</u>
Temporary Cover (PennDOT E)	N/A	1 Ton/Acre	5-5-5 @ 1000# /Acre	N/A	100% Annual Ryegrass Sow 10# per 1,000 Sq. Yds. March 15 thru October 15
Roadside; Non-mowed (PennDOT D)	Yes	800# per 1000 Sq.Yds.	10-20-20 @ 140# per 1000 Sq.Yds.	38-0-0 @ 50# per 1000 Sq.Yds. <u>or</u> 31-0-0 @ 61# per 1000 Sq.Yds.	70% Tall Fescue 30% Pennlawn Red Fescue Sow 21# per 1000 Sq. Yds. Mar. 15 thru May/Aug. thru Oct. 15
Roadside; Mowed (PennDOT B)	Yes	800# per 1000 Sq.Yds.	10-20-20 @ 140# per 1000 Sq.Yds.	38-0-0 @ 50# per 1000 Sq.Yds. <u>or</u> 31-0-0 @ 61# per 1000 Sq.Yds.	50% Kentucky Bluegrass 30% Pennlawn Red Fescue 20% Perennial Ryegrass Sow 21# per 1000 Sq.Yds. Mar. 15 thru May/Aug. thru Oct. 15
Bank Areas (PennDOT C)	Yes	800# per 1000 Sq.Yds.	No	38-0-0 @ 50# per 1000 Sq.Yds <u>or</u> 31-0-0 @ 61# per 1000 Sq.Yds.	45% Crownvetch 55% Annual Ryegrass Sow 9# per 1000 Sq. Yds. Anytime except Sept. and Oct.
Lawns (PennDOT B)	Yes	800# per 1000 Sq.Yds.	10-20-20 @ 140# per 1000 Sq.Yds.	38-0-0 @ 50# per 1000 Sq.Yds. <u>or</u> 31-0-0 @ 61# per 1000 Sq.Yds.	50% Kentucky Bluegrass 30% Pennlawn Red Fescue 20% Perennial Ryegrass Sow 21# per 1000 Sq.Yds. Mar. 15 thru May/Aug. thru Oct. 15
Open Fields; Non-Cultivated, Pasture	No	No	No	38-0-0 @ 50# per 1000 Sq.Yds. <u>or</u> 31-0-0 @ 61# per 1000 Sq.Yds.	100% Timothy Sow 10# per 1000 Sq.Yds. Mar. thru May/Aug. thru Sept.

*Unless lesser rate indicated by soils tests

SEEDING RESTORATION TABLE

<u>RESTORATION CONDITION</u>	<u>TOPSOIL</u>	<u>LIME*</u>	<u>BASIC FERTILIZER</u>	<u>START FERTILIZER</u>	<u>SEED MIX & SOWING RATE (% BY WEIGHT)</u>
Open Fields; Cultivated	No	No	No	38-0-0 @ 50# per 1000 Sq.Yds. <u>or</u> 31-0-0 @ 61# per 1000 Sq.Yds.	100% Annual Ryegrass Sow 10# per 1,000 Sq. Yds. March 15 thru Oct. 15
Woods; Sparse	No	No	10-20-20 @ 140# per 1000 Sq.Yds.	38-0-0 @ 50# per 1000 Sq.Yds. <u>or</u> 31-0-0 @ 61# per 1000 Sq.Yds.	100% Red Fescue Sow 36# per 1000 Sq. Yds. Mar. 15 thru May/Aug. thru Oct. 15
Sodding	Yes	800# per 1000 Sq.Yds.	10-20-20 @ 140# per 1000 Sq. Yds.	N/A	N/A
Basin/Channels	Yes	No	10-20-20 @ 140# Per 1000 Sq. Yds.	38-0-0 @ 50# per 1000 Sq. Yds <u>or</u> 31-0-0 @ 61# per 1000 Sq. Yds.	50% Tall Fescue, 25% Rough Bluegrass, 15% Reed Canary Grass, 10% Redtop

*Unless lesser rate indicated by soils test

END OF SECTION

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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:

- GT2500-1 Typical Minor/Collector Street Cross Section
- GT2500-2 Street Widening Detail
- GT2500-3 Temporary Cul-de-Sac Detail
- GT2500-4 Paved Driveway Apron Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

- Publication 408, Specifications
- Publication 213, Temporary 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.

3. Pennsylvania Code

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

4. Manual on Uniform Traffic Control Devices (2009 Edition)

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^o 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 Adams 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.
2. Reasonable access must be maintained for adjacent property owners and commercial properties.

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° F; in addition, the air temperature shall be forecast to remain at or above 45° F 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 as detailed on the Contract Drawings. 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.
 - a. Letters shall be composed of a combination of lower-case letters with initial upper-case letters. At a minimum, 6" high upper-case letters and 4.5" lower-case letters shall be used.
 - b. Street name signs shall have a green background with a white legend.

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.

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 Superpave binder HMA 19mm 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 eight inches of crushed aggregate base course and minimum three inches of Superpave HMA 19mm 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. Supply all water as needed.
 - 4. CONTRACTOR shall provide transitions from milled surfaces to non-milled surfaces to allow vehicular traffic during non-working hours.

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.
3. HMA Base Course- Where required, construct in accordance with Publication 408, Section 309.

B. Bituminous Surface Course (ID-2)

1. Construct binder course meeting the requirements of Publication 408 Specifications, Section 421 to compacted depth specified on the Contract Drawings.
2. Construct wearing surface meeting the requirements of Publication 408 Specifications, Section 420 to the compacted depth specified on the Contract Drawings.
3. Do not allow vehicular traffic on newly compacted bituminous material until the temperature cools below 140° F.

C. 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.

D. Bituminous Seal Coat (single application)

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

E. 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 PG64-22 or the same asphalt material used in mix design (PennDOT Publication 408 Specifications, Section 401.3 (k)).

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. The use of PG 64-22 may be permitted when approval is obtained from the Municipality.

3.05 SIGNS

- A. Install signs as specified by Municipality.
- B. Posts shall be installed in undisturbed earth with anchor top 4" above ground on lower slope side.
- C. Where posts are located in concrete, drill the existing concrete to place anchor. If in new concrete, place PVC sleeve in concrete prior to placing post.

3.06 FIELD QUALITY CONTROL

- A. Proof of product. 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.

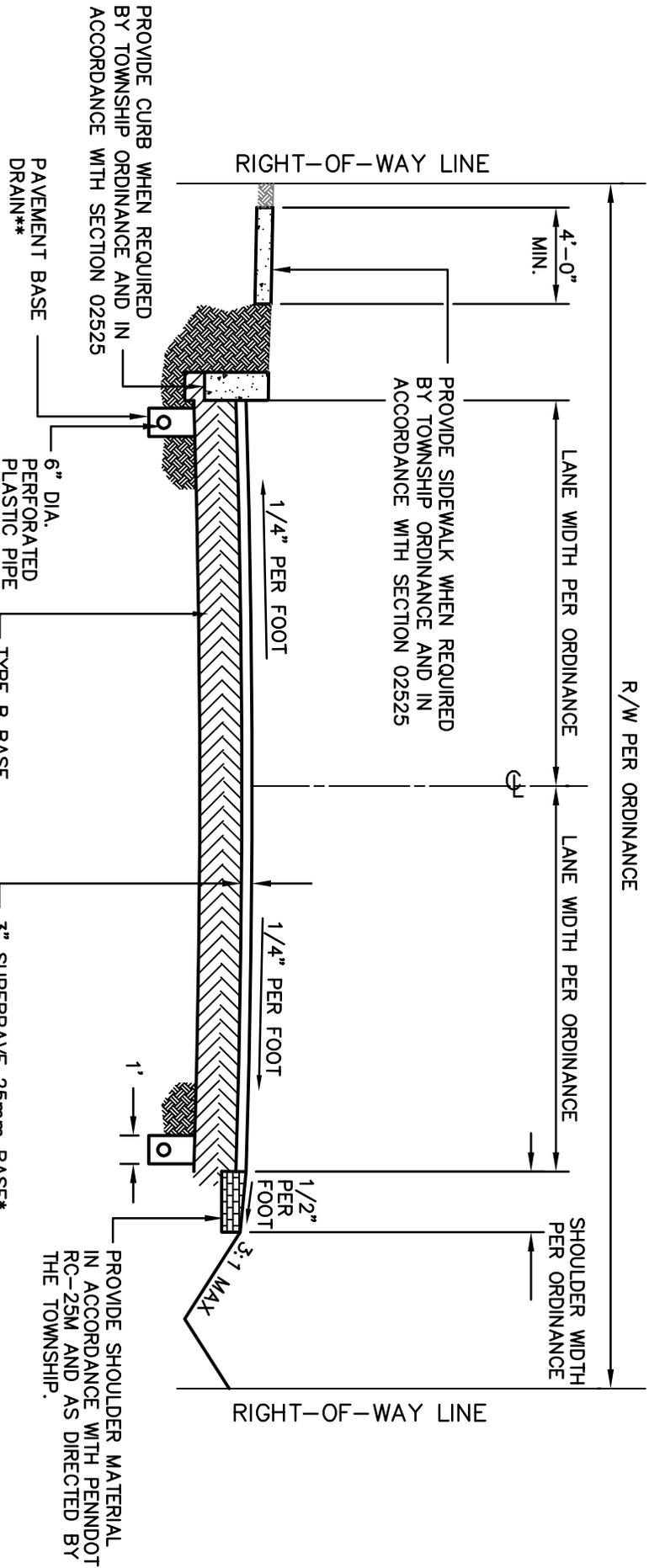
E. Tests for Depth of Finished Wearing Course.

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



PROVIDE CURB WHEN REQUIRED BY TOWNSHIP ORDINANCE AND IN ACCORDANCE WITH SECTION 02525

PROVIDE SIDEWALK WHEN REQUIRED BY TOWNSHIP ORDINANCE AND IN ACCORDANCE WITH SECTION 02525

PROVIDE SHOULDER MATERIAL IN ACCORDANCE WITH PENNDOT RC-25M AND AS DIRECTED BY THE TOWNSHIP.

NOTES:

1. MINIMUM ESAL = 0.0 TO 0.3 MILLION (MINOR) 0.3 TO 3.0 MILLION (COLLECTOR)
2. MINIMUM SRL = L (MINOR), L (COLLECTOR)
3. MINIMUM CBR = 6.0
4. ALL PETROLEUM GRADE TO BE 64-22
5. SLANT CURB MAY BE SUBSTITUTED FOR STRAIGHT CURB, WHEN APPROVED BY THE TOWNSHIP
6. EQUIVALENT MARSHALL MIXES MAY BE SUBSTITUTED, WHEN APPROVED BY THE TOWNSHIP

* THE 19mm BINDER COURSE MUST BE PLACED WITHIN ONE WEEK OF THE PLACEMENT OF THE 25mm BASE.

** PROVIDE PAVEMENT BASE DRAIN FOR 50 FEET ON EITHER SIDE OF VERTICAL SAG CURVES, WHERE STORM SEWER IS REQUIRED AND INTERFERES WITH PLACEMENT OF PAVEMENT BASE DRAIN, ELIMINATE PAVEMENT BASE DRAIN AND USE COMBINATION STORM SEWER AND UNDERDRAIN. SEE PENNDOT RC-30M.

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

TYPICAL MINOR/COLLECTOR STREET CROSS SECTION

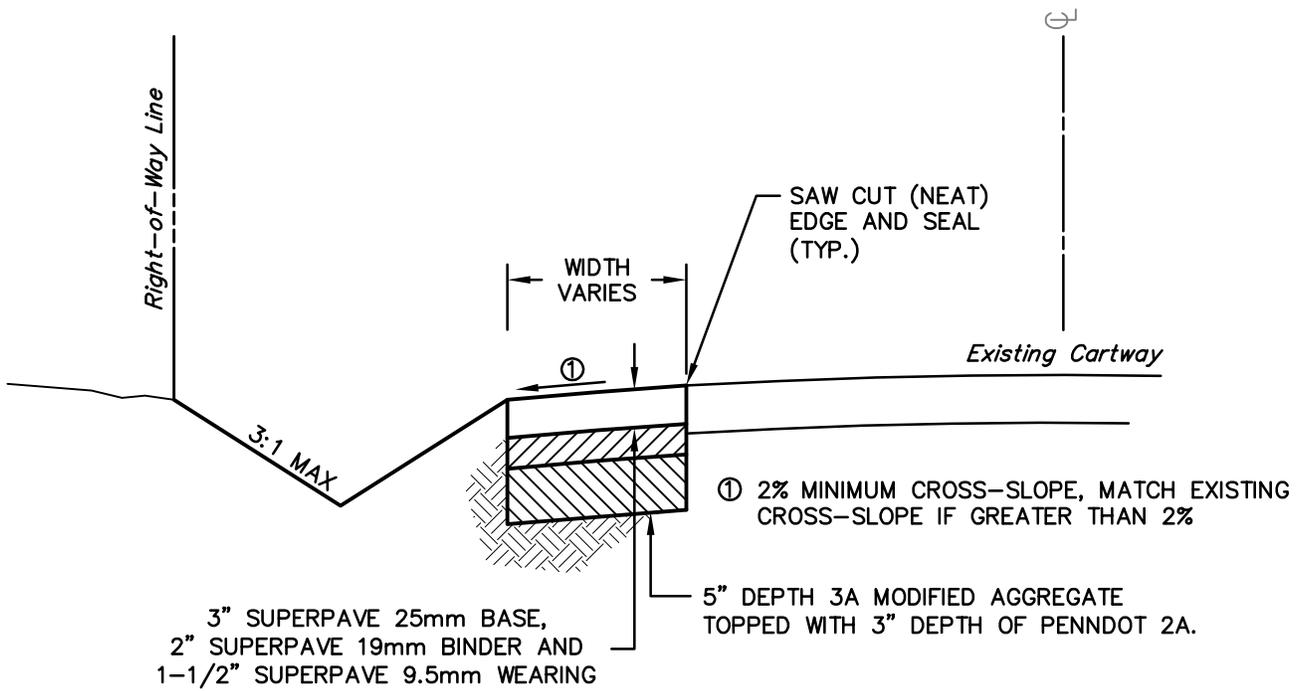
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FILE NO.	2680.1.01.00



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GERMANY TOWNSHIP

ADAMS COUNTY, PENNSYLVANIA



GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



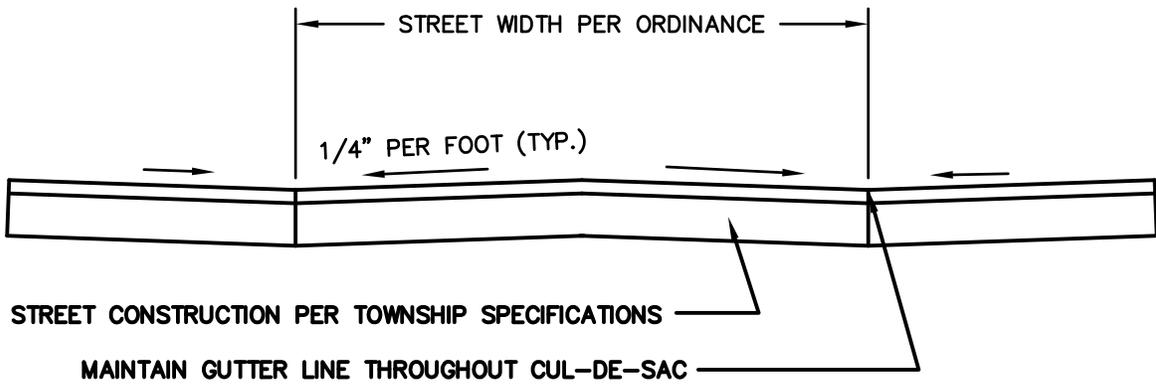
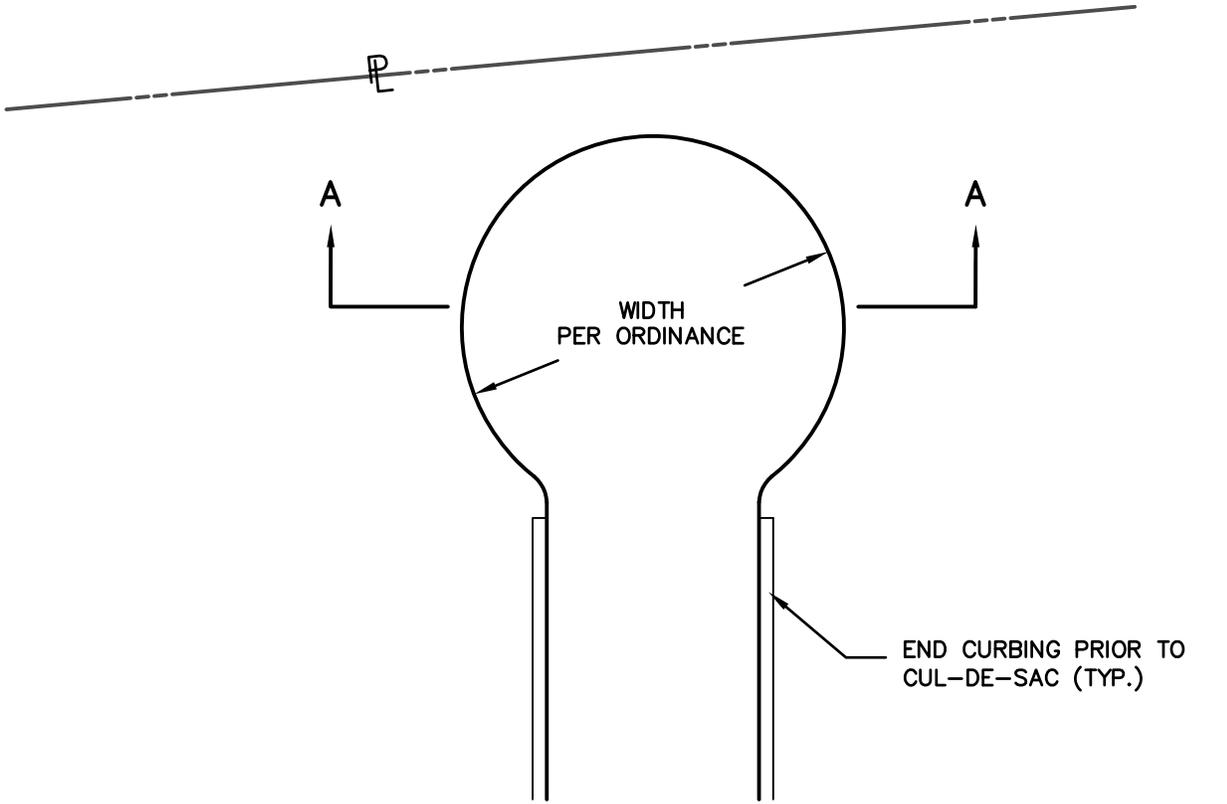
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STREET WIDENING DETAIL

GERMANY TOWNSHIP ADAMS COUNTY, PENNSYLVANIA

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SECTION A-A

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



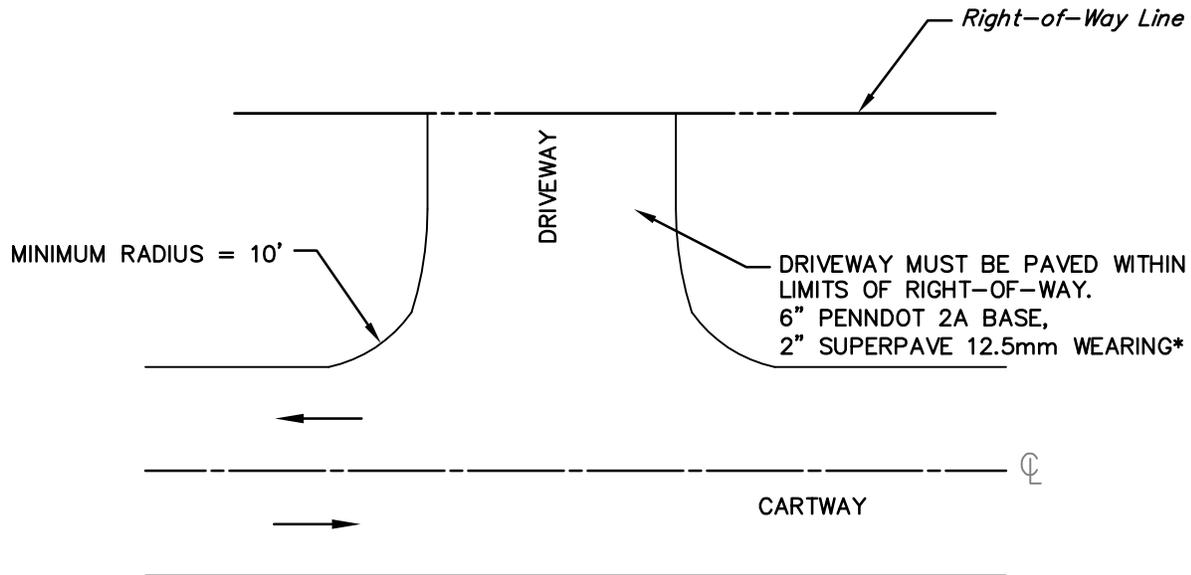
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TEMPORARY CUL-DE-SAC

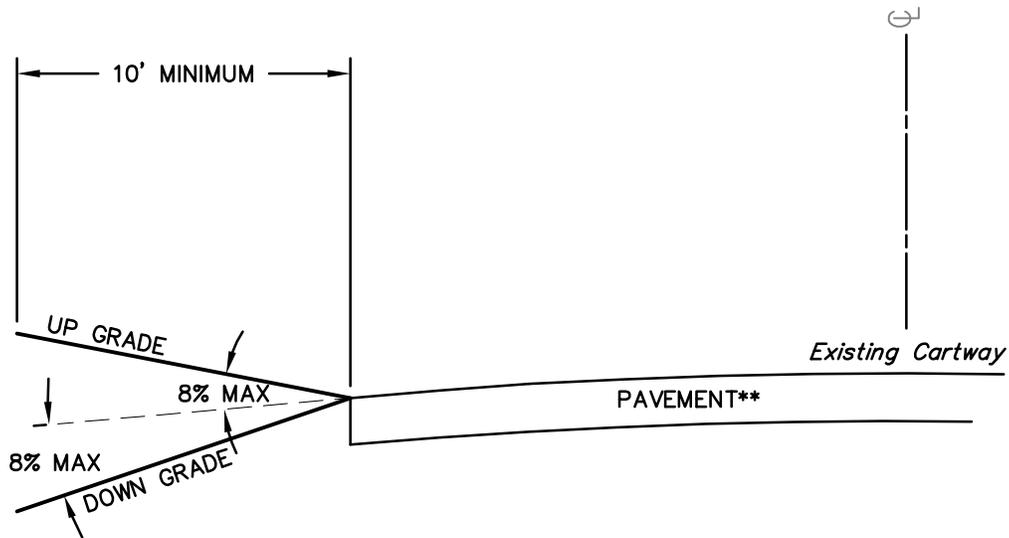
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DATE	3/19/2010
DWG. NO.	GT02500-3
FILE NO.	2680.1.01.00



* A SIMILAR MATERIAL MAY BE USED WHERE APPROVED BY THE TOWNSHIP

PLAN



** BEGIN DRIVEWAY AT EDGE OF PAVEMENT.

PROFILE

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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**PAVED DRIVEWAY
APRON DETAIL**

GERMANY TOWNSHIP ADAMS COUNTY , PENNSYLVANIA

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SCALE	N.T.S.
DATE	3/19/2010
DWG. NO.	GT02500-4
FILE NO.	2680.1.01.00

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
4. Construction of stamped (patterned) and colored concrete sidewalk

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:

- | | |
|------------|---|
| GT02525-1 | Vertical Concrete Curb Details |
| GT02525-2 | Slant Concrete Curb Details |
| GT02525-3 | Concrete Sidewalk Detail |
| GT02525-4 | Concrete Sidewalk at Driveway Details |
| GT02525-5 | Type 1 Double Curb Ramp Detail |
| GT02525-6 | Type 1 Double Curb Ramp Details (Alternate) |
| GT02525-7 | Type 1 Curb Ramp Detail |
| GT02525-8 | Type 1A Curb Ramp Detail |
| GT02525-9 | Type 2 Curb Ramp Detail |
| GT02525-10 | Type 3 Parallel Curb Ramp Detail |
| GT02525-11 | Type 3 Perpendicular Curb Detail |
| GT02525-12 | Type 4 Combination Curb Ramp Detail |
| GT02525-13 | Type 4A Combination Curb Ramp Detail |
| GT02525-14 | Detectable Warning Surface Detail |
| GT02525-15 | Roof Leader Under Sidewalk Detail |

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation:

Publication 408, Specifications

02525-1

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. All on-site testing as well as laboratory testing shall 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. The Contractor will employ traffic control measures in accordance with the MUTCD and with PennDOT Publication 213.

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. Portland Cement Concrete shall be air-tested and have a minimum 28 day compressive strength of 3,300 psi unless specified higher by Municipality.

B. Cement concrete criteria for curbs and sidewalks:

Slump:	1" minimum, 5" maximum
Air Content:	4.5% minimum, 7.5% maximum
Temperature:	50° F minimum, 90° F 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. Curbing repairs (less than 10 feet)

1. Approved metal forms.
2. Adjust to match existing conditions.

E. Machine placed curbing:

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

2.03 REINFORCEMENT

- A. Welded Wire Fabric – ASTM A185. Size and spacing as shown on Standard Details.
- B. Reinforcing bars – ASTM A615, Grade 60 billet steel, size and spacing as shown on Standard Details.

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. Form release agents shall be non-staining, liquid chemical coatings free of kerosene and on which effectively prevent absorption of moisture into the forms and bonding of the concrete to the forms.

2.06 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, Sealight 1100, Klear Seal R-75 or Enviocure Clear 500, or Similar material.

2.07 STAINED COLORED CONCRETE

- A. Concrete, reinforcement, joint material and forms- see above paragraph.
- B. Template Pattern – “old brick running board” by Matcrete (800.777.7063), or equal.
- C. Pigment-Brick Red # 10160 by Davis Colors, Los Angeles, CA or equal.
- D. Clear Sealer- Sonneborn # 800 as Manufactured by Sonneborn or equal.
- E. Template release agent dry blend powder.

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 as per standard detail.
- F. Concrete shall be placed in accordance with Section 03000, Paragraph 3.05.
- 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. Unless otherwise indicated on the drawings, the last three feet of curb shall be tapered to a 1 1/2" reveal with expansion joint at the beginning of taper.
- K. Finish top surface with wood floats. Provide depressions for drainage, driveways, and ramps for the handicapped per the approved drawings.
- L. Tool all exposed edges to the specified radius.
- M. Do not remove forms until concrete has set.
- N. Begin proper curing in accordance with Section 03000, immediately after placement.
- O. Correct minor irregularities with a carborundum stone or mortar comprised of two parts fine aggregate to one part cement.

- P. 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, and 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. All handicap ramps shall have detectible warning domes as shown on drawing GT-02525-14.
- 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 8" thick.
- F. Spread AASHTO #57 aggregate and compact to the thickness shown on the Standard Details.
- G. 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.
- H. 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.
- I. Apply light broom finish as specified in Section 03000, immediately after that finish.
- J. 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.
- K. Begin proper curing in accordance with Section 03000, immediately following form removal.

3.03 STAMPED AND COLORED CONCRETE SIDEWALKS

- A. Excavate, place stone base and place expansion joints and reinforcing similarly to plain concrete sidewalks.
- B. Pigment must be thoroughly mixed throughout concrete using ratios consistent with manufacturer's recommendations. Apply float finish and edge.
- C. Sprinkle release agent onto fresh concrete prior to stamping with template.
- D. Remove release agent by power washing approximately 24 hours after stamping is complete, or as recommended by the manufacturer.

- E. Apply clear sealer to all concrete surfaces.
- F. Release agent, pigment and sealer must be from same manufacturer or proven to be compatible with each other.

3.04 HANDICAP RAMPS

The following requirements shall be followed in all construction of handicap ramps, where these requirements are less stringent or different from ADA requirement, the ADA requirements shall govern.

A. Sidewalks

1. Sidewalk cross slopes shall not exceed 2%.
2. A minimum of 36" pedestrian path of travel, clear of obstructions, grates and other openings, shall be provided along the run of a sidewalk. A 42" pedestrian path of travel is preferred.
3. Objects shall not project more than 4 inches into the pedestrian path of travel between 27" and 80" above the sidewalk surface unless a detection barrier is provided beneath the object at a maximum of 4" less than the projection into the pedestrian path of travel.
4. All sidewalks shall conform to FHWA guidelines latest revisions.

B. Driveway aprons

1. Driveway aprons shall provide a minimum of 36" pedestrian path of travel, clear of obstructions, grates and other openings, in line with the run of a sidewalk with a maximum cross slope of 2%.

C. Curb ramps

1. Curb ramps shall have a maximum slope of 1:12.
2. The sum of the percent slope of the curb ramp and the roadway cross slope, when added together as positive values, shall not exceed 13%.
3. Curb ramps shall have a minimum width of 4 feet.
4. Curb ramps shall be constructed flush, without a reveal, at the edge of the roadway surface.
5. Curb ramps shall be perpendicular to the curb.
6. Curb ramps shall be within the crosswalk if a crosswalk exists.
7. Flares shall be provided at a maximum slope of 1:10 when a curb ramp is located in the pedestrian path of travel.

8. Return curbs shall only be provided in areas outside the pedestrian path of travel or walkway.
9. Curb ramps shall comply with PennDOT Standards RC-67M latest revisions.

D. Diagonal Curb ramps

1. Diagonal curb ramps shall not be permitted in new construction. For projects proposing improvements to handicap facilities, diagonal curb ramps shall be permitted on a case to case basis as determined by the Municipality.
2. Diagonal curb ramps shall have a minimum 4' x 4' maneuvering space at the bottom of the ramp. The maneuvering space shall have a maximum 2% cross-slope in any direction. The maneuvering space shall be within the projected curb line measured from the point of curvature and point of tangent to the point of intersection of the project curb lines. The maneuvering space shall be within the crosswalk delineation.
3. Diagonal curb ramps having flared sides shall have at least a 24 inch long segment of straight curb located on each side of the curb ramp and within the marked crossings.

E. Detectable Warning Surfaces

1. Detectable warnings shall provide significantly contrasting texture and light reflective color.
2. Detectable warnings shall be the width of the curb ramp and two feet in depth.
3. Detectable warnings shall be provided at a maximum 8" from the roadway surface.
4. Detectable warnings may be considered part of the ramp portion of the curb ramp.
5. Truncated domes within the detectable warnings surface shall provide domes in alignment with the direction of travel.
6. Truncated domes shall have a diameter of 0.9 inches, a height of 0.2 inches and a center to center spacing of 2.35 inches and shall contrast visually with adjoining surfaces, either light on dark, or dark on light.
7. Detectable warning surfaces shall be safety yellow composite inlaid tile type as approved in PennDOT Publication 15.

F. Landing Areas

1. A landing area shall be provided at any curb ramp where there is more than one pedestrian path of travel accessible to the curb ramp.
2. Landing areas shall be provided as required in accordance with Federal regulations.
3. Landing areas shall have a 60" clear turning diameter with a maximum slope of 2% in any direction

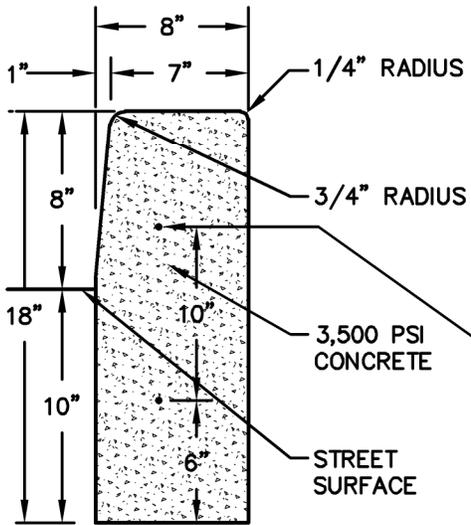
4. Landing areas shall be provided at the following locations:
 - every location the pedestrian path of travel would change direction
 - at any location where the rise of a ramp exceeds 30 inches.
5. The landing area shall be at least as wide as the ramp run leading to it.

3.05 BACKFILLING AND RESTORATION

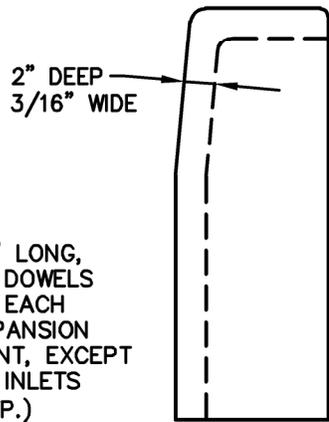
- A. Temporary backfill at curbs shall consist of select granular material per Section 02221, front and back, to within 8" of top of curb.
- B. Restore adjacent areas as indicated in Section 02575.

END OF SECTION

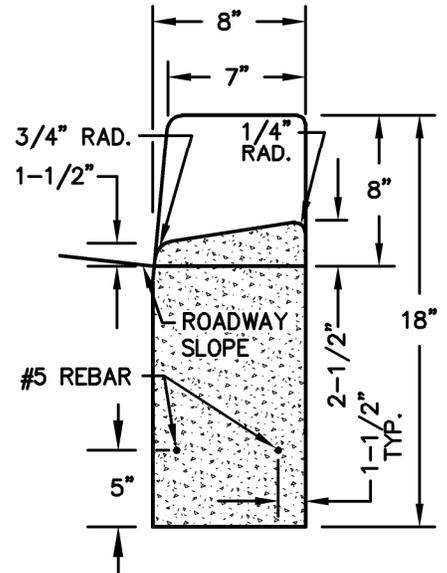
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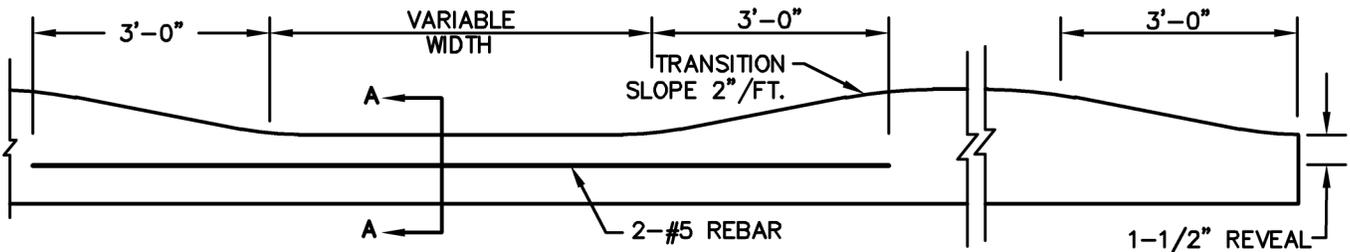
TYPICAL CROSS SECTION



CONTRACTION JOINT



SECTION A-A



DEPRESSED CURBS FOR DRIVES

TERMINAL SECTION

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



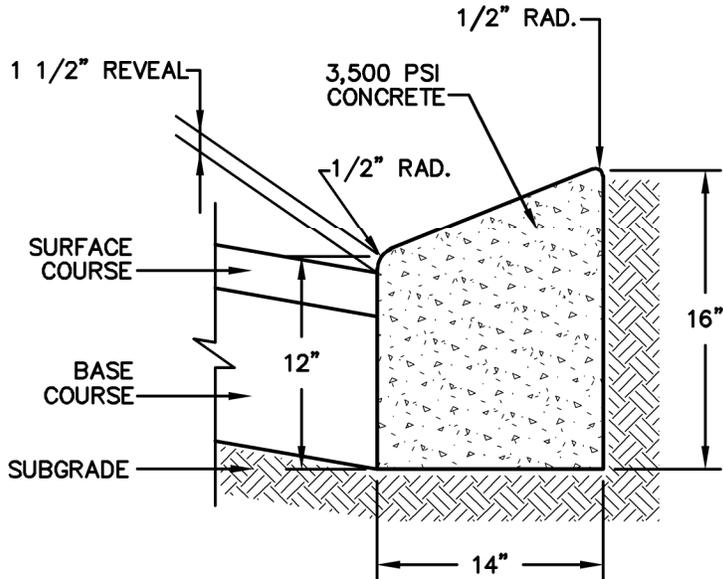
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VERTICAL CONCRETE CURB DETAILS

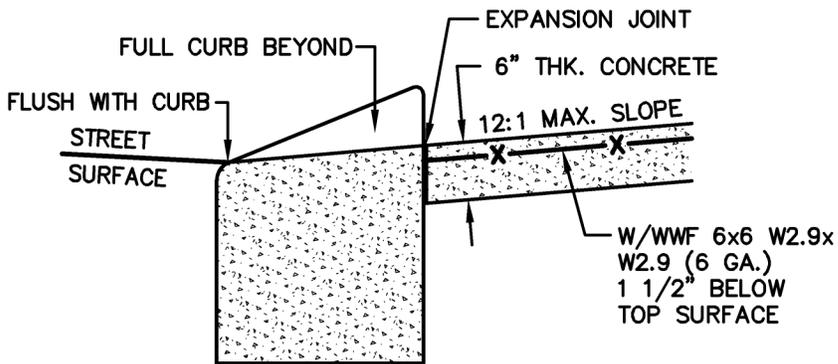
GERMANY TOWNSHIP ADAMS COUNTY, PENNSYLVANIA

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FILE NO.	2680.1.01.00



TYPICAL CROSS SECTION

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



CROSS SECTION AT HANDICAP RAMPS

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



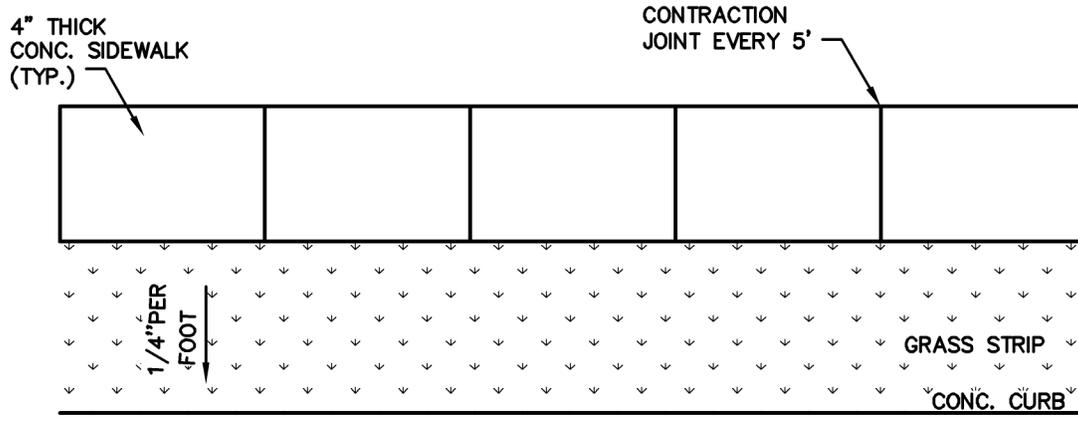
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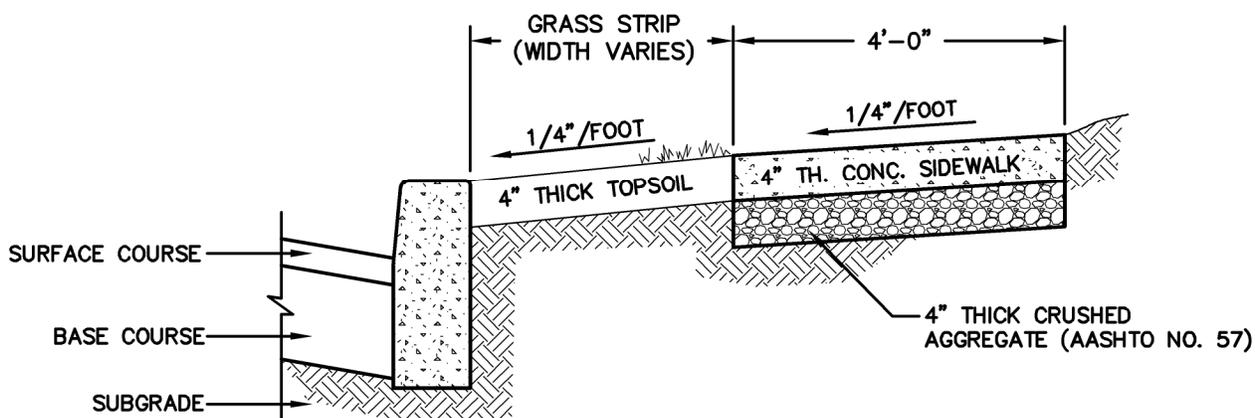
SLANT CONCRETE CURB DETAILS

GERMANY TOWNSHIP ADAMS COUNTY , PENNSYLVANIA

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PLAN



TYPICAL SECTION

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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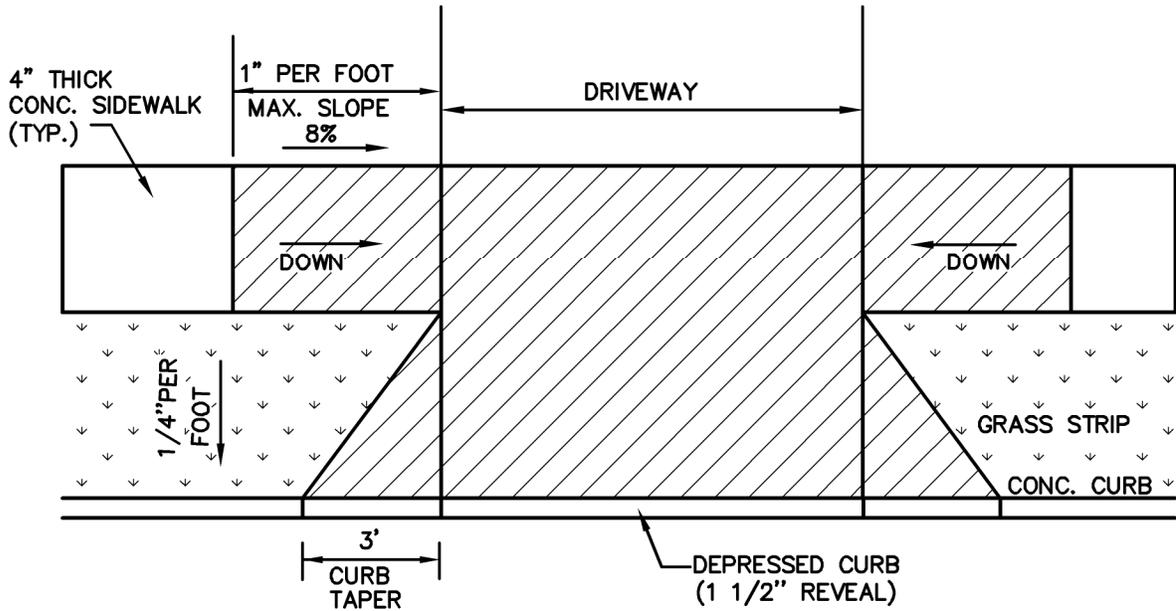
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CONCRETE SIDEWALK DETAIL

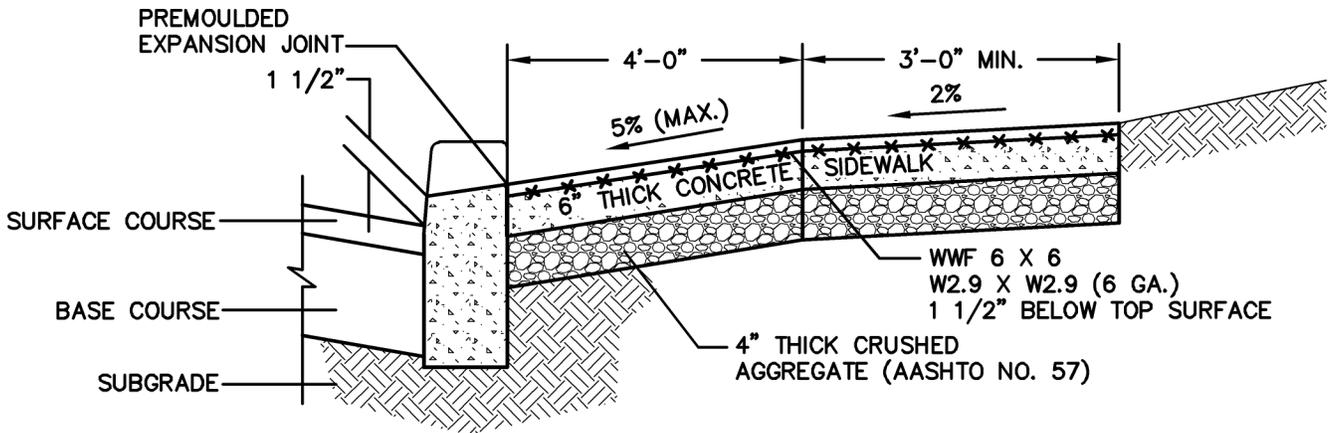
GERMANY TOWNSHIP ADAMS COUNTY, PENNSYLVANIA

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DWG. NO.	GT02525-3
FILE NO.	2680.1.01.00

 6" THICK, REINF. CONCRETE SIDEWALK



PLAN



TYPICAL SECTION

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



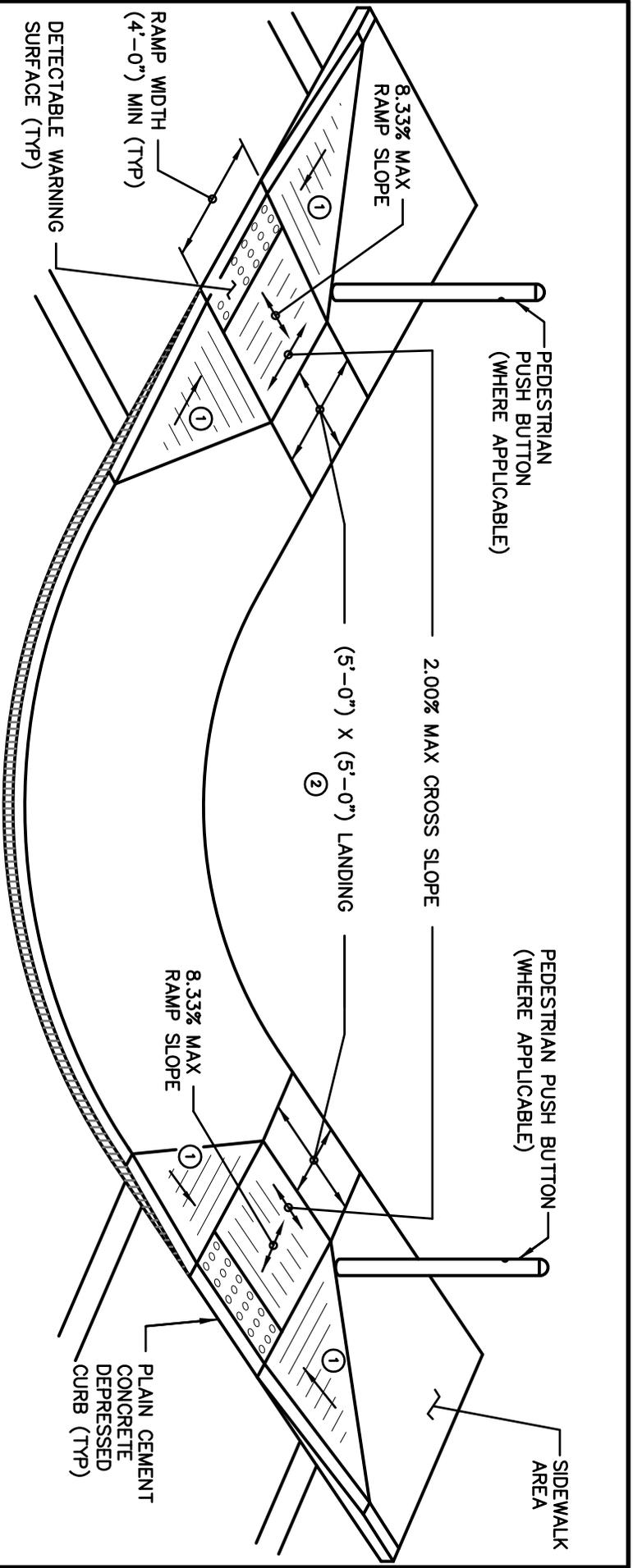
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CONCRETE SIDEWALK AT DRIVEWAY DETAILS

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FILE NO.	2680.1.01.00



- ① SIDE FLARES 10.00% MAX SLOPE
- ② 5' X 5' LANDING SHALL PROVIDE 60" CLEAR TURNING RADIUS.

- NOTES:
1. LANDING AREAS SHALL BE AT LEAST AS WIDE AS THE CURB RAMPS.
 2. CURB RAMPS SHALL BE CONSTRUCTED FLUSH AT THE EDGE OF THE ROADWAY SURFACE.
 3. DETECTABLE WARNINGS SHALL BE IN ACCORDANCE WITH TOWNSHIP SPECIFICATIONS AND SHALL MEET ALL FEDERAL REGULATIONS.
 4. PROVIDE 1/2" THICK EXPANSION JOINT WHERE CURB RAMP ADJOINS ANY RIGID PAVEMENT, SIDEWALK OR STRUCTURE WITH THE TOP OF JOINT FILLER FLUSH WITH ADJACENT CONCRETE SURFACE.
 5. ALL CURB RAMPS SHALL COMPLY WITH PennDOT ROADWAY CONSTRUCTION STANDARDS RC-67M LATEST REVISION.

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

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FILE NO.	2680.1.01.00



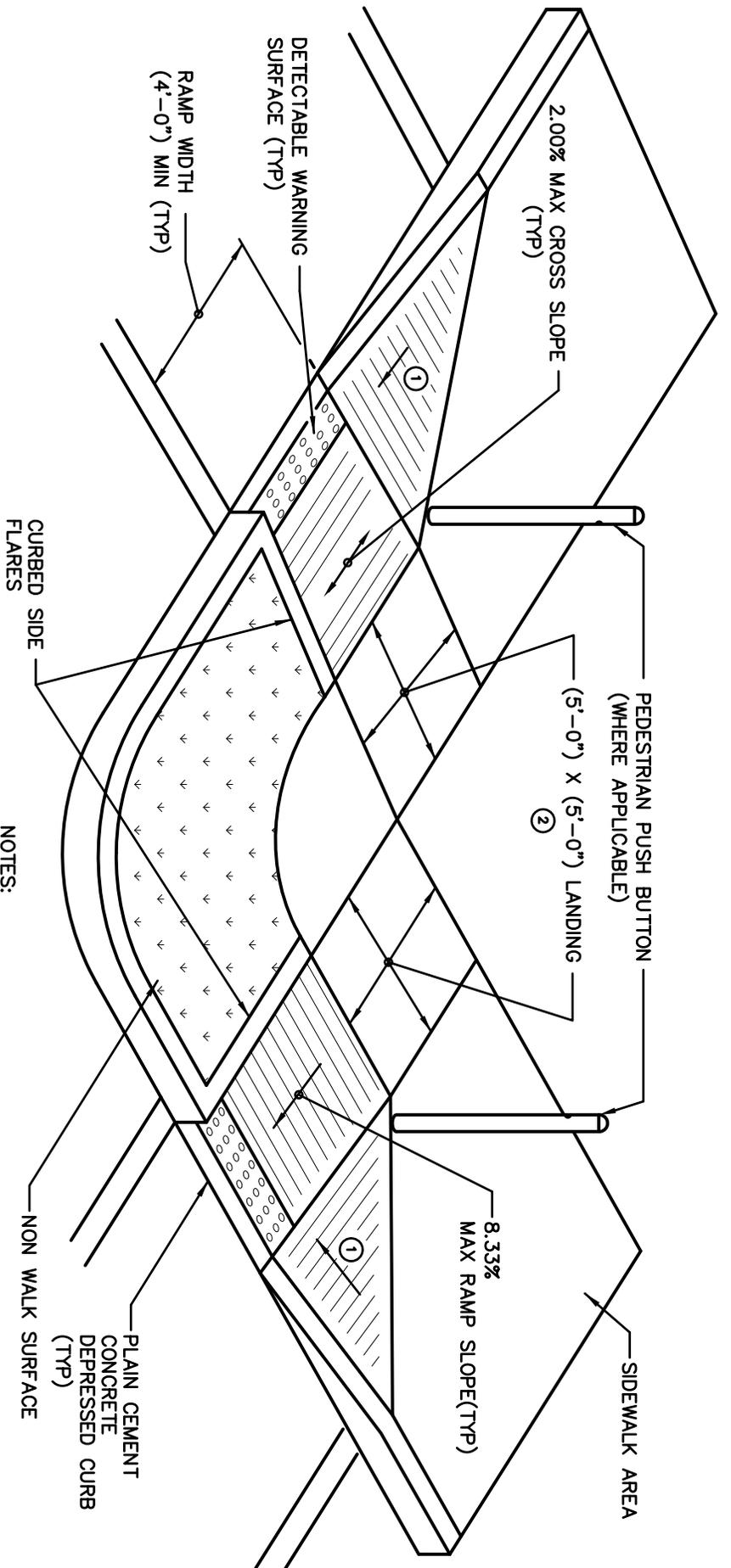
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TYPE 1 DOUBLE CURB RAMP DETAIL

GERMANY TOWNSHIP

ADAMS COUNTY, PENNSYLVANIA



- ① SIDE FLARES 10.00% MAX SLOPE.
- ② 5' X 5' LANDING SHALL PROVIDE 60" CLEAR TURNING RADIUS.

- NOTES:
1. LANDING AREAS SHALL BE AT LEAST AS WIDE AS THE CURB RAMPS.
 2. CURB RAMPS SHALL BE CONSTRUCTED FLUSH AT THE EDGE OF THE ROADWAY SURFACE.
 3. DETECTABLE WARNINGS SHALL BE IN ACCORDANCE WITH TOWNSHIP SPECIFICATIONS AND SHALL MEET ALL FEDERAL REGULATIONS.
 4. ALL CURB RAMPS SHALL COMPLY WITH PENNDOT ROADWAY CONSTRUCTION STANDARDS RC-67M LATEST REVISION.

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FILE NO.	2680.1.01.00

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

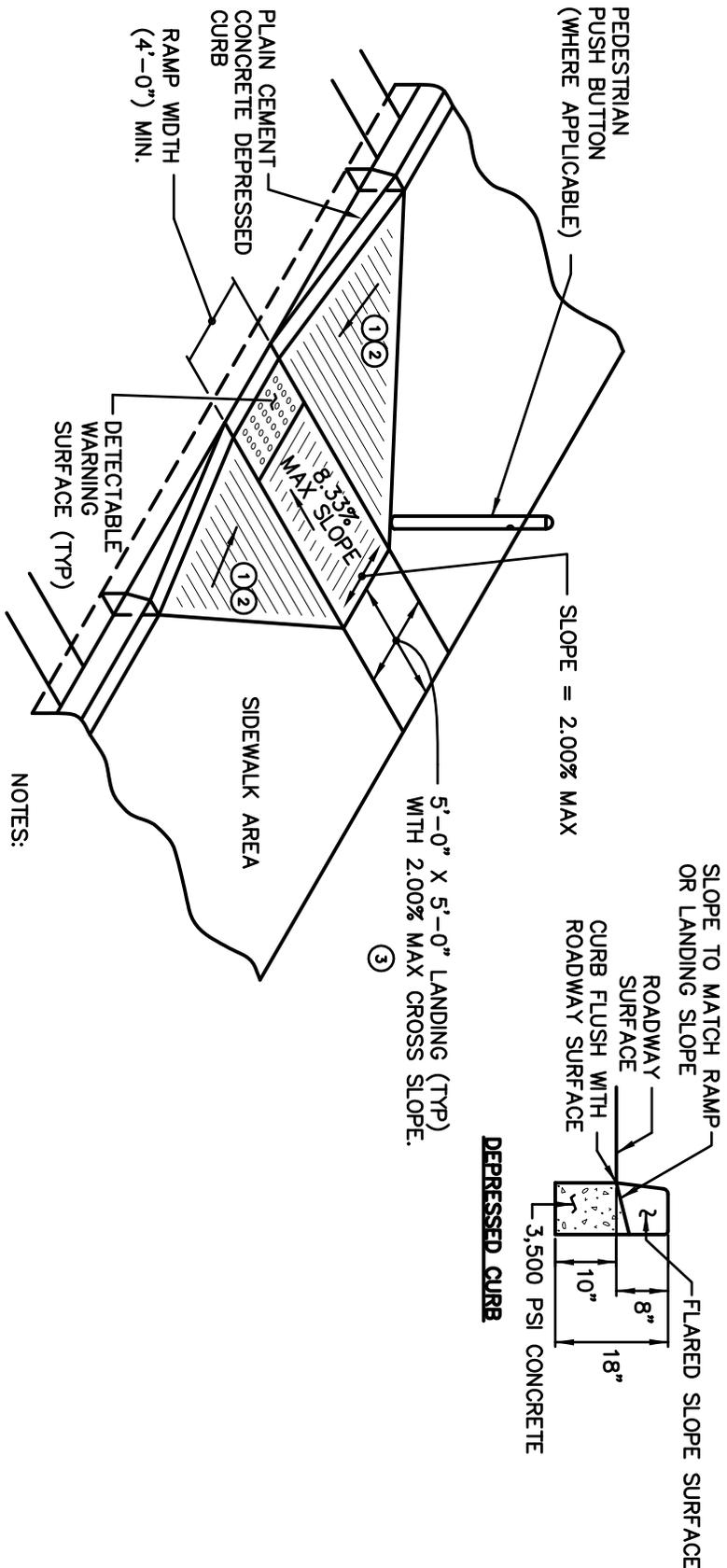


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TYPE 1 DOUBLE CURB RAMP DETAIL (ALTERNATE)

GERMANY TOWNSHIP

ADAMS COUNTY, PENNSYLVANIA



- ① SIDE FLARES 10.00% MAX SLOPE
- ② PROVIDE 1/2" THICK EXPANSION JOINT WHERE CURB RAMP ADJOINS ANY RIGID PAVEMENT, SIDEWALK OR STRUCTURE WITH THE TOP OF JOINT FILLER FLUSH WITH ADJACENT CONCRETE SURFACE.
- ③ 5'-0" X 5'-0" FOOT LANDING SHALL PROVIDE 60" CLEAR TURNING RADIUS.

- NOTES:
1. LANDING AREA SHALL BE AT LEAST AS WIDE AS THE CURB RAMP.
 2. CURB RAMPS SHALL BE CONSTRUCTED FLUSH AT THE EDGE OF THE ROADWAY SURFACE.
 3. DETECTABLE WARNINGS SHALL BE IN ACCORDANCE WITH TOWNSHIP SPECIFICATIONS AND SHALL MEET ALL FEDERAL REGULATIONS.
 4. ALL CURB RAMPS SHALL COMPLY WITH PennDOT ROADWAY CONSTRUCTION STANDARDS RC-67M LATEST REVISION.

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

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DWG. NO.	GT02925-7
FILE NO.	2680.1.01.00

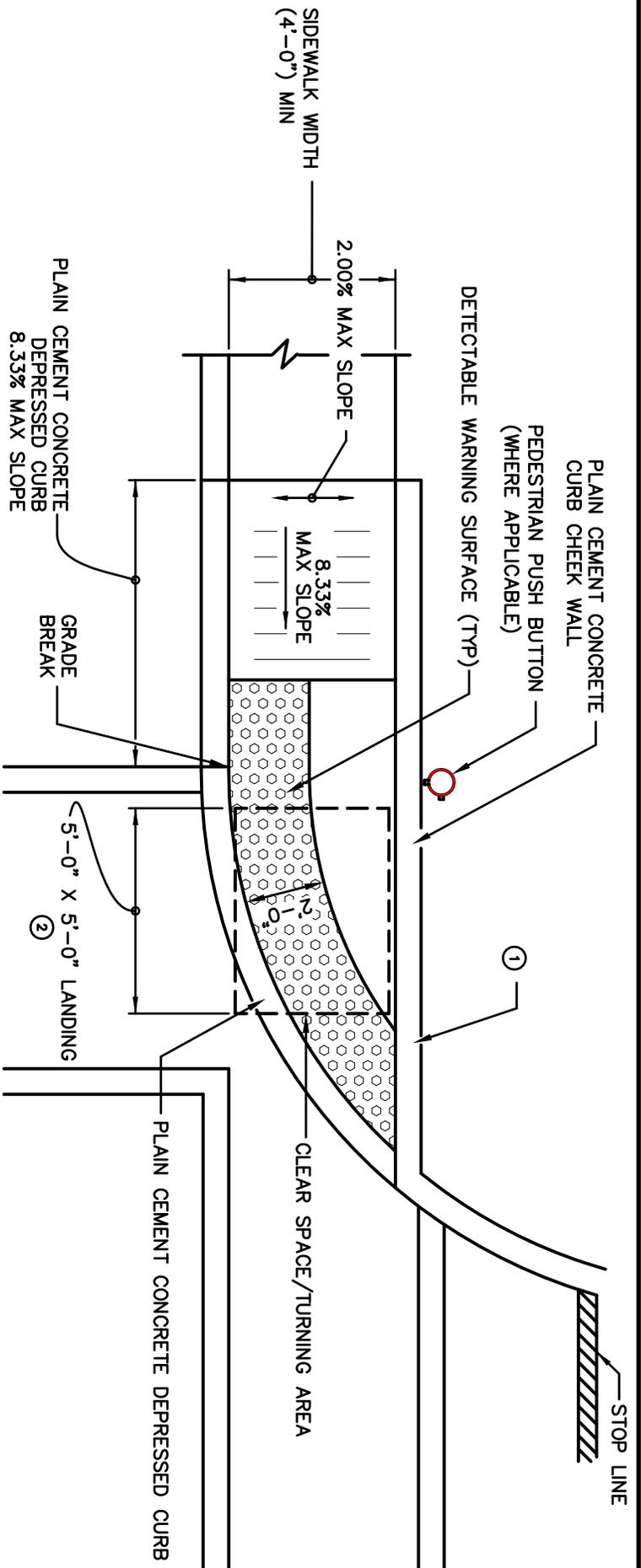


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TYPE 1 CURB RAMP DETAIL

GERMANY TOWNSHIP

ADAMS COUNTY, PENNSYLVANIA



- ① OPTIONAL ROLLED CONCRETE SURFACE OR REGRADE SLOPE CAN BE USED TO MEET THE ADJACENT SURFACES IN LIEU OF A RETURN CURB CHEEK WALL.
- ② 5' X 5' LANDING SHALL PROVIDE 60° CLEAR TURNING RADIUS OUTSIDE THE TRAVEL LANE.

- NOTES:
1. LANDING AREAS SHALL BE AT LEAST AS WIDE AS THE CURB RAMPS.
 2. CURB RAMPS SHALL BE CONSTRUCTED FLUSH AT THE EDGE OF THE ROADWAY SURFACE.
 3. DETECTABLE WARNINGS SHALL BE IN ACCORDANCE WITH TOWNSHIP SPECIFICATIONS AND SHALL MEET ALL FEDERAL REGULATIONS.
 4. PROVIDE 1/2" THICK EXPANSION JOINT WHERE CURB RAMP ADJOINS ANY RIGID PAVEMENT, SIDEWALK OR STRUCTURE WITH THE TOP OF JOINT FILLER FLUSH WITH ADJACENT CONCRETE SURFACE.
 5. CLEAR SPACE SHALL BE LOCATED WITHIN MARKINGS AND OUTSIDE OF TRAVEL LANE.
 6. ALL CURB RAMPS SHALL COMPLY WITH PennDOT ROADWAY CONSTRUCTION STANDARDS RC-67M LATEST REVISION.

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

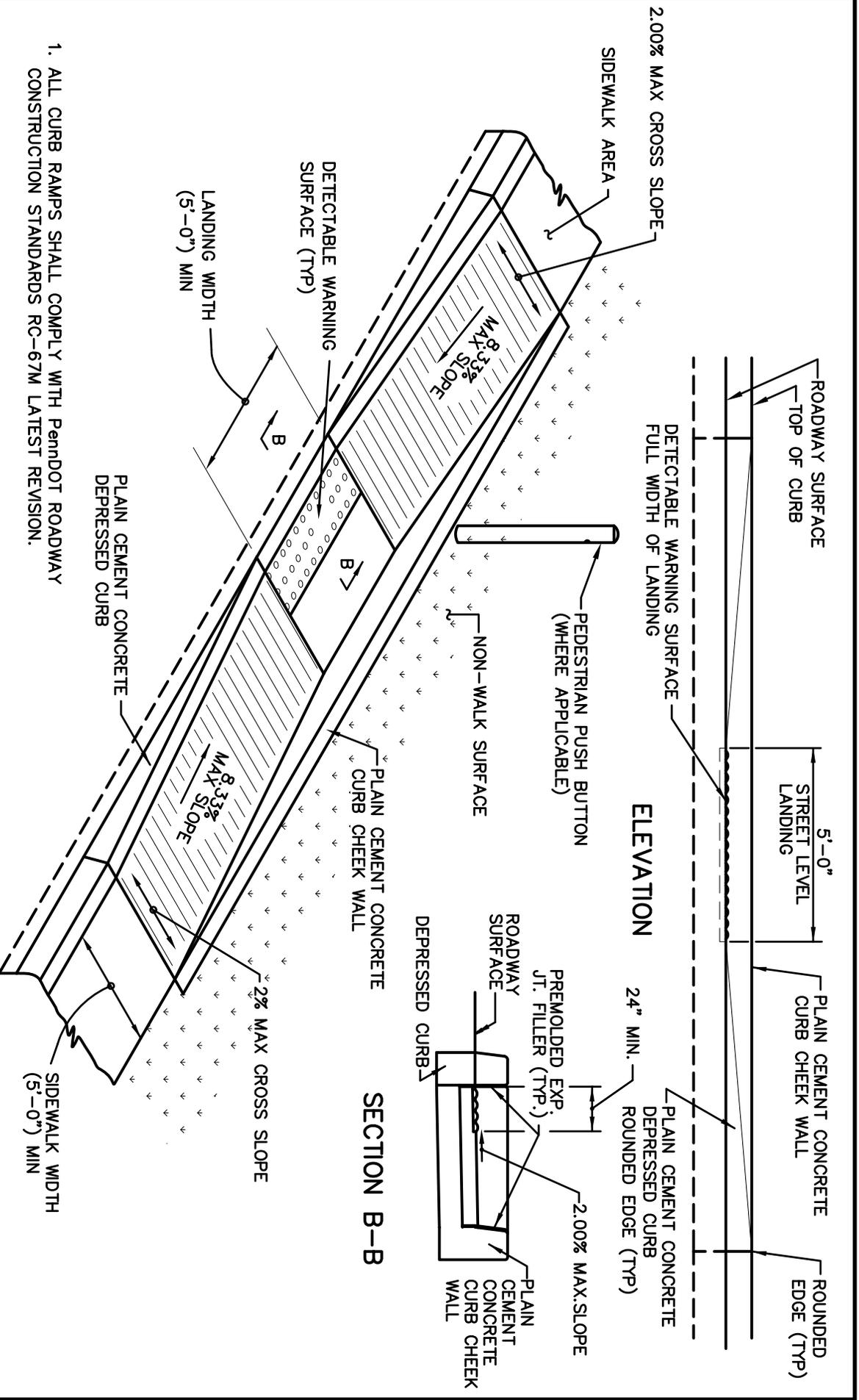


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GERMANY TOWNSHIP
 TYPE 1A CURB RAMP DETAIL
 ADAMS COUNTY, PENNSYLVANIA



1. ALL CURB RAMPS SHALL COMPLY WITH PennDOT ROADWAY CONSTRUCTION STANDARDS RC-67M LATEST REVISION.

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DATE	3/19/2010
DWG. NO.	GT02925-9
FILE NO.	2680.1.01.00

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

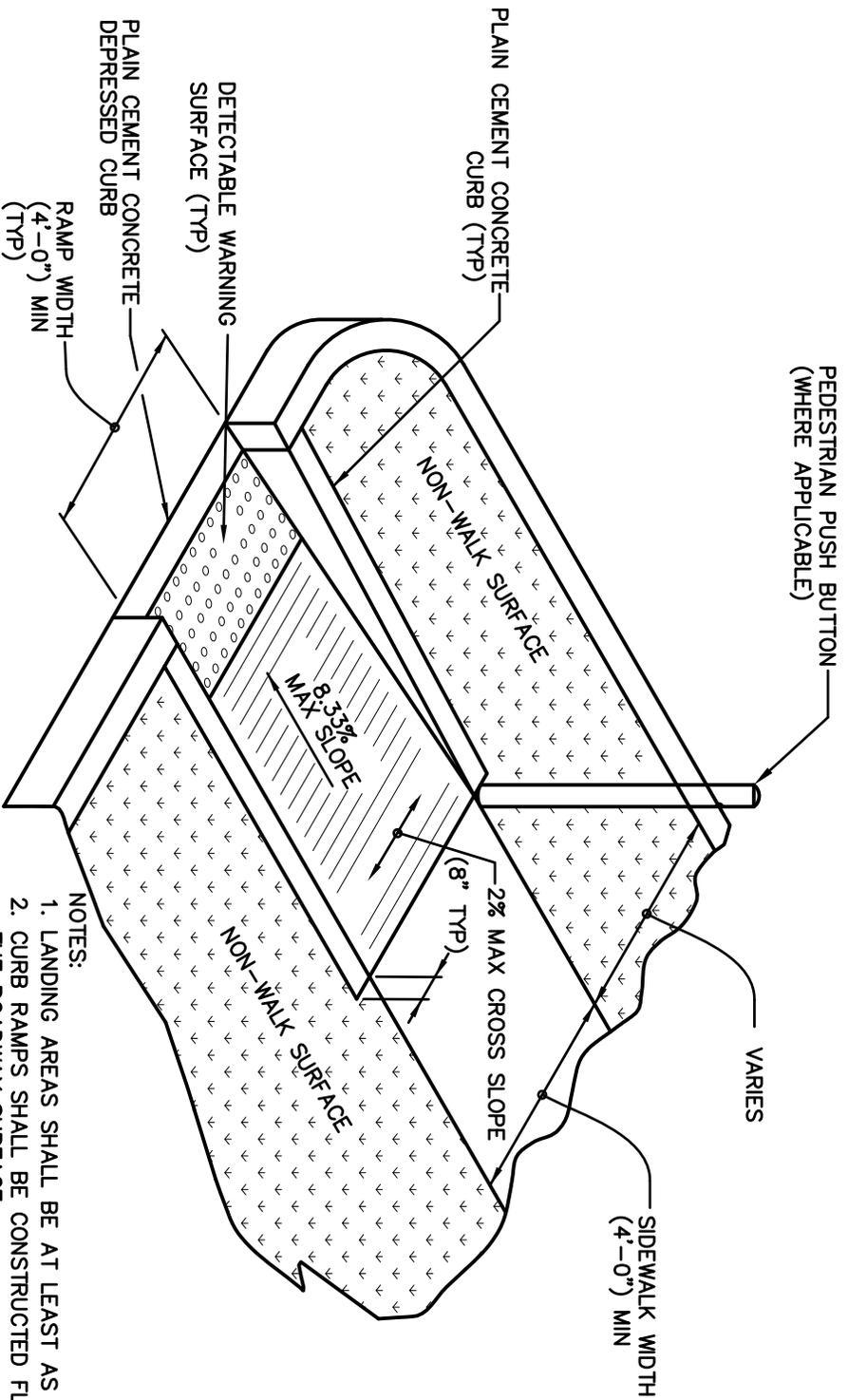


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TYPE 2 CURB RAMP DETAIL

GERMANY TOWNSHIP

ADAMS COUNTY, PENNSYLVANIA



- NOTES:
1. LANDING AREAS SHALL BE AT LEAST AS WIDE AS THE CURB RAMPS.
 2. CURB RAMPS SHALL BE CONSTRUCTED FLUSH AT THE EDGE OF THE ROADWAY SURFACE.
 3. DETECTABLE WARNINGS SHALL BE IN ACCORDANCE WITH TOWNSHIP SPECIFICATIONS AND SHALL MEET ALL FEDERAL REGULATIONS.
 4. PROVIDE 1/2" THICK EXPANSION JOINT WHERE CURB RAMP ADJOINS ANY RIGID PAVEMENT, SIDEWALK OR STRUCTURE WITH THE TOP OF JOINT FILLER FLUSH WITH ADJACENT CONCRETE SURFACE.
 5. ALL CURB RAMPS SHALL COMPLY WITH PennDOT ROADWAY CONSTRUCTION STANDARDS RC-67M LATEST REVISION.

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

TYPE 3 PARALLEL CURB RAMP DETAIL

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SCALE	N.T.S.
DATE	3/19/2010
DWG. NO.	GT02525-10
FILE NO.	2680.1.01.00

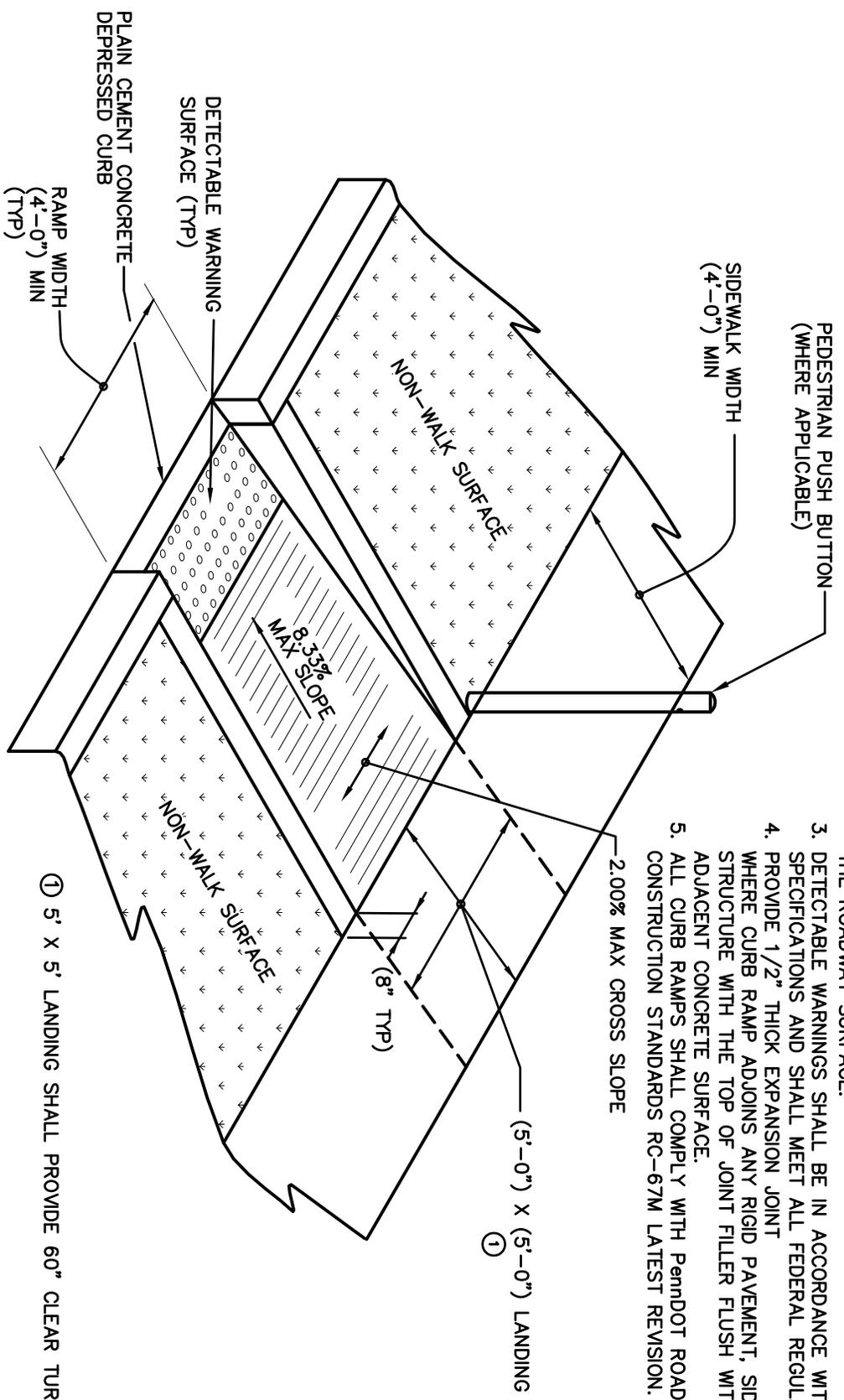


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GERMANY TOWNSHIP

ADAMS COUNTY, PENNSYLVANIA



- NOTES:
1. LANDING AREAS SHALL BE AT LEAST AS WIDE AS THE CURB RAMPS.
 2. CURB RAMPS SHALL BE CONSTRUCTED FLUSH AT THE EDGE OF THE ROADWAY SURFACE.
 3. DETECTABLE WARNINGS SHALL BE IN ACCORDANCE WITH TOWNSHIP SPECIFICATIONS AND SHALL MEET ALL FEDERAL REGULATIONS.
 4. PROVIDE 1/2" THICK EXPANSION JOINT WHERE CURB RAMP ADJOINS ANY RIGID PAVEMENT, SIDEWALK OR STRUCTURE WITH THE TOP OF JOINT FILLER FLUSH WITH ADJACENT CONCRETE SURFACE.
 5. ALL CURB RAMPS SHALL COMPLY WITH PennDOT ROADWAY CONSTRUCTION STANDARDS RC-67M LATEST REVISION.

① 5' X 5' LANDING SHALL PROVIDE 60° CLEAR TURNING RADIUS.

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DWG. NO.	GT02525-11
FILE NO.	2680.1.01.00

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



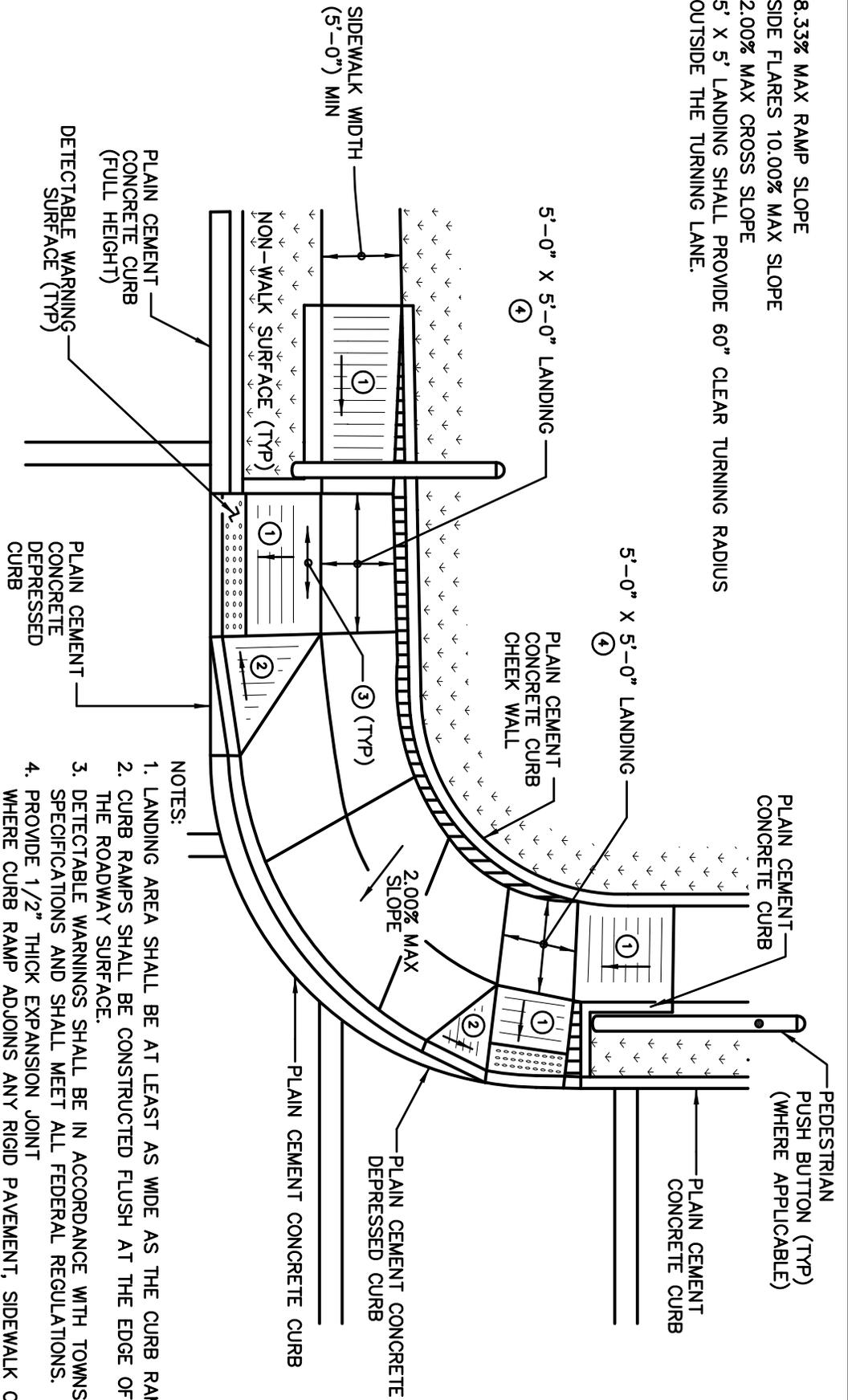
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TYPE 3 PERPENDICULAR CURB RAMP DETAIL

GERMANY TOWNSHIP

ADAMS COUNTY, PENNSYLVANIA

- ① 8.33% MAX RAMP SLOPE
- ② SIDE FLARES 10.00% MAX SLOPE
- ③ 2.00% MAX CROSS SLOPE
- ④ 5' X 5' LANDING SHALL PROVIDE 60" CLEAR TURNING RADIUS OUTSIDE THE TURNING LANE.



- NOTES:
1. LANDING AREA SHALL BE AT LEAST AS WIDE AS THE CURB RAMPS.
 2. CURB RAMPS SHALL BE CONSTRUCTED FLUSH AT THE EDGE OF THE ROADWAY SURFACE.
 3. DETECTABLE WARNINGS SHALL BE IN ACCORDANCE WITH TOWNSHIP SPECIFICATIONS AND SHALL MEET ALL FEDERAL REGULATIONS.
 4. PROVIDE 1/2" THICK EXPANSION JOINT WHERE CURB RAMP ADJOINS ANY RIGID PAVEMENT, SIDEWALK OR STRUCTURE WITH THE TOP OF JOINT FILLER FLUSH WITH ADJACENT CONCRETE SURFACE.
 5. ALL CURB RAMPS SHALL COMPLY WITH PennDOT ROADWAY CONSTRUCTION STANDARDS RC-67M LATEST REVISION.

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

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FILE NO.	2680.1.01.00

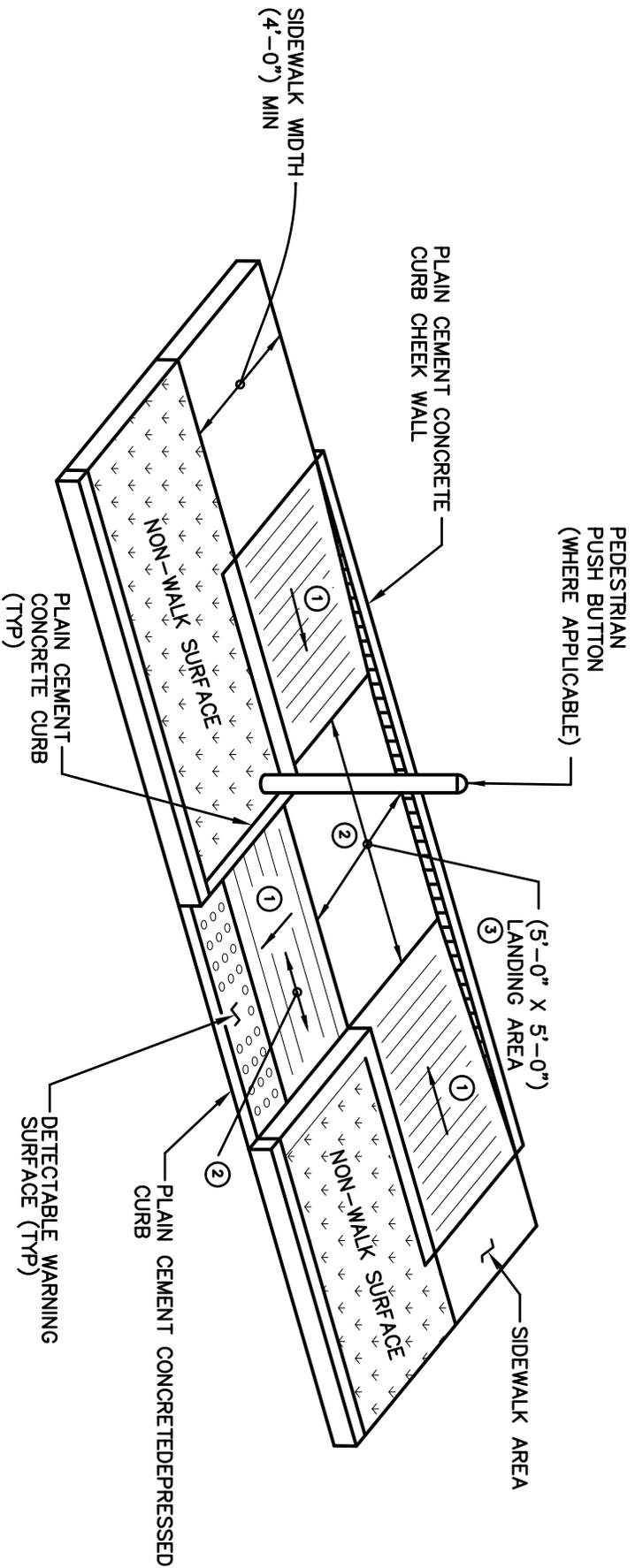


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TYPE 4 COMBINATION CURB RAMP DETAIL

GERMANY TOWNSHIP

ADAMS COUNTY, PENNSYLVANIA



- ① 8.33% MAX RAMP SLOPE
- ② 2.00% MAX CROSS SLOPE
- ③ 5' X 5' LANDING SHALL PROVIDE 60" CLEAR TURNING RADIUS.

- NOTES:
1. LANDING AREA SHALL BE AT LEAST AS WIDE AS THE CURB RAMPS.
 2. CURB RAMPS SHALL BE CONSTRUCTED FLUSH AT THE EDGE OF THE ROADWAY SURFACE.
 3. DETECTABLE WARNINGS SHALL BE IN ACCORDANCE WITH TOWNSHIP SPECIFICATIONS AND SHALL MEET ALL FEDERAL REGULATIONS.
 4. PROVIDE 1/2" THICK EXPANSION JOINT WHERE CURB RAMP ADJOINS ANY RIGID PAVEMENT, SIDEWALK OR STRUCTURE WITH THE TOP OF JOINT FILLER FLUSH WITH ADJACENT CONCRETE SURFACE.
 5. ALL CURB RAMPS SHALL COMPLY WITH PennDOT ROADWAY CONSTRUCTION STANDARDS RC-67M LATEST REVISION.

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS

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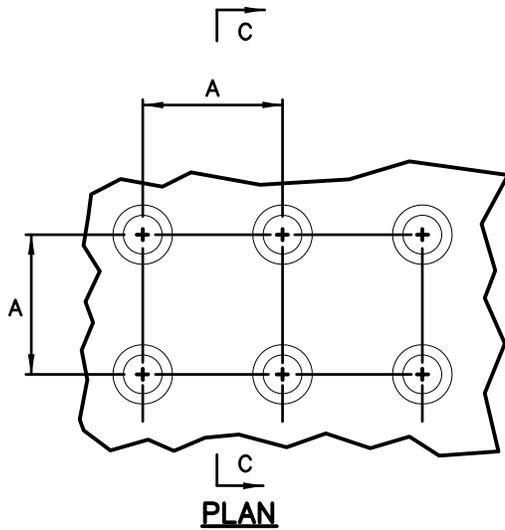
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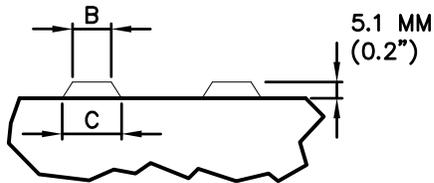
GERMANY TOWNSHIP

TYPE 4A COMBINATION CURB RAMP DETAIL

ADAMS COUNTY , PENNSYLVANIA



PLAN



SECTION D-D

TRUNCATED DOME DIMENSIONS	
DIM	mm (inch)
A	60 (2.35")
B	①
C	23 (0.9")

NOTES:

1. THE B DIMENSION IS TYPICALLY 50% TO 65 % OF THE C DIMENSION.
2. DETECTABLE WARNINGS SHALL MEET ALL FEDERAL REGULATIONS.
3. DETECTABLE WARNINGS SHALL MEET PENNDOT ROADWAY CONSTRUCTION STANDARDS RC-67M LATEST REVISION.
4. DETECTABLE WARNINGS SHALL BE SAFETY YELLOW INLAID COMPOSITE TILE AS APPROVED IN PennDOT PUBLICATION 15.

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



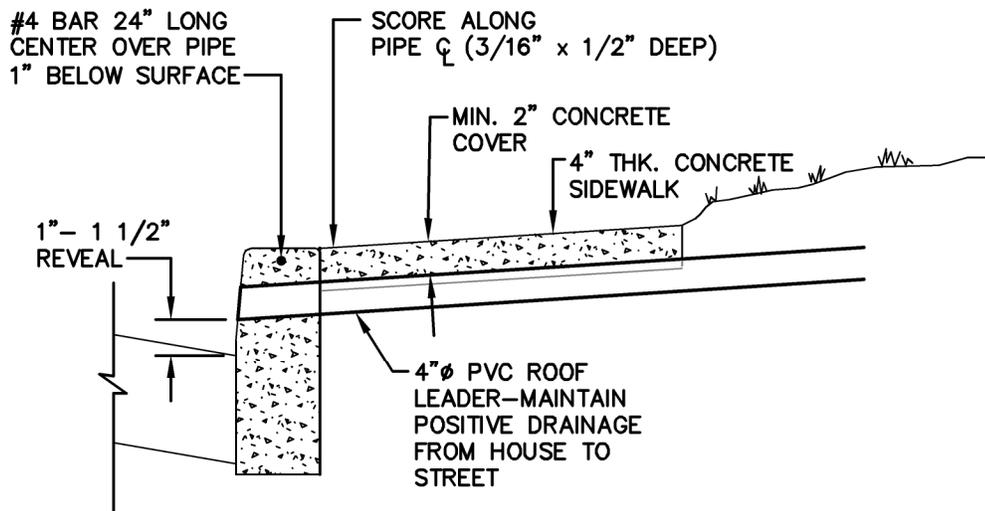
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**DETECTABLE WARNING
SURFACE DETAIL**

GERMANY TOWNSHIP ADAMS COUNTY , PENNSYLVANIA

DRAWN BY	CRP
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SCALE	N.T.S.
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FILE NO.	2680.1.01.00



NOTE: USE ROOF LEADER WITH STANDARD VERTICAL CURBS ONLY

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ROOF LEADER UNDER SIDEWALK DETAIL

GERMANY TOWNSHIP ADAMS COUNTY, PENNSYLVANIA

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DATE	3/19/2010
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FILE NO.	2680.1.01.00

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:

- GT2575-1 Temporary Trench Paving
- GT2575-2 Permanent Trench Paving

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation:

- Publication 408, Specifications
- Publication 213, Temporary 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.

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

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.
2. Submit bituminous concrete mix design for approval.
3. Provide PennDOT certifications (CS-4171) with each load delivered to the job site, as required by Municipality.

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 Adams 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; unless construction activities are restricted by PennDOT to restore after backfill.
- B. Shape and compact subgrade material proof roll, then place and compact base course to the required thickness.
- 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 backfill and surface restorations requirements table, and in accordance with Publication 408 Specifications. In State Highways, construct paving in accordance with PennDOT Highway Occupancy permit requirements.
- C. Maintain permanent paving throughout the contract maintenance period.

3.03 BITUMINOUS OVERLAY

- A. See Section 02500.
- B. Restore in accordance with the “Backfill and Surface Restoration Requirements Table”.

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. Trench roller shall have a minimum 300 pounds of pressure per inch.
- B. Restore existing concrete driveways with a 6” layer of concrete reinforced with WWF 6 x 6-W2.9 x W2.9 (6 ga.) wire mesh, placed 2” from top surface. See Section 03000.
- C. Restore existing bituminous driveways in kind; minimum 2” layer wearing course over 6” layer of select granular material (2A).
- D. Restore earth driveways with a 6” layer of select granular material (2RC).
- E. Restore stone or gravel driveways in kind; minimum 6” layer of select granular materials (2A).
- F. Restore brick driveway with like bricks placed on 4” thick wet sand bed. Place bricks in like patterns and spacing.

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.

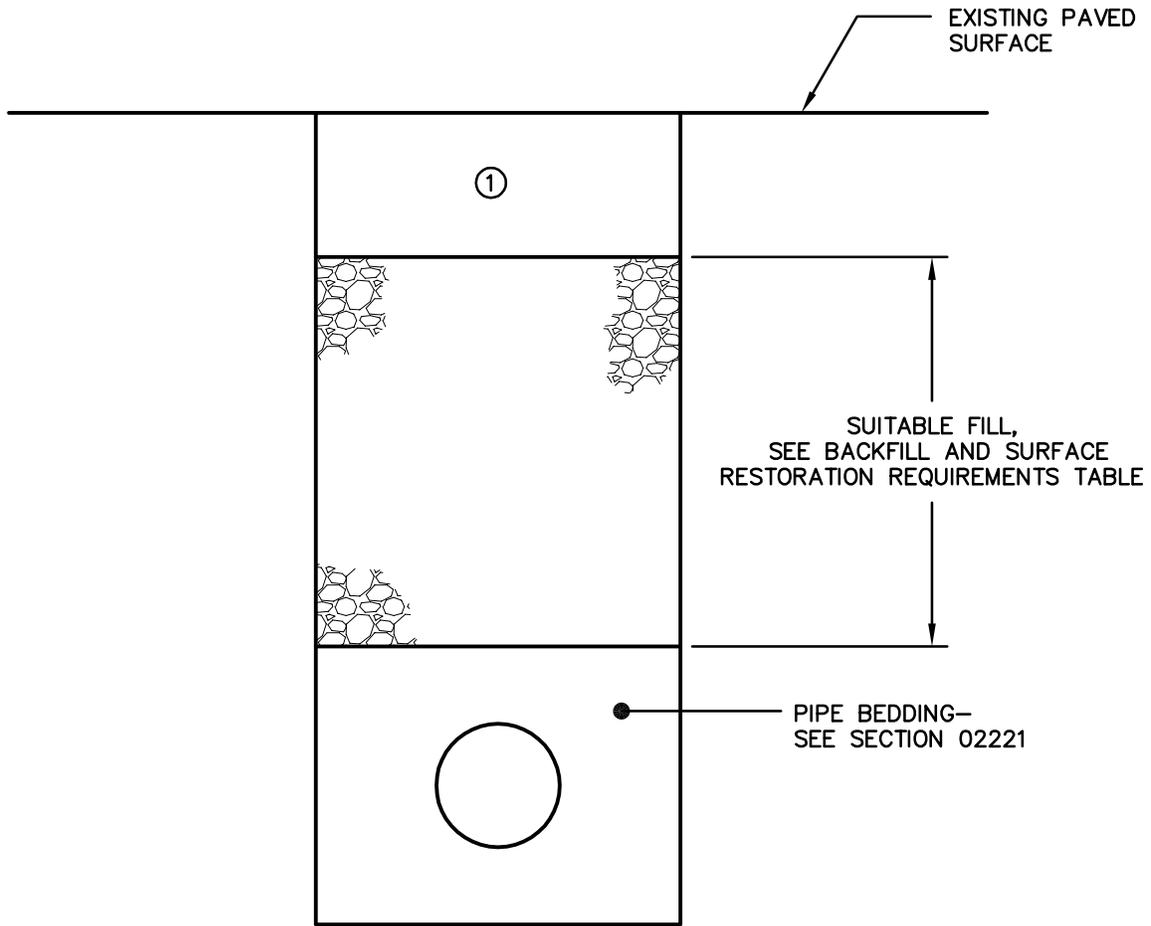
BACKFILL AND SURFACE RESTORATION REQUIREMENTS TABLE

Surface Class	Type Backfill	Percent ⁽¹⁾ Compaction	Temp. ⁽³⁾ Base	Temp. ⁽³⁾ Surface	Final Base	Final Surface
Vegetative	S.02221	90%	----	(2)	----	(2)
Stone	S.02221	95%	----	----	----	6" Thick PennDOT 2A S.02230
Bituminous Surface Course (Trench)	S.02221	95%	8" thick ⁽⁴⁾ 2A S.02230	3" thick HMA Binder (19mm) S.02500	8" thick PennDOT 2A	3" thick, 25mm HMA Base Course ⁽⁸⁾ , 2" thick, 19mm HMA Binder Course, 1½" thick HMA Wearing Surface (9.5mm) S.02500 ⁽⁷⁾
Concrete	S.02230	95%	8" thick ⁽⁴⁾ 2A S.02230	3" thick HMA 2 Binder (19mm) S.02500	8" thick PennDOT 2A	Min. 6" thick Class AA concrete ⁽⁸⁾

NOTE: Materials and construction requirements shall be in accordance with PennDOT Publication 408 Specifications.

1. Minimum, as % of maximum dry weight density at optimum moisture content plus or minus 2%.
2. See Seeding Restoration Table, Section 02485.
3. Temporary restoration shall remain in place for 90 days. Temporary restoration shall be removed prior to construction of final base and final surface.
4. To remain as final base.
5. All thicknesses shown are minimum compacted thickness.
6. PennDOT Pub. 408, Section 704. Use High Early Strength concrete for driveways.
7. See Standard Details for HMA asphalt surface if required.
8. Use Superpave Base Course, 37.5mm with a seal coat if wearing course will not immediately be placed.

END OF SECTION



STREET CLASSIFICATION	①
TOWNSHIP ROADS	3" SUPERPAVE BINDER (19MM)
STATE ROADS	SEE PERMIT

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

EQUIVALENT MARSHALL MIXES ARE ACCEPTABLE

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



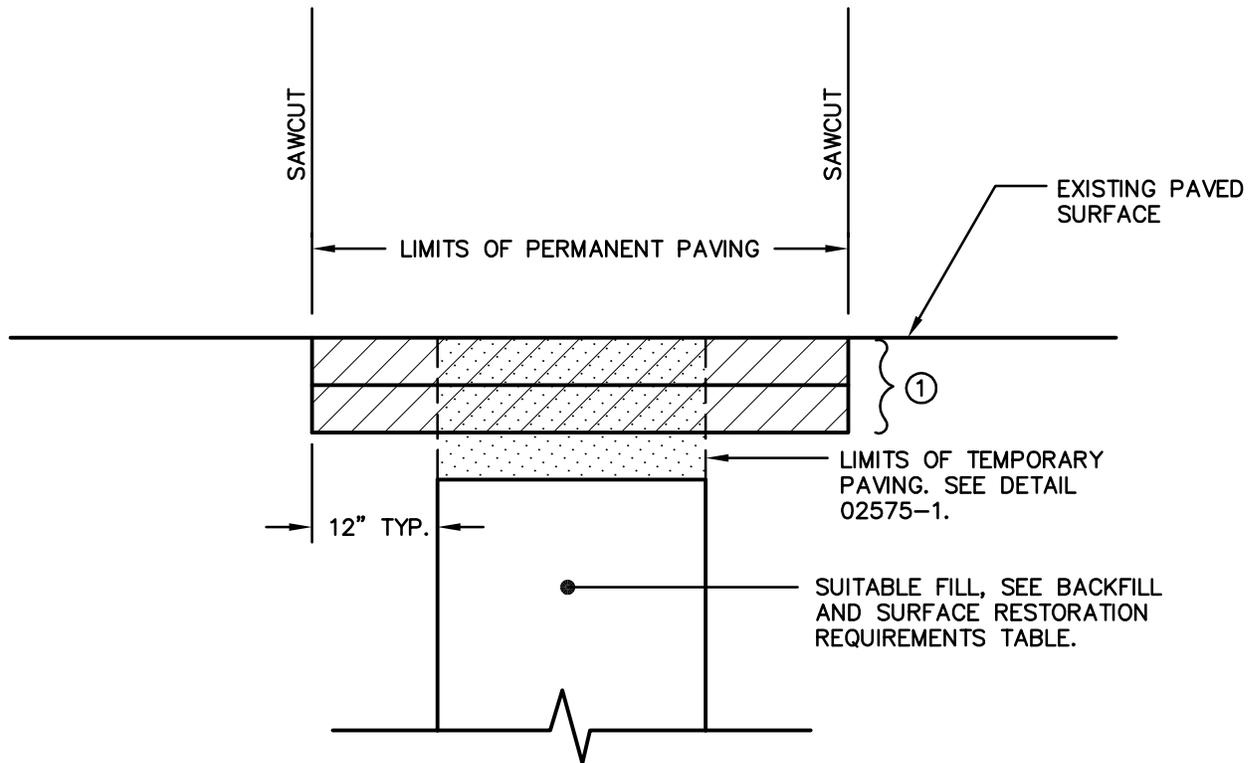
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TEMPORARY TRENCH PAVING

GERMANY TOWNSHIP ADAMS COUNTY, PENNSYLVANIA

DRAWN BY	CRP
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SCALE	N.T.S.
DATE	3/19/2010
DWG. NO.	GT02575-1
FILE NO.	2680.1.01.00



STREET CLASSIFICATION	①
TOWNSHIP ROADS	3" BASE, 2" BINDER, 1-1/2" WEARING
STATE ROADS	SEE PERMIT

BASE = SUPERPAVE BASE COURSE, 25MM

BINDER = SUPERPAVE BINDER COURSE, 19MM

WEARING = SUPERPAVE WEARING COURSE, 9.5MM

NOTE: EQUIVALENT MARSHALL MIXES MAY BE SUBSTITUTED, WHEN APPROVED BY THE TOWNSHIP.

SUPERPAVE MIXES TO BE AS SPECIFIED ON CONTRACT DRAWINGS.

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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PERMANENT TRENCH PAVING

GERMANY TOWNSHIP ADAMS COUNTY, PENNSYLVANIA

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SCALE	N.T.S.
DATE	3/19/2010
DWG. NO.	GT02575-2
FILE NO.	2680.1.01.00

SECTION 02602

STORM INLETS, CATCH BASINS, ENDWALLS

PART 1 GENERAL

1.01 DESCRIPTION

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

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

B. Related work specified elsewhere:

- | | |
|---|---------------|
| 1. Trenching, backfilling and compacting: | Section 02221 |
| 2. Finish grading, seeding and sodding: | Section 02485 |
| 3. Bituminous paving and surfacing: | Section 02500 |
| 4. Storm drain pipe: | Section 02618 |
| 5. Plain and reinforced cement concrete: | Section 03000 |

C. Definitions: NONE

D. Applicable Standard Details: GT- 02602-1 Inlet/ Storm Pipe Installation Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

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

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

A36	Specification for Carbon Structural Steel
A47	Specification for 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

1.03 SUBMITTALS

A. Certificates:

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

B. Shop Drawings:

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

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

1.04 JOB CONDITIONS: Section not utilized.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Precast Concrete Units:

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

B. Inspections

1. Inspection by the 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 ½" diameter indicating honey-combed or open texture.
 - d. Damaged or cracked ends, where such damage would prevent making a satisfactory joint.
3. Concrete Testing (For Cast-In-Place Work): Section 03000.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed Stone Subbase:

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

B. Brick: ASTM C32 Grade SS, solid.

C. Masonry Mortar: ASTM C270, Type S.

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

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

F. Structural Grade Carbon Steel: ASTM A36.

G. Cast-in-Place Cement Concrete:

H. Cast Gray Iron Castings: ASTM A48.

2.02 FABRICATIONS

A. Precast Cement Concrete Units:

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

B. Pipe Culvert End Sections:

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

C. Inlet Grates:

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

D. Precast Cement Concrete Grade Adjustment Risers: Risers shall be cast from 4000 psi concrete (28-day compressive strength), shall be a maximum of 2" thick, and shall be reinforced in accordance with ASTM A478.

E. 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. Comply with the requirements of, Publication 72M, RC-31.

PART 3 EXECUTION

3.01 EXCAVATION

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

3.02 CONSTRUCTION

- A. Construct inlets and catch basins of either precast cement concrete sections or of cast-in-place cement concrete, and of the type indicated on the 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 or brick to adjust to grade. Mortar in place.

5. Place bicycle safe grates in all paved (present or future) areas.
- B. Construct endwalls to the dimensions and design indicated on Standard Drawing RC-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.
- D. Where indicated on the drawings, provide pipe culvert end sections of the design and dimensions of Standard Drawing RC-33M, Publication 72M.
- E. Install polyethylene end sections in accordance with manufacturer's instructions, bedded and anchored as required.
- F. Construct basin outlet structures with inverts, grates and openings at the required elevations shown on the drawings. Connect to new or existing outlet pipes, relaying or adding pipe as needed to meet the structure.

3.03 BACKFILLING

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

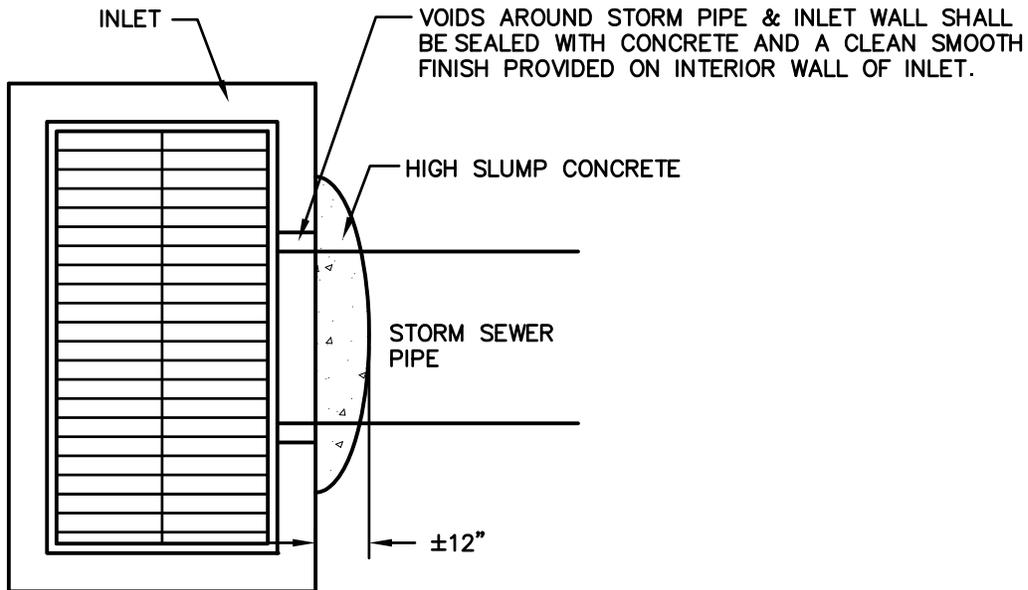
3.04 DISPOSAL OF EXCAVATED MATERIAL: Section 02221.

3.05 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

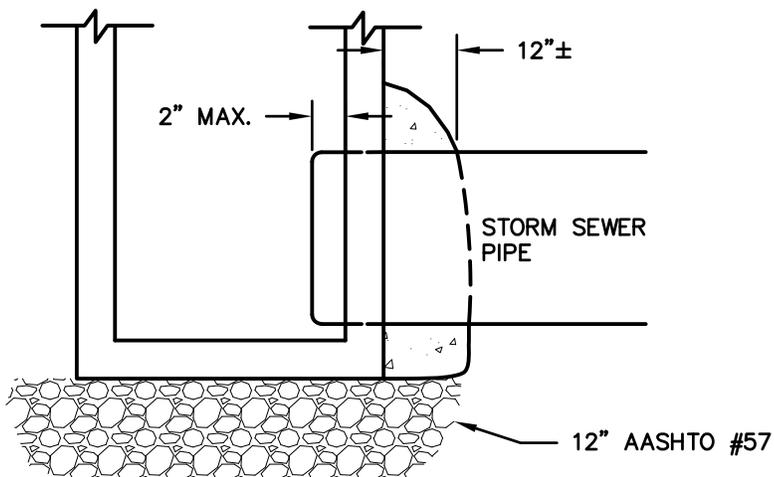
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PLAN VIEW

NOTES:

1. ALL INLETS SHALL CONFORM TO PennDOT CONSTRUCTION STANDARDS RC-46M LATEST REVISION.



ELEVATION

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



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**INLET/STORM PIPE
INSTALLATION DETAIL**

GERMANY TOWNSHIP ADAMS COUNTY, PENNSYLVANIA

DRAWN BY	CRP
CHECKED BY	
SCALE	N.T.S.
DATE	3/19/2010
DWG. NO.	GT02602-1
FILE NO.	2680.1.01.00

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. Utility conflict statement | Section 00160 |
| 2. Boring and jacking | Section 02150 |
| 3. Trenching, backfilling and compaction: | Section 02221 |
| 4. Finish grading, seeding and sodding: | Section 02485 |
| 5. Trench paving and restoration: | Section 02575 |
| 6. Inlets, catch basins and endwalls: | Section 02602 |

C. Definitions:

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

D. Applicable Standard Details:

GT2618-1 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
2. AASHTO M294 and MP7
3. ASTM F667

C. 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.

2.03 ELLIPTICAL REINFORCED CONCRETE PIPE

A. Pipe:

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

2.04 CORRUGATED GALVANIZED STEEL PIPE AND PIPE ARCH

A. Pipe and Coupling Bends

1. Section 601.2, Publication 408 Specifications.
2. AASHTO M36, Type 1 or AASHTO M218, Type 1 or AASHTO M274, Type II.
3. Minimum 14 gauge: 2 2/3" x 1/2" corrugations unless otherwise approved by Municipality.

2.05 POLY VINYL CHLORIDE PIPE

A. Pipe and Fittings

1. AASHTO M278
2. ASTM D3034

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 (Type III or IV) 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 Municipality in advance of pipe laying operations, minimum 24 hours.
- B. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to pipe. Do not drop pipe.
- C. Lay pipe proceeding upgrade with the bell or groove pointing upstream.
- D. Lay pipe to a true uniform grade with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- E. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.
- F. Clean and inspect each pipe and fitting before joining. Align pipe with previously laid sections. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. Assemble joints in accordance with the pipe manufacturer's instructions.
- G. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. A deviation from the designed line or grade as shown on the drawings will be cause for rejection.
- H. Place and compact sufficient backfill to hold each section of pipe firmly in place as the pipe is laid.

3.03 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of pipe by the 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

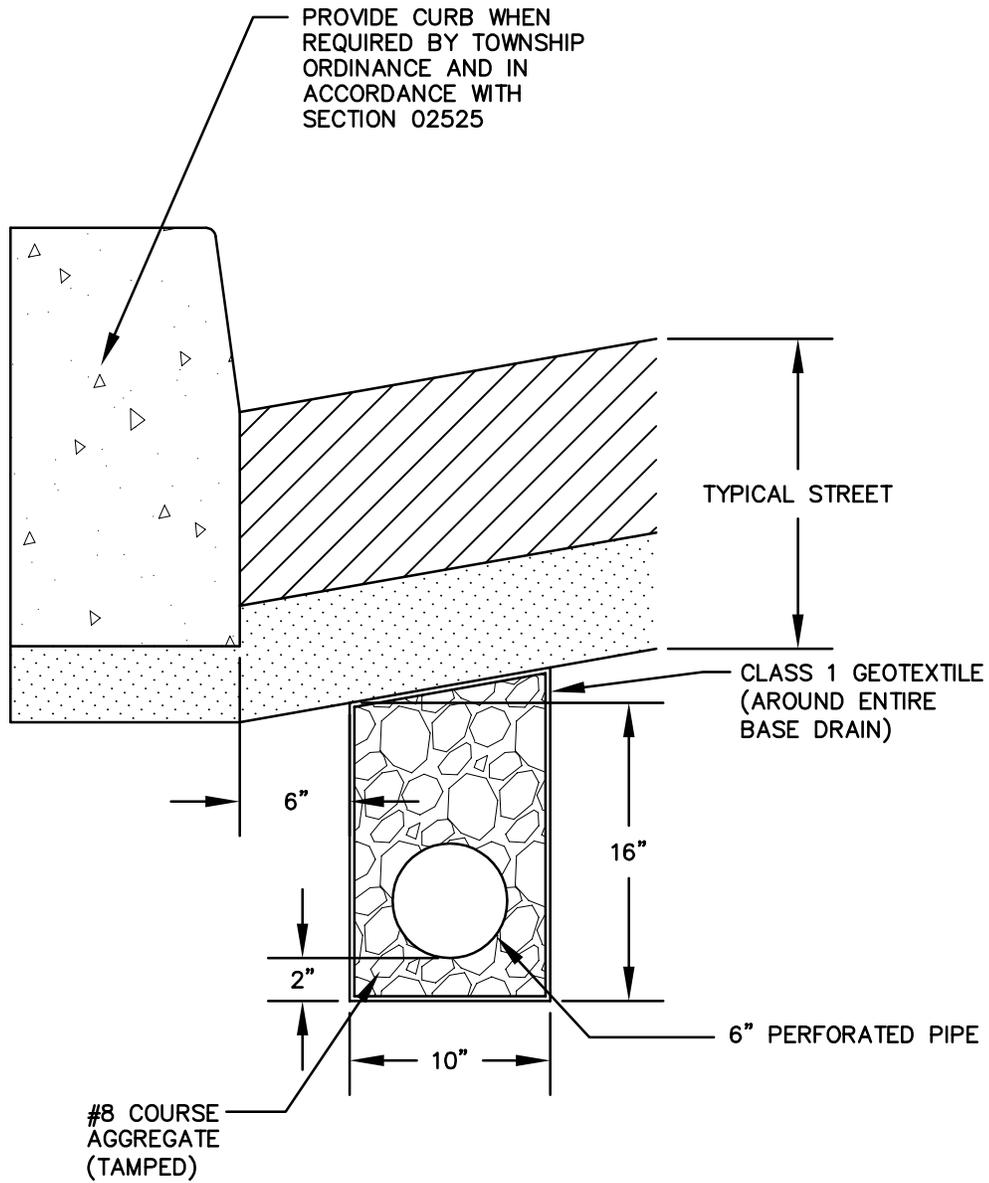
- A. Construct drains of the size and type indicated on the drawings in accordance with the requirements set forth in Section 610, Publication 408 Specifications and as shown on Standard drawings RC-30, Publication 72M.

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

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NOTE:

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

GERMANY TOWNSHIP CONSTRUCTION & MATERIAL SPECIFICATIONS



Excellence in Civil Engineering

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 WWW.CSDAVIDSON.COM

BASE DRAIN DETAIL

GERMANY TOWNSHIP ADAMS COUNTY, PENNSYLVANIA

DRAWN BY	CRP
CHECKED BY	
SCALE	N.T.S.
DATE	3/19/2010
DWG. NO.	GT02618-1
FILE NO.	2680.1.01.00

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 Municipality, Engineer and Adams 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 spacing's, 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

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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.

B. Related Work Specified Elsewhere:

1. Cement concrete curb and sidewalk: Section 02525

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

E. Work shall conform to all requirements of ACT 301-05, published by the American Concrete Institute, Farming Hill Michigan except as modified by the specifications.

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 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 air content limits in ACT 301 moderate exposure.
- 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.
- F. 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.
- G. 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.
- H. 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 reinforcements 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, straightedge, and darbied 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 Municipality.
 - 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, f'c. Moisture retention measures may also be terminated when the temperature of the concrete is maintained at least at 50°F for the same length of time that laboratory-cured cylinders, representative of the concrete in-place, require to achieve 85 percent of f'c.
- 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 defects are 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 Municipality.
 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.
 2. Additional testing and inspection required because of changes in materials or proportions requested by the CONTRACTOR.
- 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 Municipality 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 60° to 80°F, 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